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# Encumbered Security? Vertical and Horizontal Repos in the Euro Area and Their Inherent Ambiguity

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## ABSTRACT

Despite the significance of repurchase agreements (repos) in market-based finance, European repo markets remain underexplored. Drawing on monetary hierarchy literature, we make three conceptual arguments. First, we argue that repos' balance sheet mechanics differ depending on the counterparties' relative hierarchical position. *Vertical repos* across hierarchical levels imply money creation; *horizontal repos* lend on pre-existing money. Second, we conceptualize the 'inherently ambiguous' whereabouts of the security used as repo collateral: it becomes the lender's off-balance-sheet asset, paired with a liability to return it, while the Basel III regulations treat it as 'encumbered' on the borrower's balance sheet. Third, we propose an on-balance-sheet notation of collateral frameworks that illustrates their function as a central bank policy tool which influences central counterparties' general collateral baskets. Empirically, we study vertical repos of the Eurosystem and horizontal repos in European interbank markets with regard to their institutional evolution and principal role in the Eurocrisis. We show that in case of Eurosystem repos, the 'inherent ambiguity' helps *conceal* the security and enable sovereign debt funding compliant with the 'monetary financing prohibition'. In case of interbank repos, the 'inherent

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ambiguity' facilitates the security's effective *bilocation* as it gets simultaneously treated as the borrower's encumbered asset and as disposable for the lender's re-use.

**KEYWORDS:** Repurchase agreements, collateral, market-based finance, Eurosystem, European Central Bank, Eurex Clearing



## I. 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'.[1] The US central bank had been founded just before the war, after years of struggle between different political fractions about its design.[2] 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',[3] and only exceptionally with some forms of short-term government debt. The only legitimate counterparties were member banks, ie commercial banks that had become members of one of the Fed's district central banks.[4] Repos were a convenient way to circumvent these restrictions and extend the set of both 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.[5] 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 non-member banks.[6] The Fed's legal counsel argued that these transactions were not sales, as they pretended to be, but in fact secured loans and therefore *ultra vires*, ie beyond the scope of the Fed's powers, but these reservations were brushed aside.[7] 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.[8]

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 now is called the 'shadow banking system' or 'market-based finance'.[9] Even though rulings of common law courts and regulatory changes have at different times attempted to provide more clarification

1 Seymour Edwin Harris, *Twenty Years of Federal Reserve Policy* (Harvard University Press 1933) 289. Edward C Simmons, 'Sales of Government Securities to Federal Reserve Banks under Repurchase Agreements' (1954) 9 Journal of Finance 23.

2 Nadav Orian Peer, 'Negotiating the Lender of Last Resort: The 1913 Federal Reserve Act as a Debate over Credit Distribution' (2019) 15 New York University Journal of Law and Business 367.

3 Lloyd Wynn Mints, *A History of Banking Theory in Great Britain and the United States* (University of Chicago Press 1945).

4 US Congress, 'Federal Reserve Act' (United States Congress 1913) Sec 13–14.

5 Harris (n 1) 289.

6 FRBNY, *Fourth Annual Report of the Federal Reserve Bank of New York for the Year Ended December 31, 1918* (1919) 24.

7 Harris (n 1) 290.

8 Repos complemented other macro-financial techniques to support the war financing effort, see eg Lev Menand and Joshua Younger, 'Money and the Public Debt: Treasury Market Liquidity as Legal Phenomenon' (2023) 2023 Columbia Business Law Review 247.

9 Perry Mehrling, *The New Lombard Street: How the Fed Became the Dealer of Last Resort* (Princeton University Press 2011); Dan Awrey, 'Toward a Supply-Side Theory of Financial Innovation' (2013) 41 Journal of Comparative Economics 401; Lev Menand, *The Fed Unbound: Central Banking in a Time of Crisis* (Columbia Global Reports 2022).

about the nature of repos,[10] they remain an inherently ambiguous instrument that the literature in law and political economy sometimes refers to as a form of 'shadow money'.[11] In the present setting, repos are particularly attractive to market participants due to their special treatment under bankruptcy law.[12] It is widely recognized that contractions in the repo market lay at the heart of the 2007–9 Global Financial Crisis (GFC).[13] Some even perceived repos as the instrument that elevated a real estate crisis and the bursting of a mortgage securitization scheme to global proportions.[14] After all, the part of Lehman Brothers that went bankrupt was the bank's repo dealer, which had confused customers, regulators, and eventually itself about the volume of repos outstanding and the whereabouts of the repo collateral.[15]

Less widely studied—both conceptually and empirically—are repos in Europe which have many similarities but also important differences to those in the US.[16] Conceptually, there is a common tendency in the limited volume of literature on European repos not to systematically distinguish between repos used for the purpose of monetary policy implementation by the Eurosystem and those used between private financial market participants.[17] Empirically, the macro-financial role of the European repo market in the 2009–12 Eurocrisis is still insufficiently explored. It is true that there have been in-depth quantitative analyses on the dynamics of European repo markets[18] as well as pioneering work on the political economy of European repo regulation.[19] Still, the actual crisis dynamics connected to European repo markets are insufficiently modelled. It is known that repos replaced unsecured interbank lending early on

[10] Kenneth D Garbade, 'The Evolution of Repo Contracting Conventions in the 1980s' (2006) 12 Economic Policy Review 27; see also William F Hagerty, 'Lifting the Cloud of Uncertainty over the Repo Market: Characterization of Repos as Separate Purchases and Sales of Securities' (1984) 24 Vanderbilt Law Review 401; Gary Walters, 'Repurchase Agreements and the Bankruptcy Code: The Need for Legislative Action' (1984) 52 Fordham Law Review 828; Howard R Schatz, 'The Characterization of Repurchase Agreements in the Context of the Federal Securities Laws' (1987) 61 St John's Law Review 290; Fiona Maclachlan, 'Repurchase Agreements and the Law: How Legislative Changes Fueled the Housing Bubble' (2014) 48 Journal of Economic Issues 515; Harry McVea, 'Central Counterparties and Sale and Repurchase Agreements. Regulating Financial Markets in the Light of Yet Another False Dawn' (2017) 17 Journal of Corporate Law Studies 111.

[11] Morgan Ricks, 'Regulating Money Creation after the Crisis' (2011) 1 Harvard Business Law Review 75; Morgan Ricks, *The Money Problem: Rethinking Financial Regulation* (University of Chicago Press 2016); Zoltan Pozsar, 'Shadow Banking: The Money View' (2014) Office of Financial Research Working Paper; Daniela Gabor and Jakob Vestergaard, 'Towards a Theory of Shadow Money' (2016) Institute for New Economic Thinking (INET) Working Paper; Steffen Murau, 'Shadow Money and the Public Money Supply: The Impact of the 2007–2009 Financial Crisis on the Monetary System' (2017) 24 Review of International Political Economy 802.

[12] John Armour and others, *Principles of Financial Regulation* (Oxford University Press 2016) ch 21. They argue at 455 that 'the growth of repo markets in recent years is a consequence of the special treatment extended to repos under bankruptcy law. In general, bankruptcy laws in jurisdictions such as the US and UK impose an automatic stay upon bankruptcy filing preventing lenders from, *inter alia*, immediately seizing and liquidating any collateral against which the obligations of the bankrupt counterparty may have been secured. . . . Over the course of the last several decades, however, repo agreements have received near-universal legislative carve-outs from these important restrictions, thus enabling repo lenders to liquidate the collateral of a bankrupt counterparty, net out gains and losses on different repos, and retain any eve-of-bankruptcy payments'. In our understanding, this describes how the regulatory regime of exceptions created around repos permeates their inherent ambiguity, which depends crucially on the status of the security used as collateral during the maturity period of a repo.

[13] Brian A Johnson and Hal Scott, 'Controlling the Long-Term Problem of Short-Term Funding' (2019) 2 Journal of Financial Regulation 101.

[14] Gary Gorton and Andrew Metrick, 'Securitized Banking and the Run on Repo' (2012) 104 Journal of Financial Economics 425; Viral Acharya and Sabri Öncü, 'The Repurchase Agreement (Repo) Market' in Viral Acharya and others (eds), *Regulating Wall Street: The Dodd-Frank Act and the New Architecture of Global Finance* (Wiley 2010) 319.

[15] Oonagh McDonald, *Lehman Brothers: A Crisis of Value* (Manchester University Press 2015) ch 5.

[16] Iain Hardie and others, 'Banks and the False Dichotomy in the Comparative Political Economy of Finance' (2013) 65 World Politics 691; Songjiwen Wu and Hossein Nabilou, 'Repo Markets across the Atlantic: Similar but Unalike' (2019) 30 European Business Law Review 513.

[17] European Central Bank (ECB), 'Main Features of the Repo Market in the Euro Area' (2022) ECB Monthly Bulletin (October): 55; Jean Pisany-Ferry and Guntram Wolff, 'Propping Up Europe?' (*Bruegel*, 24 April 2012).

[18] Eg Charles Boissel and others, 'Systemic Risk in Clearing Houses: Evidence from the European Repo Market' (2017) 125 Journal of Financial Economics 511; Claudio Bassi and others, 'Enhancing Repo Market Transparency: The EU Securities Financing Transactions Regulation' (2025) Journal of Financial Regulation (forthcoming).

[19] Daniela Gabor, 'The (Impossible) Repo Trinity: The Political Economy of Repo Markets' (2016) 23 Review of International Political Economy 967; Daniela Gabor and Cornel Ban, 'Banking on Bonds: The New Links Between States and Markets' (2016) 54 Journal of Common Market Studies 617.

in the crisis and provided a channel for the spread of contagion through the European monetary and financial system during the looming default of Greece.[20] However, there is no convincing explanation of how precisely it worked and why it happened. Repos were likely at the very heart of the crisis dynamics because they connect banking, shadow banking, and—via the sovereign debt securities posted as collateral—also fiscal balance sheets across countries. 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 developed, for example, by the Money View[21] and the (critical) macro-finance literature[22]—has the potential to provide clarification about repos' ambiguity and inform the literature on law and macro-finance interested in questions of financial regulation.[23] While money creation is notoriously difficult to conceptualize,[24] balance sheet methodology offers the appropriate analytical categories that are 'true' for the nature of the object of analysis.[25] 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.[26] As repos connect the balance sheets of central banks, commercial banks, and non-bank financial institutions while typically using sovereign debt securities as collateral, they uniquely bridge all segments of the 'monetary architecture'.[27] This makes repos a quintessential use case 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 and also impede the application of balance sheet methodology for debates on financial regulation.

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 (as their name may be misleadingly taken to insinuate[28] and as the FRBNY insisted in 1917), in which way exactly do they expand the liability sides on the balance sheets 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.[29] For instance, some attempts to make sense of repos on-balance-sheet involve a symmetric expansion of both counterparties' balance sheets with a 'repo'

[20] Adrian van Rixtel and Gabriele Gasperini, 'Financial Crises and Bank Funding: Recent Experience in the Euro Area' (2013) Bank for International Settlements (BIS) Working Paper No 406.

[21] Mehrling (n 9).

[22] Daniela Gabor and Jakob Vestergaard, 'Chasing Unicorns: The European Single Safe Asset Project' (2018) 22 Competition and Change 139; Daniela Gabor, 'Critical Macro-Finance: A Theoretical Lens' (2020) 6 Finance and Society 45; Sahil Dutta and others, 'Critical Macro-Finance: An Introduction' (2020) 6 Finance and Society 34; Steffen Murau and Tobias Pforr, 'What Is Money in a Critical Macro-Finance Framework?' (2020) 6 Finance and Society 56.

[23] Katharina Pistor, 'A Legal Theory of Finance' (2013) 41 Journal of Comparative Economics 315; M Konrad Borowicz, 'A Theoretical Framework for Law and Macro-Finance' (2022) 9 Journal of Financial Regulation 55.

[24] Dirk Bezemer, "Towards an "Accounting View" on Money, Banking and the Macroeconomy: History, Empirics, Theory' (2016) 40 Cambridge Journal of Economics 1275; Jo Michell, 'Theorising Non-Bank Financial Intermediation' (2024) 12 Review of Keynesian Economics 181.

[25] Cf John Maynard Keynes, 'On the Theory of a Monetary Economy' (1963 [1933]) 2 Nebraska Journal of Economics and Business 7; Perry Mehrling, 'Financialization and Its Discontents' (2017) 3 Finance and Society 1.

[26] Adam Tooze, *Crashed: How a Decade of Financial Crises Changed the World* (Viking 2018).

[27] Steffen Murau, 'A Macro-Financial Model of the Eurozone Architecture Embedded in the Global Offshore US-Dollar System' (July 2020) Global Economic Governance Initiative (GEGI) Study ((GEGI), Boston University; Steffen Murau, Armin Haas and Andrei Guter-Sandu, 'Monetary Architecture and the Green Transition' (2023) 56 Environment and Planning A: Economy and Space 382; Andrei Guter-Sandu, Armin Haas and Steffen Murau, 'Green Macro-Financial Governance in the European Monetary Architecture: Assessing the Capacity to Finance the Net-Zero Transition' (2024) *Competition and Change* 1.

[28] Cf Moorad Choudhry, *The Repo Handbook* (Elsevier 2010) 5.

[29] Carolyn Sissoko, 'Repurchase Agreements and the (De)Construction of Financial Markets' (2019) 48 Economy and Society 315.

against reserves,[30] an 'overnight repo' against a 'term repo',[31] or both,[32] whereas others perceive the repo issuance as expanding only one of the counterparties' balance sheet[33] or as being balance sheet neutral.[34] Alternative analyses of repos that make money creation analogies but do not explicitly use balance sheet visualizations argue on the basis of loanable funds theory[35] or use concepts of fractional reserve banking theory such as the money multiplier.[36]

Second, there is presently no entirely satisfactory on-balance-sheet depiction of the repo mechanism that clarifies the whereabouts of the security used as collateral during the maturity period of the repo. This, however, would be crucial from the perspective of financial regulation. Many representations that emphasize the credit character of the repo transaction abstract from the security altogether,[37] whilst others seek to integrate the security by abstracting from the repo IOU.[38] Daniel Neilson 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 entire story.[39] 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 the specific European context to be appropriately grasped, 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. Matters are further complicated by the fact that European countries have their own repo-related legacy structures and country-specific terminologies. 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,[40] there is not yet a solution for an on-balance-sheet representation of those mechanisms, which is in fact an important policy tool to affect the credit condition of the system.[41]

In this article, we propose a novel way to depict repos on-balance-sheet that remedies these issues. Drawing on the literature on monetary hierarchy,[42] we make three conceptual arguments. First, we argue that the balance sheet mechanics of repos vary if the counterparties involved are located on different hierarchical 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 solution to coherently represent the whereabouts of the security posted as repo collateral during the repo's maturity

30 Mehrling (n 9) 98.
31 Pozsar (n 11) 15.
32 Jo Michell, 'Do Shadow Banks Create Money? "Financialization" and the Monetary Circuit' (2017) 68 Metroeconomica 372.
33 Gabor and Vestergaard (n 11) 18; Gabor and Vestergaard (n 22) 149.
34 Gabor and Vestergaard (n 11) 16.
35 Gorton and Metrick (n 14); cf Michell (n 32).
36 Gary B Gorton, *Slapped by the Invisible Hand: The Panic of 2007* (Oxford University Press 2010).
37 Mehrling (n 9); Pozsar (n 11).
38 Gabor and Vestergaard (n 22).
39 Daniel Neilson, 'Repo from First Principles' (*Soon Parted* (blog), 2021) <https://www.soonparted.co/p/repo-first-principles.
40 Jens van 't Klooster, 'The Politics of the ECB's Market-Based Approach to Government Debt' (2022) 21 Socio-Economic Review 1103.
41 Jakob Vestergaard and Daniela Gabor, 'Should Central Bank Liquidity Be a Vehicle for Fiscal Disciplining?' (2022) 46 *Cambridge Journal of Economics* 491.
42 See eg Perry Mehrling, 'The Inherent Hierarchy of Money' in Lance Taylor, Armon Rezai and Thomas Michl (eds), *Social Fairness and Economics: Economic Essays in the Spirit of Duncan Foley* (Routledge 2012) 394; Daniel Neilson, 'Quadruple-Entry Accounting' (*Soon Parted* (blog), 2021) <https://www.soonparted.co/p/quadruple-entry; Neilson (n 39); Steffen Murau, Fabian Pape and Tobias Pforr, 'International Monetary Hierarchy through Emergency US-Dollar Liquidity: A Key Currency Approach' (2023) 27 Competition and Change 495; Pistor (n 23).

period. It is held as an off-balance-sheet position of the repo lender, combined with a liability to repay it. The 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, but this provides only an imperfect regulatory fix. Third, we introduce an on-balance-sheet notation of the collateral framework as a means for 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 show the merits of our repo conceptualization, we apply it on the two most relevant cases for Europe'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 depicting 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 clarifies the balance sheet mechanics involved in both General Collateral and Special Collateral repos, whether carried out bilaterally or via a central counterparty (CCP). This allows us to show on-balance-sheet how CCPs have mimicked the transformation of the Eurosystem's collateral framework and thus magnified the Eurosystem's policy interventions to private repo markets.

We find that the inherent ambiguity of both vertical repos of the Eurosystem and horizontal repos between banks crucially shapes the contemporary European monetary architecture. Vertical repos facilitate the Eurosystem's funding of sovereign debt despite the infamous 'monetary financing prohibition' because they *conceal* the security that banks pledge as collateral for central bank money creation. The inherent ambiguity here helps tweak the provisions of the Maastricht Treaty that are now found in article 123 of the Treaty on the Functioning of the European Union (TFEU). Horizontal repos, by contrast, facilitate the maintenance of a regulatory setting where the security used as collateral remains allegedly encumbered on the balance sheet of the repo borrower but simultaneously can be re-used by the repo lender in another repo transaction. The inherent ambiguity here helps create a *bilocation* of the security, exploiting inconsistencies between the Basel III regulation and the EU's Directive on Financial Collateral Arrangements.

This assessment allows us to shed new light on the Eurocrisis and explain the role of repos in it. At its heart, the Eurocrisis was an implosion of the funding of sovereign debt securities via vertical and horizontal repos. For better or worse, the elasticity space on the 'off-balance-sheet balance sheets' of the repo lenders has become indispensable for funding sovereigns' structural debt burden. Euro area Member States entered into a debt crisis when their sovereign debt securities stopped being eligible to tap this elasticity space. The eligibility depends on the collateral framework of the Eurosystem and the General Collateral baskets of CCPs, which were organized in a way that fostered the emergence of a self-fulling debt crisis. The failure to provide systemic funding for sovereign debt via vertical and horizontal repos was the main cause of the Eurocrisis, whose nature and origin continues to be misunderstood until the present day.

We contribute to several ongoing debates. 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 to explain repos' inherent ambiguity and the ongoing struggles of

regulators who now double down on the encumbrance concept.[43] 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.[44] Moreover, our empirical analysis contributes to studies of repos in Europe, both as a monetary policy tool and as a mechanism for secured interbank lending.[45] We also speak to the literature on the implications of the Eurosystem's collateral framework on the Eurocrisis.[46] Our findings offer an entry point to reflect on the implications that the inherent ambiguity involved in repos may have for financial regulation. As Dan Awrey has argued, unveiling the real-world complexity of financial markets is required to provide a rational basis for improving financial regulation.[47]

The remainder of this article is organized as follows. Section II introduces our proposed balance sheet methodology to conceptualize vertical and horizontal repos. Section III applies this methodology to vertical repos as a monetary policy instrument in the Euro area, and section IV applies it to horizontal repos in the Euro area's interbank market. Section V concludes.

## II. BALANCE SHEET METHODOLOGY

### 1. Vertical and horizontal repos as different quadruple-entry-consistent operations

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—eg by central banks for monetary policy implementation;[48] by banks for borrowing and lending on the secured interbank market;[49] or by securities dealers for market making as part of the shadow banking daisy chain.[50] 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.[51]

From our perspective, the view that there is only one type of repo 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.

[43] CGFS, 'Asset Encumbrance, Financial Reform and the Demand for Collateral Assets' (2013) BIS, Committee on the Global Financial System (CGFS) Papers <www.bis.org/publ/cgfs49.pdf.

[44] Matthias Thiemann, *The Growth of Shadow Banking: A Comparative Institutional Analysis* (Cambridge University Press 2018); Katharina Pistor, *The Code of Capital: How the Law Creates Wealth and Inequality* (Princeton University Press 2019).

[45] Gabor (n 19); Gabor and Ban (n 19); Benjamin Braun, 'Central Banking and the Infrastructural Power of Finance: The Case of ECB Support for Repo and Securitization Markets' (2020) 18 Socio-Economic Review 395; Leon Wansleben, 'Formal Institution Building in Financialized Capitalism. The Case of Repo Markets' (2020) 49 Theory and Society 187.

[46] Athanasios Orphanides, 'ECB Monetary Policy and Euro Area Governance: Collateral Eligibility Criteria for Sovereign Debt' in Ernest Gnan and Donato Masciandaro (eds), *New Challenges in Central Banking: Monetary Policy Governance and Macroprudential Issues* (SUERF Conference Proceedings 2017) 13; Kjell G Nyborg, *Collateral Frameworks: The Open Secret of Central Banks* (Cambridge University Press 2017); Jens van 't Klooster, 'The Political Economy of Central Bank Risk Management', PhD thesis (University of Groningen, 2021); Van 't Klooster (n 40); Vestergaard and Gabor (n 41).

[47] Dan Awrey, 'Complexity, Innovation, and the Regulation of Modern Financial Markets' (2012) Harvard Business Law Review 235.

[48] CGFS, 'Implications of Repo Markets for Central Banks' (1999) CGFS Working Group Report; Ulrich Bindseil and Kjell Nyborg, 'Monetary Policy Implementation: A European Perspective' (2007) Norwegian School of Economics and Business Administration, Department of Finance and Management Science Discussion Paper.

[49] Patrick Schaffner, Angelo Ranaldo and Kostas Tsatsaronis, 'Euro Repo Market Functioning. Collateral is King' (2019) BIS Quarterly Review (December) 95.

[50] Zoltan Pozsar and others, 'Shadow Banking' (2012) Federal Reserve Bank of New York Staff Report; Tobias Adrian and others, 'Repo and Securities Lending' (2013) Federal Reserve Bank of New York Staff Report No 529; Katie Kolchin, Justyna Podziemska and Ali Mostafa, 'The US Repo Markets: A Chart Book' (2022) SIFMA Research Fact Sheet.

[51] Garbade (n 10); Luca Meneghini, 'The Legal and Economic Underpinnings of Repo Transactions: A Comparative Overview' (2019) Rivista Di Diritto Del Risparmio (December).

On the one hand, as *instruments*, repos appear simultaneously as IOUs on the asset and liability 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. The repo claim is the temporary legal claim to the security posted as collateral, and not the security itself that appears on the asset side of the balance sheet. Similarly, a repo liability indicates the future promise to repurchase the legal ownership of the security posted as collateral at maturity.[52]

Note that 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 whether the motivation is to secure cash ('repo') or the security ('reverse repo').[53] Both 'repo' and 'reverse repo' are in fact the same instrument, which 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 or whether they are on the same one.[54] 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 mobilize the matrix of quadruple-entry-consistent financial transactions introduced by Daniel Neilson,[55] 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 book-keeping. This necessarily involves four booking entries of IOUs, two on each balance sheet, which are either additions or subtractions of instruments on the asset or liability side. The matrix is helpful to explore the appropriate notation style for repos as it introduces the formal criterion for quadruple-entry-consistency which informs our analysis and arguments. 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: a *balance sheet expansion* involves symmetric additions on both the asset and the liabilities side; a *balance sheet contraction* entails a symmetric subtraction on the sides of the balance sheet; and a *balance sheet neutral transaction* involves both an expansion and a contraction happening on the same side of a balance sheet, either the asset or the liability side. If we now look at the combination of both balance sheets involved, each of the 16 options will either correspond to net *credit creation* (if one balance sheet expands and the other one does not contract); to net *credit destruction* (if one balance sheet contracts and the other one does not expand); or to *no change of net credit* in the system (if both transactions are balance sheet neutral, or one expands and the other contracts).

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

[52] From a legal perspective, the repo borrower may be thought of as having a 'contract claim' (in the form of a right to repurchase) whereas the repo lender may be thought to have a 'property claim' (ownership claim in respect of the asset provided as security). See in this regard Jongchul Kim, 'Modern Money and the Rise and Fall of Capitalist Finance. The Institutionalization of Trusts, Personae and Indebtedness' (Routledge 2024), 102. In 'Repurchase Agreements and the (De)construction of Financial Markets', Carolyn Sissoko emphasizes the importance of the contractual structure of a repo that creates 'safety' for the lender but 'instability' for the borrower.

[53] Our understanding of a reverse repo follows the official definition of the International Capital Markets Association (ICMA), cf ICMA, Repo FAQ: 'What Is a Repo?' (*IMCA*, 2024) <https://www.icmagroup.org/market-practice-and-regulatory-policy/repo-and-collateral-markets/icma-ercc-publications/frequently-asked-questions-on-repo/1-what-is-a-repo/.

[54] Murau (n 27).

[55] Neilson (n 42).

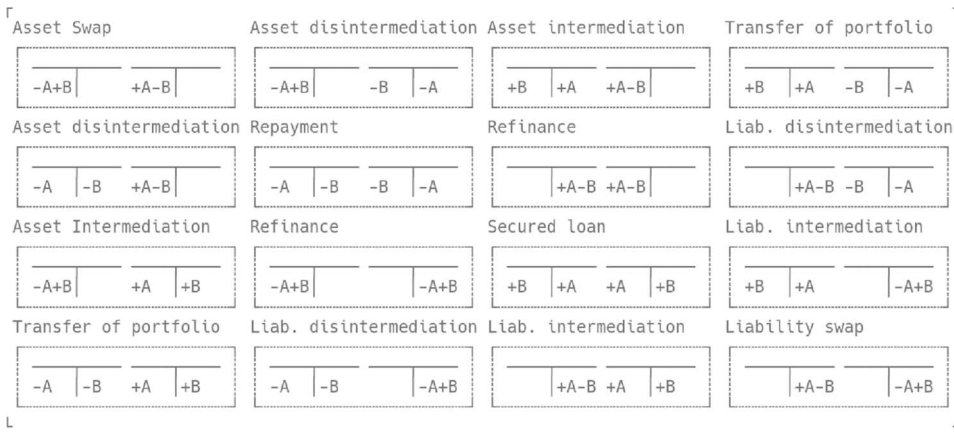


**Figure 1.** Matrix of sixteen quadruple-entry-consistent financial transactions. *Source:* Daniel Neilson, 'Quadruple-Entry Accounting' (*Soon Parted* (blog), 2021) <https://www.soonparted.co/p/quadruple-entry.

balance sheets and could also be referred to as a 'swap of IOUs',[56] 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.[57] 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 eg 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 an additional second liability that the hierarchically lower institution can treat as money.[58]

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, ie the issuance of a second liability in addition to the repo claim.

Figure 3 depicts the case of a horizontal repo, here in the 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

[56] Mehrling (n 9); Murau and Pforr (n 22).

[57] Steffen Murau and Tobias Pforr, 'Shadow Money in the History of Monetary Thought' (2023) Review of Political Economy 1.

[58] Note that in our balance sheet depictions, we abstract from quantitative volumes and do not explicitly indicate prices, interest, margins, or haircuts, but those elements could be easily added.

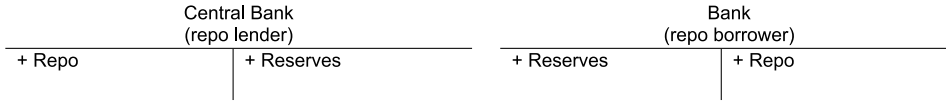


**Figure 2.** Vertical repos as new money creation.

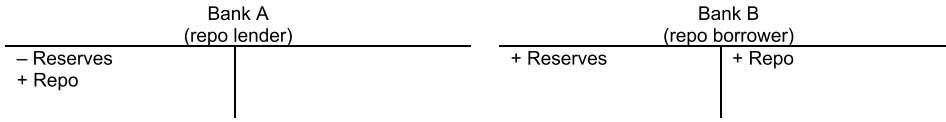


**Figure 3.** Horizontal repos as borrowing and lending pre-existing money.

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 the repo liability does not coincide with new money creation. Rather, the repo IOUs serve 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 IOU.

In sum, the distinction between vertical and horizontal repos as two different quadruple-entry consistent balance sheet mechanisms helps clarify the question of whether the issuance of a repo corresponds to new money creation—it depends on the relative position of the counterparties within the hierarchy of money. Both vertical and horizontal repos formally imply net credit creation, but only if both balance sheets expand it is possible to refer to it as money creation following the logic of a swap of IOUs.

## 2. Collateral transfer in a second-quadruple-entry-consistent operation

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 collateralized lending in contrast to non-collateralized lending, and it does not provide an answer to the question of where the collateral is during the maturity of a repo.

*Prima facie*, as it seems to be 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 visualizes 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.

The depiction in Figure 4 would be the most literal on-balance-sheet representation of the repo mechanism in a way that abstracts entirely from any credit creation and conceals that it is a lending operation. 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')[59]—unlike in the US where the repo is treated as collateralized lending without full 'title transfer'.[60] However, both in the Euro area and the US, the *accounting treatment* of repos differs from the legal treatment.[61] Repos are seen as a lending operation that clearly involves credit creation. How

[59] Wu and Nabilou (n 16).

[60] Viktoria Baklanova, Adam Copeland and Rebecca McCaughrin, 'Reference Guide to U.S. Repo and Securities Lending Markets' (2015) Office of Financial Research Working Paper.

[61] Richard Comotto, 'The Repo Instrument', ICMA Professional Repo Market Course (November 2012) 20–21; Gabor and Vestergaard (n 22); Armour and others (n 12) 452.

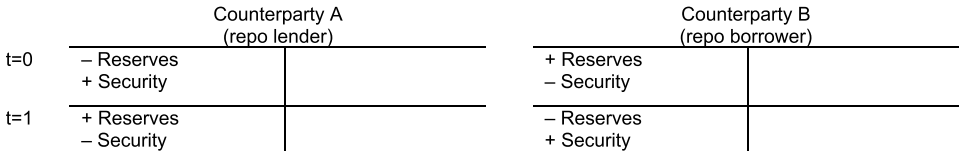


**Figure 4.** Repo imagined as asset swap with security changing balance sheets.

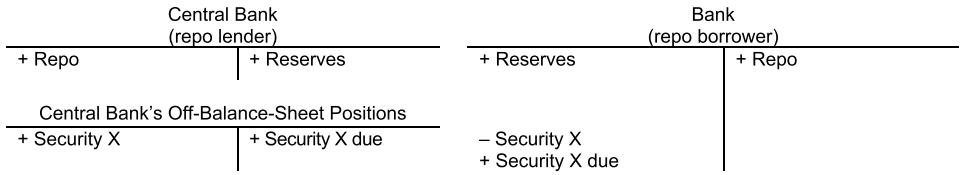


**Figure 5.** Vertical repo with an encumbered security as collateral.

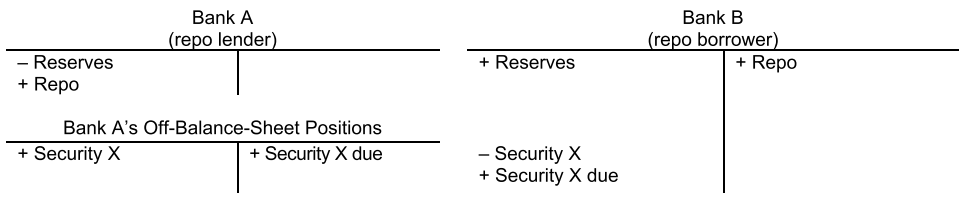


**Figure 6.** Horizontal repo with an encumbered security as collateral.

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 include a given Security X used as collateral. These figures now show the 'full' repo transaction in a way that combines the lending transaction with a depiction of the collateral transfer.

This notation style of the second quadruple-entry consistent operation combines conceptual arguments on repo accounting brought forth by Daniel Neilson[62] as well as Albert Banal-Estañol, Enrique Benito, Dmitry Khametshin, and Jianxing Wei in a Banco de España publication.[63]

On the one hand, we follow Daniel Neilson concerning the collateral transfer and credit creation in the second operation.[64] Accordingly, the security shifts its 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, ie 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. Looking back at Figure 1, the second operation is a

[62] Neilson (n 39).
[63] Albert Banal-Estañol and others, 'Asset Encumbrance and Bank Risk. Theory and First Evidence from Public Disclosures in Europe' (2021) Banco de España Documentos de Trabajo.
[64] Neilson (n 39).

quadruple-entry consistent transaction that follows the scheme of 'asset intermediation' which thus involves net credit creation.

On the other hand, we follow the argument of Albert Banal-Estañol and others that the security must be held as an off-balance-sheet position of the repo lender.[65] To comply with the rules of quadruple-entry-consistent accounting, it is necessary for the repo lender to have a corresponding entry to the repo borrower's booking of '– Security X' and '+ Security X due'. At the same time, 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 and what would be needed to help inform debates on financial regulation. It simultaneously conveys, first, how credit creation takes place in the form of a repo IOU and, second, whether another credit money instrument is created, depending on whether the balance sheet mechanism corresponds to a vertical or a horizontal repo. Third, it includes the security that is used as collateral and shows how it ends up as the repo lender's off-balance-sheet asset while creating yet another implicit credit claim.

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 introduces quadruple-entry consistency as an indispensable criterion for a formally correct balance sheet depiction and seems to offer an answer to the question where the security is during the maturity period of the repo contract. At the same time, it is far from self-evident what it means in practice that the repo lender holds the security off-balance-sheet while the repo borrower maintains an on-balance-sheet claim to receive it back.

In our view, it is precisely this logical tension in the second-quadruple entry consistent operation—which typically receives less analytical attention in attempts to conceptualize repos—that is the origin of the mechanism's *inherent ambiguity*. The pretense of a sale and repurchase, combined with the vagary of the involved credit operation, gives interpretative leeway to the counterparties regarding the whereabouts of the security used as collateral. Depending on context, this can be resolved in such a way that the security is with the repo lender, the repo borrower, with both, or in fact nowhere. This helps clarify why financial regulators have been consistently grappling with the repo regulation. 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 non-member 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.[66]

Second, Kenneth Garbade gives a convincing example of how the inherent ambiguity of repos contributed to their success as a financial instrument on US private markets. In the 1970s and early 1980s, when the shadow banking system was just developing, it was never fully specified what happened to the security in the repo contract, ie whether it was an outright sale or a collateralized loan. Garbade 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

[65] Albert Banal-Estañol and others (n 63) 40–43.
[66] Cf Harris (n 1) 289–90, and FRBNY (n 6) 24–25.

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 ...[67]

Hence, the inherent ambiguity regarding the whereabouts of the security and the credit creation involved 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 entirely 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.[68] Repo 105 and 108 made use of a special clause 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 per cent of the value of the loan in collateral.[69] Hence, Lehman's practice was to hide the whereabouts of the security 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 re-appeared, 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 exemption was passed into law via the Bankruptcy Amendments and Federal Judgeship Act of 1984.[70]

The latest change of repo regulation materialized after the Lehman bankruptcy—the introduction of *'encumbrance'*.[71] In line with the introduction of the Basel III framework and its Pillar 3 disclosure requirements, 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.[72] Instead, the asset swap on the repo borrower's balance sheet is taken to mean that the security becomes *'encumbered'* in a repo transaction.[73]

The EU implemented the Basel III framework by means of Directive 2013/36/EU5, the Capital Requirements Directive (CRD), and Regulation (EU) No 575/2013, 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'.[74] This

[67] Garbade (n 10) quote from 34–35.

[68] McDonald (n 15) 90–92.

[69] Bryce Jones and Theresa Presley, 'Law and Accounting: Did Lehman Brothers Use of Repo 105 Transactions Violate Accounting and Legal Rules?' (2013) 16 Journal of Legal, Ethical and Regulatory Issues 57. Also see Armour and others (n 12).

[70] Garbade (n 10) 35. Volcker's argument was that repos were an important tool in the Fed's open market operations and therefore the repo market should be protected from 'unnecessary disruptions', one of which would have been automatic stay in case of a bankruptcy. Also see Walters (n 10).

[71] CGFS (n 43).

[72] Basel Committee of Banking Supervision (BCBS), 'Pillar 3 Disclosure Requirements—Updated Framework', BCBS Standards (2018) 8, fn 12 <https://www.bis.org/bcbs/publ/d455.pdf.

[73] Pierre Berthonnaud and others, 'Asset Encumbrance in Euro Area Banks: Analysing Trends, Drivers and Prediction Properties for Individual Bank Crises' (2021) European Central Bank Occasional Paper Series 8.

[74] ibid 8.

framing conveys by implication that repo transactions involve encumbrance. 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.[75]

Further specifications of encumbrance are to be found in Annex XVII of Regulation (EU) No 680/2014 (ITS on Supervisory Reporting), which provides technical standards for Regulation (EU) No 575/2013.[76] The Annex defines an asset as encumbered 'if it has been pledged or if it is subject to any form of arrangement to secure, collateralise or credit enhance any transaction from which it cannot be freely withdrawn. [ . . . T]his definition is not based on an explicit legal definition, such as title transfer, but rather on economic principles, as the legal frameworks may differ in this respect across countries'.[77]

In addition, the Annex provides numerous 'types of contracts being well covered by the definition', among them 'secured financing transactions, including repurchase contracts and agreements, securities lending and other forms of secured lending'. It refers to both 'repo/-matching repo' and 'central bank funding', stating that similar reporting rules apply to it because 'collateralised central bank funding is only a specific case of a collateralised deposit or a repo transaction in which the counterparty is a central bank'.[78]

In our view, the stipulation that the security used as collateral gets *encumbered* during the maturity period of the repo transaction is a new regulatory attempt to grasp the underlying balance sheet mechanics expressed in Figures 5 and 6. Even though the Capital Requirements Directive and Regulation do not portray 'encumbrance' as a fundamental regulatory innovation but merely as an update of reporting standards, they nevertheless generalize an interpretative norm for what happens with the collateral that previously has been used only occasionally by some financial institutions.[79] As the Lehman bankruptcy made it urgent to provide a better definition of the whereabouts of the security during the maturity period of the repo, the new reporting standard seeks to mitigate the repetition of the 'Repo 105' and 'Repo 108' devices. The encumbrance logic is meant to provide an assessment of the liquidity position on the repo borrower's balance sheet. Hence, it seeks to prevent that the accounting entry '– Security X' is read as if the collateral leaves the balance sheet permanently while the '+ Security X due' position gets dropped.

However, the introduction of encumbrance into regulation does not change anything fundamental about repos' underlying balance sheet mechanics and the ambiguity that the second

[75] In the US, the Financial Accounting Standards Board (FASB) implemented this regulation in June 2014 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. See David Salerno, John Ruddy and Murli Rajan, 'Changes to Accounting for Repurchase Agreements' (*CPA Journal* (blog), 2016) <https://www.cpajournal.com/2016/08/01/changes-accounting-repurchase-agreements/; Rachel Klein, 'Transfer Troubles: "Sale" or "Secured Borrowing" under ASC 860?' (*GAAP Dynamics* (blog), May 2022) <https://www.gaapdynamics.com/insights/blog/2022/05/31/transfer-troubles-sale-or-secured-borrowing-under-asc-860/.

[76] Regulation (EU) No 680/2014 has been substituted by Regulation (EU) 2015/2178 of 9 July 2015 amending Implementing Regulation (EU) No 680/2014 laying down implementing technical standards with regard to supervisory reporting of institutions as regards instructions, templates and definitions. Annex VII now delivers reporting details on asset encumbrance. Its material content is identical to Annex XVII which we cite.

[77] Regulation (EU) No 680/2014 (ITS on Supervisory Reporting), Annex XVII, para 11.

[78] ibid.

[79] Reimo Juks, 'Asset Encumbrance and Its Relevance for Financial Stability' (2012) Sveriges Riksbank Economic Review; Fabrizio Cipollini, Federica Ielasi and Francesca Querci, 'Asset Encumbrance in Banks: Is Systemic Risk Affected?' (2024) 67 Research in International Business and Finance, 102123; Albert Banal-Estañol, Enrique Benito and Dmitry Khametshin, 'Asset Encumbrance and CDS Premia of European Banks: Do Capital and Liquidity Tell the Whole Story?' in Colin Mayer and others (eds), *Finance and Investment: The European Case* (Oxford University Press 2018) 349.

quadruple-entry consistent operation generates. On the one hand, the encumbrance formulation de-emphasizes that a title transfer of the security takes place to the repo lender. It is telling in this regard that Annex XVII of Regulation (EU) No 680/2014 refuses to give a clear legal definition of encumbrance that in any way could conflict with a title transfer taking place and only vaguely refers to 'economic principles' that are not further specified. On the other hand, the encumbrance definition does not reflect in any way that the repo lender receives an obligation to return the security, which is a form of credit creation. The International Capital Markets Association (ICMA), for instance, expresses its skepticism about this regulatory treatment in its repo FAQ when it describes the argument that repos encumber assets as 'largely illusory'.[80] Hence, we interpret the regulatory treatment of encumbrance as a temporary fix that will 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 depicts 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 collateral is during the repo's maturity period. Using balance sheet methodology to specify the on-balance-sheet position of all three instruments that are part of this operation makes the inherent ambiguity explicit that comes along with the 'alleged sale' of the security by the repo borrower and the off-balance-sheet nature of the transaction for the repo lender. This inherent ambiguity is often rationalized in the literature on financial regulation as a discrepancy of the legal and accounting treatment.[81] The nature of the second quadruple-entry consistent operation opens the possibility for flexible interpretations according to which the collateral may be located on the balance sheet of the repo lender or the repo borrower, on neither, or even on both—depending on context.

## III. 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 on the specific securities that are eligible to be used as collateral in the repo operation. The visualizations 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 and thus be put on the 'off-balance-sheet balance sheet' of the repo lender.

Figure 7 presents a notation style for such a macro-financial stock perspective. Drawing on the 'Monetary Architecture' framework, it places 'actual' assets and liabilities on the upper part of the balance sheet and 'contingent' liabilities such as liquidity insurance on the lower part.[82] Our example shows a central bank ('repo lender') and a bank ('repo borrower') that form a vertical repo relationship. The bank issues repos as its liability, which the central bank holds as an asset. We specify which securities are eligible for repo on the balance sheet of the central bank as it is ultimately the repo lender's power to determine which securities to accept 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.

[80] ICMA, Repo FAQ: 'Does repo "encumber" a borrower's assets?' (*IMCA*, 2024) <https://www.icmagroup.org/market-practice-and-regulatory-policy/repo-and-collateral-markets/icma-ercc-publications/frequently-asked-questions-on-repo/34-does-repo-encumber-a-borrower-s-assets/.

[81] Cf eg Comotto (n 61); Gabor and Vestergaard (n 22); Meneghini (n 51); Wu and Nabilou (n 16).

[82] Murau (n 27).

| Central Bank (repo lender) | |
|---|---|
| Securities held outright | Reserves |
| Repos | |
| Against eligible securities | |
| Other loans and bonds | |
| | Liquidity insurance (to banks) |

| Bank (repo borrower) | |
|---|---|
| Reserves | Deposits |
| Interbank lending | Interbank borrowing |
| Securities held outright | Repos (with central bank) |
| Eligible securities for repo | |
| Non-eligible securities for repo | |
| Securities due | |
| Other loans and bonds | |
| | *Equity capital* |
| Liquidity insurance (at central bank) | |

**Figure 7.** Determining collateral eligibility via the repo lender's balance sheet.

The depiction in Figure 7 shows how the securities devised as eligible for repo can be readily converted into hierarchically higher money: here reserves. This conveys why eligible securities may 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) and the institutions that issue them as their liabilities. 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 to be paid will be significantly lower. The issuers of the security do not feature in Figure 7 but could be added in a more comprehensive 'Monetary Architecture' visualization.

The repo lender is in the position to stipulate collateral eligibility either ad hoc or in a more formalized 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.[83] The design of a collateral framework has a paramount influence on the market liquidity of the securities included in it—ie, the ease with which they are traded—as well as the funding liquidity of the repo borrowers—ie, the ease with which they can obtain funding.[84] Repo lenders can modify the collateral framework upon their discretion. A tightening of the collateral framework implies a reduction of 'elasticity space'[85] 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[86]—explicit and transparent.

To substantiate the merits of our proposed notation style of vertical and horizontal repos with two quadruple-entry consistent operations and the collateral framework made a property of the repo lender's balance sheet, we apply it in the subsequent sections on two quintessential

[83] Nyborg (n 48); Vestergaard and Gabor (n 41).
[84] Cf Markus Brunnermeier and Lasse Heje Pedersen, 'Market Liquidity and Funding Liquidity' (2009) 22 Review of Financial Studies 2201.
[85] Murau, Haas and Guter-Sandu (n 27).
[86] Nyborg (n 48).

cases that are of profound relevance for the European monetary architecture: the Eurosystem's monetary policy operations that are based on vertical repos, as well as the secured interbank market of the Euro area, which uses the horizontal repo mechanism both for General and Special Collateral Repos. The two case studies investigate the institutional setup around vertical and horizontal repos as well as the historical transformations which have taken place since the inception of the Economic and Monetary Union (EMU), in particular in relation to the Global Financial Crisis and the Eurocrisis.

## III. VERTICAL REPOS AS MONETARY POLICY INSTRUMENTS IN THE EURO AREA

### 1. Eurosystem monetary policy operations on-balance-sheet

Our first case study addresses vertical repos, which 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.[87] 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.[88] They thus create reserves—ie, provide liquidity—for 'their' banking system in accordance with ECB rules and the capital key.[89] The ECB balance sheet was not originally operationalized for monetary policy activities.[90]

Table 1 provides a systematic overview on the role of vertical repos in the original monetary policy framework, which was developed prior to the start of the European monetary union in 1999. On the one hand, *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. On the other hand, 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 banks to deposit remunerated reserves at the Eurosystem. For both OMOs and standing facilities repos and outright purchases are the main transaction types.[91]

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

[87] Mats Galvenius and Paul Mercier, 'The Story of the Eurosystem Framework' in Paul Mercier and Francesco Papadia (ed), *The Concrete Euro: Implementing Monetary Policy in the Euro Area* (Oxford University Press 2011) 148.

[88] Ulrich Bindseil, *Monetary Policy Operations and the Financial System* (Oxford University Press, 2014).

[89] The capital key represents the shares owned by the different NCBs which hold the ECB's capital. The key is periodically adjusted to reflect changes of a country's population size and GDP in relation to the EU's aggregate. While all central banks of EU Member States (also non-euro area NCBs) are required to contribute to the costs of the ECB, the Eurosystem capital key drives the allocation of liquidity and of the various monetary policy programmes implemented by the Eurosystem. For further details, see <https://www.ecb.europa.eu/ecb/orga/capital/html/index.en.html.

[90] Steffen Murau and Matteo Giordano, 'Forging Monetary Unification through Novation: The TARGET System and the Politics of Central Banking in Europe' (2023) 22 *Socio-Economic Review* 1283.

[91] Note here that in the original version of Table 1, the ECB actually writes 'reverse transactions' which it later specifies as either 'repurchase agreements' or 'collateralised loans'. This points to the fact that historically, there were different terminologies and regulations that were called either repurchase agreements, sell/buy-backs, buy/sell-backs, or collateralized loans. There are marginal differences between them, but none that would matter to the level of abstraction we adopt in our analysis. For instance, sell/buy-backs do not have master agreements which removes the legal obligation to comply with margin calls and complicates the settling in case of default. However, despite those legal differences, the underlying balance sheet mechanics are identical, which warrants that we simply refer to all of them as 'repo' in the context of our analysis. For more details, see Regulation (EU) 2015/2365 of the European Parliament and of the Council of 25 November 2015 on transparency of securities financing transactions and of reuse and amending Regulation (EU) No 648/2012; European Securities and Markets Authority (ESMA), 'Report on Securities Financing Transactions and Leverage in the EU' ESMA(2016/1415) (4 October 2016); and ICMA, Repo FAQ: 'What Is the Difference Between a Repurchase Transaction and a Buy/Sell-Back?' (*IMCA*, 2024) <https://www.icmagroup.org/market-practice-and-regulatory-policy/repo-and-collateral-markets/icma-ercc-publications/frequently-asked-questions-on-repo/11-what-is-the-difference-between-a-repurchase-transaction-and-a-buy-sell-back/.

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

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

*Source:* ECB, 'The Single Monetary Policy in Stage Three', General Documentation on Eurosystem Monetary Policy Instruments and Procedures (2000) 7.

framework. Table 2 presents an overview of those unconventional monetary programs. On the one hand, it shows the different rounds of non-regular repo operations, starting with the first Targeted Longer-Term Refinancing Operations (TLTROs) in 2014 up to the Pandemic Emergency Longer-Term Refinancing Operations (PELTRO) introduced in 2020. On the other hand, the table lists the four non-regular Asset Purchasing Programmes introduced after the GFC and the Eurocrisis as well as the Pandemic Emergency Purchase Programme (PEPP).

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 an 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. In the second quadruple-entry consistent operation, the security used as repo collateral becomes 'due' for the Euro area bank but according to Basel III regulations does not leave its balance sheet and is put into 'encumbered' status. The NCB could record the securities received as an off-balance-sheet position, but it does not formally touch its asset book.

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

| NON-REGULAR REPO OPERATIONS | | | | | |
|---|---|---|---|---|---|
| **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 |

| NON-REGULAR TEMPORARY ASSET PURCHASING PROGRAMMES | | | | |
|---|---|---|---|---|
| **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[a] | * 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[b] | * 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 |

| NON-REGULAR TEMPORARY ASSET PURCHASING PROGRAMMES—COVID PANDEMIC SPECIAL | | | | |
|---|---|---|---|---|
| **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 |

Notes: [a]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.

[b]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 Nederland Che Bank: Netherlands.

*Sources:* ECB, 'ECB Extends Pandemic Emergency Longer-Term Refinancing Operations', Press Release (10 December 2020) <https://www.ecb.europa.eu/press/pr/date/2020/html/ecb.pr201210~8acfa5026f.en.html; ECB, 'Monetary Policy Decisions', Press Release (12 March 2020) <https://www.ecb.europa.eu/press/pr/date/2020/html/ecb.mp200312~8d3aec3ff2.en.html; ECB, 'Asset Purchase Programmes' (*ECB*, 2022), <https://www.ecb.europa.eu/mopo/implement/app/html/index.en.html; ECB, 'Pandemic Emergency Purchase Programme (PEPP)' (*ECB*, 2022) <https://www.ecb.europa.eu/mopo/implement/pepp/html/index.en.html; ECB, 'Targeted Longer-Term Refinancing Operations (TLTROs)' (*ECB*, 2022) <https://www.ecb.europa.eu/mopo/implement/omo/tltro/html/index.en.html>.

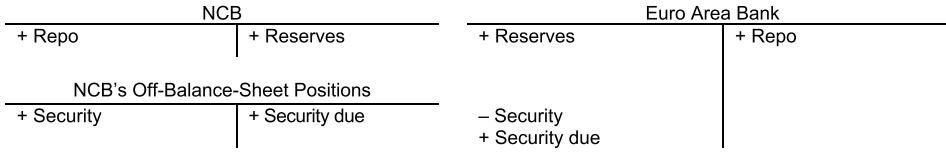


**Figure 8.** Monetary policy operation between NCB and bank as a vertical repo.

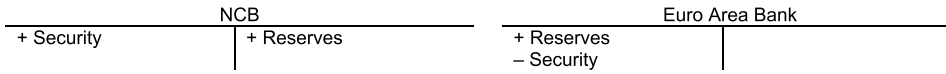


**Figure 9.** Monetary policy operation between NCB and bank as outright purchase.

The empirical data that corresponds to this transaction can be retrieved from the official documentation of the Eurosystem's disaggregated financial statements.[92] The NCB's repo lending is recorded in item 5 called 'lending to euro area credit institutions related to monetary policy operations denominated in euro'; as sub-categories, this item 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 which is a more straightforward case. 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. In the official documentation of the Eurosystem's disaggregated balance sheet, the security received by the NCB is recorded under 'assets' in item 7 called 'securities of euro area residents denominated in euro', which has two sub-categories: 'securities held for monetary policy purposes' and 'other purposes'.

The reserves created by the NCB in either repo or outright transactions are recorded under 'liabilities' in item 2 called 'liabilities to euro area credit institutions related to monetary policy operations denominated in euro'. As sub-categories, this item 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 item are 'fixed-term deposits', 'fine-tuning reverse operations', as well as 'deposits related to margin calls'. Item 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 reserve 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.[93]

To provide empirical context for those items, Figure 10 plots a visualization of the asset and liability structure of Deutsche Bundesbank from 2019 to 2021. Items 5 and 7 pertaining to vertical repos and outright purchases can be found in the left panel (cf A5 and A7); items 2 and 3 on the different types of reserves feature in the right panel (cf L2 and L3).

Figure 11 looks at the Eurosystem as a whole and presents the volumes of monetary policy operations as to the official documentation from 1999 to 2022. Panel 1 shows repo transactions, Panel 2 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.

[92] ECB, 'Disaggregated Data' (*ECB*, 2024) <https://www.ecb.europa.eu/press/pr/wfs/dis/html/index.en.html.

[93] ECB, 'What Is Excess Liquidity and Why Does It Matter?' (*ECB*, 2017) <https://www.ecb.europa.eu/ecb/educational/explainers/tell-me-more/html/excess_liquidity.en.html.

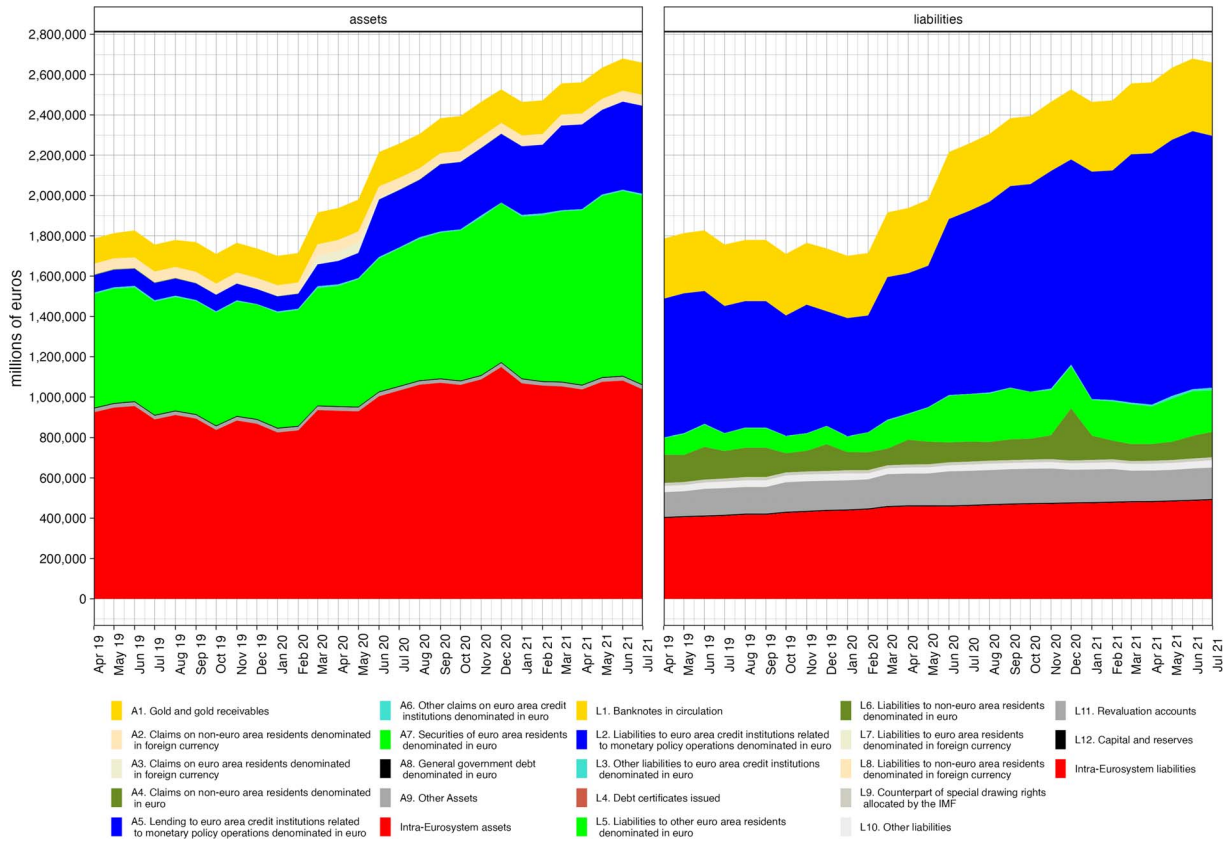


**Figure 10.** Deutsche Bundesbank Balance Sheet, Assets and Liabilities, 2019–21. *Notes:* Labels starting with 'A' apply to the 'asset' panel, and with 'L' to the 'liabilities' panel. *Source:* Disaggregated Financial Statement of the Eurosystem.

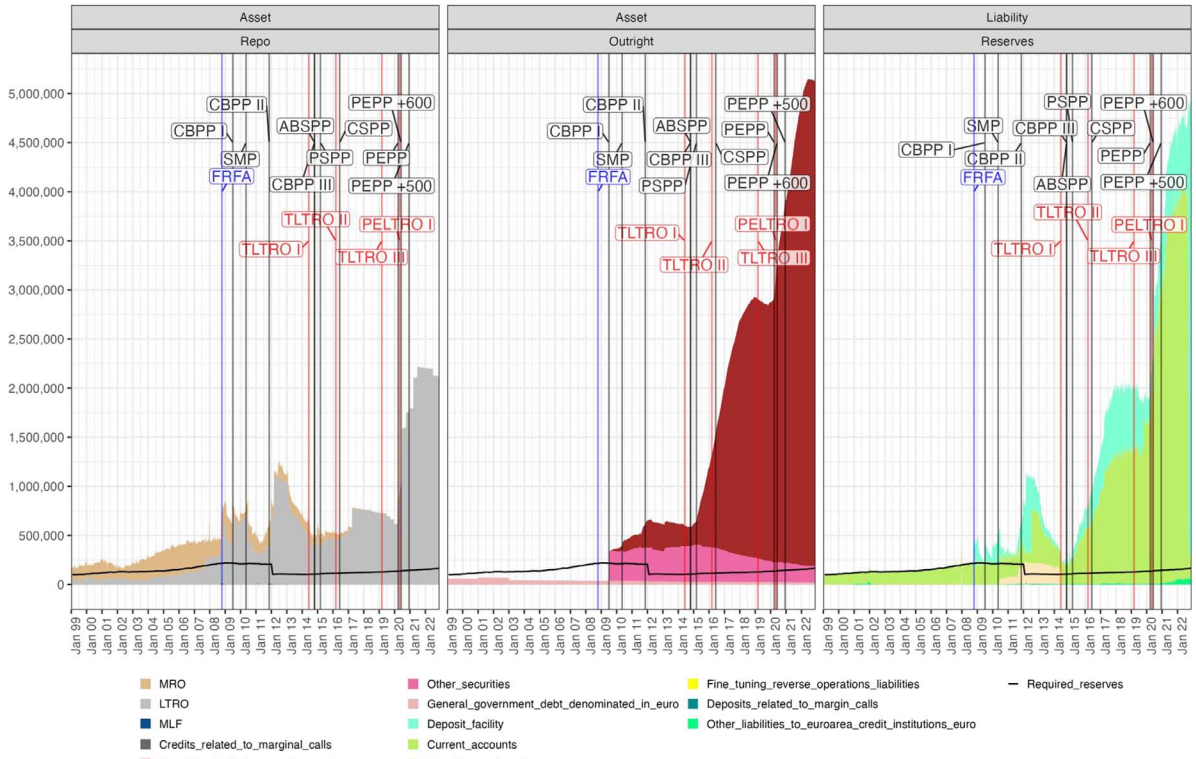


**Figure 11.** Eurosystem Aggregated Financial Statement, weekly balance, in mn EUR (1999–2022). *Notes:* Euro area changing composition, only items denominated in euro. LTROs include all LTROs and TLTROs. *Source:* ECB, 'Internal Liquidity Management (ILM)' (*ECB*, 2024) <https://data.ecb.europa.eu/data/datasets/ILM/data-information#:~:text=ILM%20statistics%20refer%20to%20the,the%20banking%20system%27s%20liquidity%20position.&text=The%20data%20refer%20to%20or,financial%20statement%20of%20the%20Eurosystem>.

The three panels in Figure 11 display the relative empirical importance of vertical repos in the history of the European monetary union and their impact on central bank money creation. Vertical repos were the Eurosystem's main mechanism for monetary policy implementation prior to the GFC. In this period, the Eurosystem had a 'lean' balance sheet. Reserves were almost exclusively kept in the current accounts and matched the level of required reserves. Outright purchases of securities merely played a subordinate role, as originally intended. The sea change in the composition of Eurosystem balance sheets started on 6 October 2008 when the Eurosystem—under the pressure resulting from 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.[94] 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.[95] Paralleling the Fed's *Dealer of Last Resort* operations at the time,[96] the securities bought under CBPP-1 are not classified as 'securities held for monetary policy purposes' but rather as 'other securities'. In 2014, the Eurosystem's APPs commenced. The most significant impact on the Eurosystem balance sheet came from the purchases of Asset-backed Securities (ABSs) with the Asset-Backed Securities Purchase Programme (ABSPP), which began in November 2014, as well as the Pandemic Emergency Purchase Programme (PEPP), which started in March 2020.[97] Both programmes gave rise to a massive increase of central bank reserve creation that impacted both the current account and the deposit facility. Due to the APPs, outright purchases today play a substantially larger role than vertical repos for the creation of central bank reserves.

As repos declined in relative importance to outright purchases, the data shows substantial dynamics in the volume of vertical repos. To understand the spikes as they happened for instance in 2012, 2017, and 2020, we have to look at the Eurosystem's *collateral framework*.

## 2. The Eurosystem's collateral framework and its transformations

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 and thus receive the status of a 'secondary reserve'.

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 framework.[98] The collateral framework not only applies to securities in standard and non-standard repo transactions but also to securities purchased outright in standard and

[94] Philippine Cour-Thimann and Bernhard Winkler, 'The ECB's Non-Standard Monetary Policy Measures. The Role of Institutional Factors and Financial Structure' (2013) ECB Working Paper Series, 11.

[95] John Beirne and others, 'The Impact of the Eurosystem's Covered Bond Purchase Programme on the Primary and Secondary Markets' (2011) ECB Occasional Paper Series.

[96] Mehrling (n 9).

[97] Banca d'Italia, 'The Eurosystem's Asset Purchase Programmes' (*Banca d'Italia*, 2022) <https://www.bancaditalia.it/compiti/polmon-garanzie/pspp/index.html.

[98] Jakob Eberl and Christopher Weber, 'ECB Collateral Criteria. A Narrative Database 2001–2013' (2014) Ifo Working Paper; Ulrich Bindseil and others, 'The Eurosystem Collateral Framework Explained' (2017) ECB Occasional Paper Series, No 189 (May 2017) <https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op189.en.pdf.

| NCB | |
|---|---|
| FX reserves | Reserves |
| Securities held outright | Required reserves |
| Sovereign debt securities | Notes |
| Other securities | |
| Repos | |
| Against | |
| *Tier 1 assets (esp. sov. debt securities)* | |
| *Tier 2 assets (others)* | |
| Other loans and bonds | |
| | Liquidity insurance |
| | MLF (to banks) |

| Euro Area Banks | |
|---|---|
| Reserves | Deposits |
| Interbank lending | Interbank borrowing |
| Securities held outright | Covered bonds |
| Eligible securities for repo (Tier 1+2) | Repos (with NCB) |
| Non-eligible securities for repo | |
| Securities due | |
| Loans | |
| | *Equity capital* |
| Liquidity insurance | |
| MLF (at NCB) | |

**Figure 12.** NCB and banks in Euro area with two-tiered collateral framework (as of 1999).

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.[99] 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 became effective when the European monetary union became operational in 1999. Accordingly, 'Tier 1 assets' comprised debt instruments with harmonized 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.[100]

Figure 12 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 constitutes a contingent asset for the banks. The NCB balance sheet comprises both securities held outright and repos, for which the list of eligible collateral is stipulated. The bank has posted this eligible collateral in vertical repo transaction with the NCB and thus has Tier 1 and Tier 2 assets as securities in a repo transaction. Tier 1 securities mainly comprise sovereign debt securities. Tier 2 assets are more diverse and also include more unusual instruments such as equities.

As the two-tier collateral framework had only been seen as a temporary solution, the Eurosystem soon started working on harmonizing the collateral framework within the monetary union.[101] The goal was the introduction of a 'Single List', in which the distinction of Tier 1 and Tier 2 assets would be replaced with a distinction of 'marketable' and 'non-marketable'

[99] Christopher Weber, *The Collateral Policy of Central Banks—An Analysis Focusing on the Eurosystem* (ifo Institut, 2016).
[100] Galvenius and Mercier (n 87) 179–81.
[101] Van 't Klooster (n 46) chs 4–5.

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.[102] 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.[103] In 2007, as the level of segmentation in financial markets 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.[104]

As part of the 2005 reforms, the Eurosystem introduced a *market-based approach* for government bonds in their collateral framework. 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.[105] 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 sovereign debt securities independently of the market situation. Athanasios Orphanides explains this as an attempt by the ECB to enforce the Stability and Growth Pact (SGP).[106] An alternative interpretation by Martin Marcussen is a pure scientization of monetary policy.[107] Jens van 't Klooster argues that the primary reason was to depoliticize the choice of collateral in order to avoid contestation of the ECB's legitimacy.[108]

Figure 13 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.

Whatever the intention behind the shift to a market-based collateral framework, this decision backfired during the GFC and the Eurocrisis.[109] 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 automatically withdraw its support for it by denying access to its 'off-balance-sheet balance sheet'.[110] This affected Greece from 2009 onwards, and later Ireland, Portugal, Spain, and Italy. 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.

[102] Eberl and Weber (n 98) 9.
[103] ECB, 'The Single List in the Collateral Framework of the Eurosystem' (2006) ECB Monthly Bulletin (May) 75.
[104] Samuel Cheun, Isabel von Koppen-Mertes and Benedict Weller, 'The Collateral Frameworks of the Eurosystem, the Federal Reserve System and the Bank of England' (2009) ECB Occasional Paper Series, No 107 (December); Bindseil (n 98).
[105] ECB, 'The Implementation of Monetary Policy in the Euro Area' (2006) General Documentation on Eurosystem Monetary Policy Instruments and Procedures, 41.
[106] Orphanides (n 46); Athanasios Orphanides, 'Monetary Policy and Fiscal Discipline: How the ECB Planted the Seeds of the Euro Area Crisis' (*voxEU*, 9 March 2018) <https://cepr.org/voxeu/columns/monetary-policy-and-fiscal-discipline-how-ecb-planted-seeds-euro-area-crisis.
[107] Martin Marcussen, 'Scientization of Central Banking: The Politics of A-Politicization' in Kenneth Dyson and Martin Marcussen (eds), *Central Banks in the Age of the Euro: Europeanization, Convergence, and Power* (Oxford University Press 2009) 373–90.
[108] Van 't Klooster (n 40).
[109] Van 't Klooster (n 46) ch 6.
[110] Vestergaard and Gabor (n 41).

NCB

| | |
|---|---|
| FX reserves | Reserves |
| Securities held outright | Required reserves |
| Sovereign debt securities | Notes |
| Other securities | |
| Repos | |
| Against | |
| *Sovereign debt securities (rated at least A-)* | |
| *Covered bonds (rated at least A-)* | |
| *ABS (rated at least A-)* | |
| *Other securities (rated at least A-)* | |
| Other loans and bonds | |
| | Liquidity insurance |
| | MLF (to banks) |

Banks

| | |
|---|---|
| Reserves | Deposits |
| Interbank lending | Interbank borrowing |
| Securities held outright | Covered bonds |
| Eligible securities for repo | Repos (with NCB) |
| Non-eligible securities for repo | |
| Securities due | |
| Loans | |
| | *Equity capital* |
| Liquidity insurance | |
| MLF (at NCB) | |

**Figure 13.** NCB and banks in Euro area with Single List collateral framework (as of June 2007).

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 was forced to increase elasticity within the Eurozone 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 and 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. 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-'.[111]

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, eg, 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 also lowered from 'AAA' to 'BBB-' in July 2012. The threshold for third-class ABSs was decreased in July 2014.[112]

The third round of crisis-driven reforms materialized during the COVID-19 crisis in 2020—now in the Basel III world where regulations interpret the collateral as encumbered on the

[111] ECB, 'The Eurosystem Collateral Framework throughout the Crisis' (2013) ECB Monthly Bulletin (July) 71.

[112] Guntram Wolff, 'Eurosystem Collateral Policy and Framework. Was It Unduly Changed?' (2014) Bruegel Policy Contribution <https://www.bruegel.org/sites/default/files/wp_attachments/pc_2014_14.pdf.

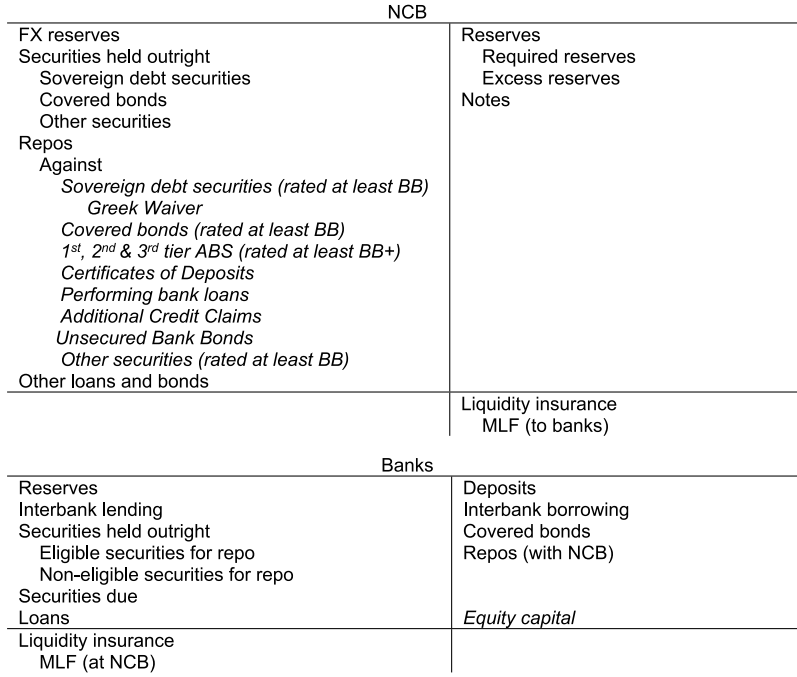


**Figure 14.** NCB and banks in Euro area with crisis-transformed collateral framework in 2024.

repo borrower's balance sheet.[113] To increase the elasticity space in the European 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.[114] This 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. As a second important measure, the ECB increased the concentration limit for unsecured bank bonds (UBBs) from 2.5 per cent to 10 per cent. 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.[115] 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.[116]

Taking on board those three rounds of crisis-driven transformations, Figure 14 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, for instance due

[113] Luis De Guindos and Isabel Schnabel, 'Improving Funding Conditions for the Real Economy during the COVID-19 Crisis: The ECB's Collateral Easing Measures' (*ECB Blog*, 2020) <https://www.ecb.europa.eu/press/blog/date/2020/html/ecb.blog200422~244d933f86.en.html; AM Mooij, 'The Role of the European Central Bank in Response to COVID19: An Evaluation of Its Mandate' (2022) Journal of European Integration.

[114] ECB, 'ECB Announces Package of Temporary Collateral Easing Measures' (2020) ECB Press Release <https://www.ecb.europa.eu/press/pr/date/2020/html/ecb.pr200407~2472a8ccda.en.html.

[115] De Guindos and Schnabel (n 113).

[116] ECB, 'ECB Takes Steps to Mitigate Impact of Possible Rating Downgrades on Collateral Availability' (2020) ECB Press Release <https://www.ecb.europa.eu/press/pr/date/2020/html/ecb.pr200422_1~95e0f62a2b.en.html.

to the CBPPs, and points to the emergence of structural excess reserves from 2009 onwards. This visualization underpins the extent to which multiple credit instruments in the monetary architecture now have de facto central bank backstops and are positioned on the Eurosystem's 'off-balance-sheet balance sheet' during the maturity period of a vertical repo.

Figure 15 depicts the volume of monetary policy operations that the Eurosystem has carried out through repo (panel 1 of Figure 11) in a more fine-grained way. It integrates the individual repo programs and indicates both the key dates when the collateral framework was changed and the APPs announced. 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 collateralized 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. These measures comprised 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.[117]

This historical account of the Eurosystem's collateral framework and its transformation has used our methodology to demonstrate the dynamics of the Eurocrisis and their connection to the erosion of 'off-balance-sheet' funding via vertical repos as the credit ratings for sovereign bonds deteriorated. 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 volume through CBPP-1, ABSPP, and PEPP. Still, the question remains why in the original monetary policy framework, vertical repos as the more 'convoluted' way for central bank money creation have received *de facto* priority over outright transactions as the more 'straightforward' way of central bank money creation and why this changed during the Eurocrisis. To understand this, we must look at the legal stipulations for the macro-financial environment created via the Maastricht Treaty of 1992.

## 3. Vertical repos with the Eurosystem and the monetary financing prohibition

With the Treaty of Maastricht, European monetary unification has been predicated on an influential norm enshrined in European Primary Law: the 'monetary financing prohibition'.[118] This means that in line with the idea of a strict separation of monetary and fiscal policy, the members of the European System of Central Banks (ESCB) are supposed to not provide any 'financing' to Member States' treasuries by 'monetizing' their sovereign debt securities to ensure that treasuries would be subject to 'fiscal discipline'.[119] The 'monetary financing prohibition' was known to be an important stipulation when the European Monetary Institute from 1994 to 1998 developed the original monetary policy framework in stage II of the process towards Economic and Monetary Union. In the context of such a 'monetary financing prohibition',

[117] ECB, 'Economic Bulletin' (issue 6/2021).

[118] Cf eg Otmar Issing, *The Birth of the Euro* (Cambridge University Press 2008) 54–55. The 'monetary financing prohibition' also features in the Delors Report which provided the blueprint for Economic and Monetary Union, see Jacques Delors, 'Report on Economic and Monetary Union in the European Community' (1989) Committee for the Study of Economic and Monetary Union, Report 24.

[119] Cf eg Jörn Pipkorn, 'Legal Arrangements in the Treaty of Maastricht for the Effectiveness of the Economic and Monetary Union' (1994) 31 Common Market Law Review 263.

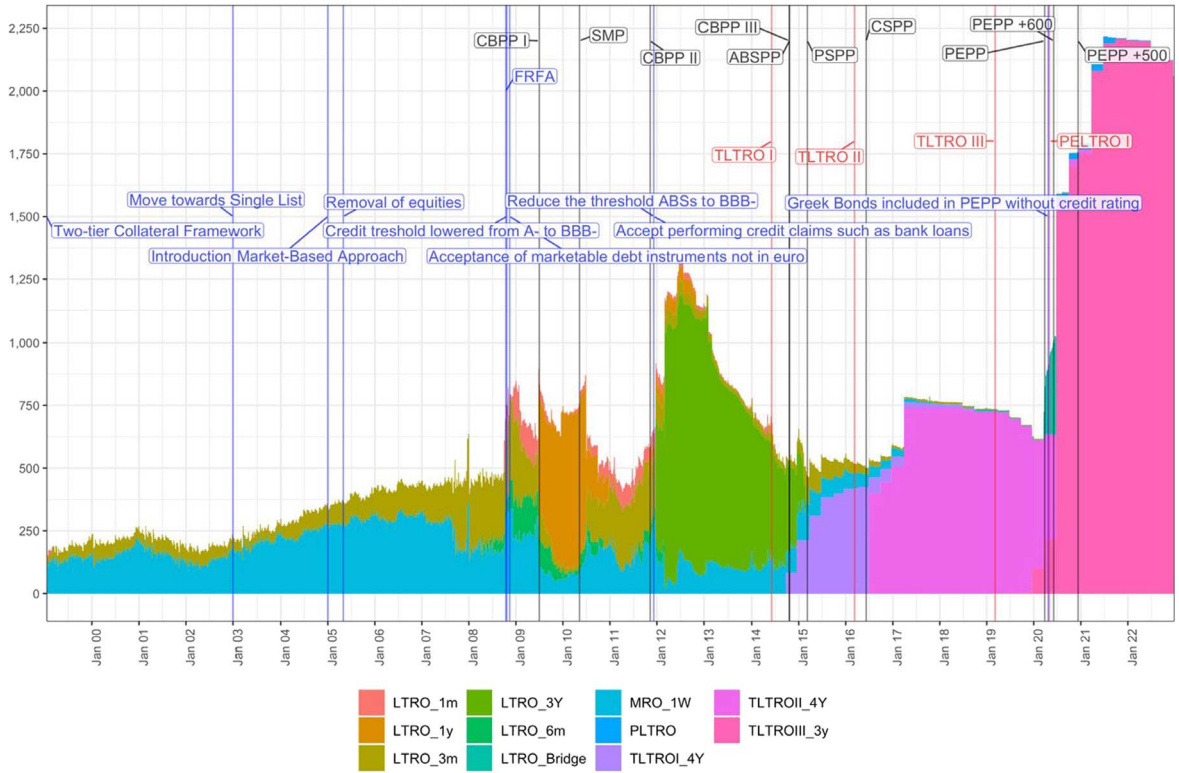


**Figure 15.** Eurosystem Refinancing Programmes (LTROs and TLTROs), in bn EUR (1999–2022). *Source:* Elaborations based on Leipzig Universität and ECB, 'History of All ECB Open Market Operations' (*ECB*, 2024) <https://www.ecb.europa.eu/mopo/implement/omo/html/top_history.en.html.

vertical repos offer an important advantage over outright purchases that echoes why the Federal Reserve originally adopted repos in 1917: Repos' 'inherent ambiguity' about the location of the security used as collateral helps *conceal* how sovereign debt securities are used for the purpose of central bank money creation because they merely touch central banks' 'off-balance-sheet balance sheet' and not the asset book on their actual balance sheet.

Despite its centrality for the European macro-financial arrangements, the 'monetary financing prohibition' does not actually show up *verbatim* in the European Treaties and is a surprisingly unclear concept.[120] In the European legal context, it can be operationalized in two ways. In a narrower sense, it rules out that the ECB or NCBs directly purchase sovereign debt securities of Member States on the primary market.[121] This principle was originally codified in article 104 of the Maastricht Treaty[122] and today is laid down, without any substantive changes, in article 123(1) of the Treaty on the Functioning of the European Union (TFEU).[123] In a broader sense, however, the 'monetary financing prohibition' can also refer to secondary-market purchases of sovereign debt. Council Regulation No 3603/93/EC, passed on 13 December 1993, provides additional definitions for article 104 of the Maastricht Treaty. While its articles stipulate some minor exceptions to article 104, for instance with regard to foreign exchange management or intraday credit, the most consequential point is to be found in a commencement clause, which states that 'purchases made on the secondary market must not be used to circumvent the objective of that Article' and thus puts any outright purchases on the secondary market under general suspicion of being 'monetary financing'.[124]

From the perspective of balance sheet methodology, the difference between central bank purchases of sovereign debt securities on the primary or secondary market corresponds to the distinction between an 'initial balance sheet expansion' and 'funding'.[125] On the one hand, an *initial balance sheet expansion* takes place when two counterparties engage in an operation with each other that involves net credit creation (cf the matrix in Figure 1). If the central bank and the treasury were to interact directly with each other, this would correspond to a swap of IOUs in which the treasury creates a sovereign debt security that the central bank puts in its asset book, whereas the central bank creates a liability that increases the funds on the treasury's account at the central bank. The treasury can then use the central bank money for additional government expenditure.[126] On the other hand, *funding* involves the central bank using the elasticity space on its balance sheet to help the treasury maintain its structural debt burden.[127] *Ceteris paribus*, the treasury will roll over maturing debt, ie issue new sovereign debt certificates with private institutions as counterparties as old sovereign debt securities mature, whilst the central bank

[120] Will Bateman, 'The Law of Monetary Finance under Unconventional Monetary Policy' (2021) 41 Oxford Journal of Legal Studies 929.

[121] In *The Birth of the Euro*, Issing links monetary financing only to primary market purchases: Issing (n 118) 54–55.

[122] Cf article 104 Maastricht Treaty and Protocol on the Statute of the European Monetary Institute.

[123] The key sentence in article 123(1) TFEU reads: 'Overdraft facilities or any other type of credit facility with the European Central Bank or with the central banks of the Member States . . . in favour of Union institutions, bodies, offices or agencies, central governments, regional, local or other public authorities, other bodies governed by public law, or public undertakings of Member States shall be prohibited, as shall the purchase directly from them by the European Central Bank or national central banks of debt instruments'.

[124] Council Regulation No 3603/93/EC (13 December 1993) specifying definitions for the application of the prohibitions referred to in articles 104 and 104b (1) of the TFEU.

[125] Cf Murau, Haas and Guter-Sandu (n 27); Guter-Sandu and others (n 27).

[126] Cf the 'budgetary' view on monetary financing used by Bateman (n 120).

[127] For discussions on this conception of long-term funding, see Perry Mehrling, 'Payment vs. Funding: The Law of Reflux for Today' (2020) Institute for New Economic Thinking (INET) Working Paper no 113 and Paul Davidson, 'Finance, Funding, Saving, and Investment' (1986) 9 Journal of Post Keynesian Economics 101–10. Another way of putting it is to talk about first finance and final finance, cf Louis-Philipp Rochon, 'The Creation and Circulation of Endogenous Money: A Circuit Dynamique Approach' (1999) 33 Journal of Economic Issues 1. In 'Theorising Non-Bank Financial Intermediation', Jo Michell provides an overview on the wider literature (Michell (n 24)).

stands ready to make last-resort purchases of the sovereign bonds in case private entities such as banks and non-bank financial institutions are not willing or able to keep them on their balance sheet. In this situation, the mere willingness and ability of the central bank to stand ready for last resort purchases of sovereign debt certificates typically stabilizes the aggregate funding of the sovereign debt in the primary market.

Conceptually, 'monetary financing'—and by consequence its 'prohibition'—can both refer to the initial balance sheet expansion or the long-term funding, which fulfil two different macro-financial functions.[128] The only consistent way to indeed prohibit 'monetary financing' would be to ban central banks from holding sovereign debt securities as assets altogether.[129] This would effectively mean a roll-back of the central banking evolution in the twentieth century, possibly through a return to the real bills doctrine, that would be hardly feasible in practice.[130] It would fundamentally clash with the needs of the contemporary credit money system where treasuries are dependent on (at least last resort) central bank support to maintain their structural sovereign debt burden[131] all the while central banks need sovereign debt securities to engage in monetary policy operations and influence banks' credit money creation.[132] Such a full-fledged prohibition was never seriously considered in the process of crafting Economic and Monetary Union. Indeed, the Delors Report states that 'binding rules are required that would . . . exclude access to direct central bank credit and other forms of monetary financing while, however, permitting open market operations in government securities'.[133]

Yet, the Maastricht Treaty does not pay attention to the conceptual intricacies of 'monetary financing'. It has a simplistic conception of the central bank-treasury relationship that assumes a clear distinction between monetary and fiscal policy where the treasuries' debt issuance activities are only connected to closing gaps in the public budget and central banks' monetary policy activities are concerned with maintaining price stability.[134] Still, this dichotomous distinction does not work out in practice once we think about a world of interlocking balance sheets. Both primary and secondary market purchases *unavoidably* involve central bank money creation against sovereign debt securities which does not fit the idealized conceptions of monetary and fiscal policy that inform the Maastricht Treaty. 'Monetary financing' thus cannot be avoided as long as central banks accept sovereign debt securities in their asset book. The specific legal provisions of the 'monetary financing prohibition' in European law are thus self-contradictory.[135]

[128] Cf Davidson (n 127).

[129] This would comprise both *direct* and *indirect* monetary financing, as defined by Bateman (n 120) 936.

[130] Éric Monnet, *Balance of Power: Central Banks and the Fate of Democracy* (University of Chicago Press 2024).

[131] For the 'Buyer of Last Resort Concept', see for instance Viral Acharya, Diane Pierret and Sascha Steffen, 'Lender of Last Resort, Buyer of Last Resort, and a Fear of Fire Sales in the Sovereign Bond Market' (2012) 30 Financial Markets, Institutions & Instruments 87.

[132] Guter-Sandu and others (n 27).

[133] Delors (n 118) 20–21.

[134] The official economic rationale was communicated in publications such as European Commission, Report of the Directorate-General for Economic and Financial Affairs, *One Market, One Money: An Evaluation of the Potential Benefits and Costs or Forming and Economic and Monetary Union* (Brussels 1990) and European Commission, 'Economic and Monetary Union. Communication of the Commission of 21 August 1990' in *Intergovernmental Conferences: Contributions by the Commission,*: Bulletin of the European Communities, Supplement 2/91 (1991). However, during the negotiations, the Commission adopted a less strict position, cf Marijn van der Sluis, 'The Role of Constitutional Law for the ECB: Past, Present, and Future' in Thomas Beukers, Diane Fromage and Giorgio Monti (ed), *The New European Central Bank. Taking Stock and Looking Ahead* (Oxford University Press 2022) 392.

[135] See Will Bateman and Jens van 't Klooster, 'The Dysfunctional Taboo. Monetary Financing at the Bank of England, the Federal Reserve, and the European Central Bank' (2024) 31 Review of International Political Economy 413. They point to origins of the self-contradiction on 428: 'While discussing the historically unprecedented prohibition of direct credit to governments into European law, [Bank of England] Governor Leigh-Pemberton worried that "occasionally it would be useful to undertake such operations to influence the market" . . . . That worry was dismissed by French governor de Larosière who pointed out that the prohibition would "enable the System to buy and sell marketable instruments, such as Treasury bills and other securities, in the pursuit of monetary policy and, as such, Mr. Leigh-Pemberton's point was covered"'.

In the present legal setting, however, it does not matter whether the 'monetary financing prohibition' is consistent or self-contradictory from the perspective of balance sheet methodology. Instead, the legal practice is concerned with determining whether the actions of the ECB comply with the letter of the law. In this regard, the distinction between a narrow and a broad definition of the 'monetary financing prohibition' sets out two conflict lines for legal reasoning and litigation.[136] First, it must be determined in practice under which circumstances secondary-market purchases 'circumvent' the prohibition of primary market purchases in article 123 TFEU.[137] This question boils down to whether secondary-market purchases of sovereign debt securities are primarily for the purpose of monetary policy implementation or for the fiscal support of treasuries, even though it is in fact always both. It becomes a matter of the stated intent. Second, it must be determined to which extent the 'monetary financing prohibition' in a broader sense curtails the central bank independence and autonomy which is enshrined in article 130 TFEU and gives the Eurosystem wide-ranging discretion to fulfil its mandate.[138] In fact, article 123 TFEU is primarily meant to address treasuries, and stands in conflict with article 18 of the ESCB Statutes which gives the ESCB full discretion to carry out open market operations to fulfil its mandate.[139]

These two structural conflict lines clarify the advantages of vertical repos over outright purchases as instruments for monetary policy implementation in the structural setting of a self-contradictory 'monetary financing prohibition'. Outright purchases make it explicit how the central bank provides on-balance-sheet funding to sovereigns. Figure 10—visualizing the Bundesbank balance sheet with a time series—demonstrates how the sovereign debt securities show up explicitly under A7. Hence, outright purchases unavoidably are subject to the contestation that they might serve to circumvent the broadly defined 'monetary financing prohibition'. This situation does not arise in the case of vertical repos. If sovereign debt securities get pledged as collateral, they do not formally touch the central bank's balance sheet. What is visible in the statistics are the instruments created via the first quadruple-entry consistent operation, namely the repo IOU and the central bank reserves (A5 and L2 in Figure 10). The *funding* of sovereign debt happens merely on the central bank's 'off-balance-sheet balance sheet'. The transfer of the sovereign debt security used as collateral—which could possibly conflict with the 'monetary financing prohibition'—does not formally appear, and even less so if we think of the security as encumbered on the repo borrower's balance sheet.

Moreover, outright purchases of government debt securities seem more prone to conflict with the 'monetary financing prohibition' than vertical repos because they provide funding to the issuing treasury until the security matures (assuming the central bank doesn't decide to sell them before that). Vertical repos, by contrast, seem to provide merely temporary funding that only lasts until the repo contract matures, which is typically short-term and must be less than the maturity date of the government debt security. Still, repo transactions can be rolled over without temporal limits and thus nevertheless maintain a structural funding of the sovereign debt volume.

As a result, the 'inherent ambiguity' of repos helps central banks navigate the self-contradiction of the legally binding 'monetary financing prohibition' and safeguard their autonomy and independence. These considerations do not matter merely in the abstract. The disadvantage of outright purchases in contrast to vertical repos became apparent in the litigation

[136] For a state-of-the-art legal commentary around the 'monetary financing prohibition', see Jörn Axel Kämmerer (2022) 'Article 123' in Helmut Siekmann (ed), *The European Monetary Union: A Commentary on the Legal Foundations* (Hart Publishing 2022) 155.

[137] Cf Kämmerer (n 136) para 18.

[138] Cf Kämmerer (n 136) paras 6, 19.

[139] Protocol (No 4) on the Statute of the European System of Central Banks and of the European Central Bank.

over the Eurosystem's Asset Purchasing Programmes at the German Constitutional Court (*Bundesverfassungsgericht*) and the Court of Justice of the European Union (CJEU).[140] After the ECB's interventions during the Eurocrisis with the Securities Market Programme (SMP) and the Outright Monetary Transactions (OMT), several German claimants appealed to the *Bundesverfassungsgericht* via a constitutional complaint (*Verfassungsbeschwerde*), arguing that the asset purchases were circumventions of article 123 TFEU and thus 'monetary financing'.[141] The *Bundesverfassungsgericht* subsequently asked the CJEU to clarify the legal situation. The CJEU determined that the ESCB carries out actions equivalent to primary market purchases if 'the potential purchasers of government bonds on the primary market knew for certain that the ESCB was going to purchase those bonds within a certain period and under conditions allowing those market operators to act, de facto, as intermediaries for the ESCB for the direct purchase of those bonds from the public authorities and bodies of the Member State concerned'.[142] Therefore, ESCB programmes involving outright purchases of sovereign debt securities must involve 'conditions intended to ensure that the ESCB's intervention on secondary markets does not have an effect equivalent to that of a direct purchase of government bonds on the primary market'.[143] In consequence, even though the *Bundesverfassungsgericht* ultimately turned down the constitutional complaint, the CJEU further consolidated the general suspicion that secondary-market purchases could be 'monetary financing', thus reinforcing the legal upsides for the central banks to use vertical repos.[144]

It is important to bear in mind that the 'on-balance-sheet' funding of sovereign debt securities via asset purchases by the Eurosystem only became necessary when the 'off-balance-sheet' funding via vertical repos eroded as the credit ratings for sovereign bonds deteriorated. With a self-contradictory 'monetary financing prohibition', it has become a *life lie* in the legal setting of the European monetary union that the structural funding of the sovereign debt burden could be possible by the private sector alone and would not require the support of central banks' balance sheets. The 'inherent ambiguity' of vertical repos offers a convenient way to avoid having to face the reality that the 'monetary financing prohibition' is dysfunctional.[145] As with any life lie, it continuously widens in scope and creates further problems. One of those is the constant neglect of the role of repos in the Eurocrisis. The causes of the crisis are continuously misattributed to individual debt levels of Member States. EU policymakers continue to double down on the erroneous macro-financial ideas enshrined in the Maastricht Treaty[146] rather than understanding the Eurocrisis as the implosion of the funding structure for the structural sovereign debt burden due to poorly designed legal stipulations about the relationship between central bank money and sovereign debt securities.[147]

In sum, our methodology for representing vertical repos on-balance-sheet gives a systematic understanding of the use of repos as a policy tool by the Eurosystem and helps shed light on their role in the European monetary architecture. First, the methodology shows how vertical repos lead to money creation on the higher-ranking balance sheet, here in the form of central bank

[140] Alicia Hinarejos, *The Euro Area Crisis in Constitutional Perspective* (Oxford University Press 2015) 21–23.
[141] Cf the arguments of the 'Beschwerdeführer' in BVerfGE 142, 123, 132 et seq (para 16–18, 26).
[142] Case C-62/14 *Gauweiler*, para 104.
[143] ibid para 105.
[144] The ECB stated in an official response to the litigations over the asset purchase programmes that 'the acceptance of government bonds or other public debt instruments as collateral by Eurosystem central banks in the context of credit operations with monetary policy counterparties has been considered compatible with the monetary financing prohibition since the start of EMU', see European Central Bank, 'Compliance of Outright Monetary Transactions with the Prohibition of Monetary Financing' (2012) ECB Monthly Bulletin (October) 7–9.
[145] Bateman and van 't Klooster (n 135).
[146] Andrei Guter-Sandu and Steffen Murau, 'The Eurozone's Evolving Fiscal Ecosystem. Mitigating Fiscal Discipline by Governing through Off-Balance-Sheet Fiscal Agencies' (2022) 27 New Political Economy 62.
[147] Guter-Sandu and others (n 27).

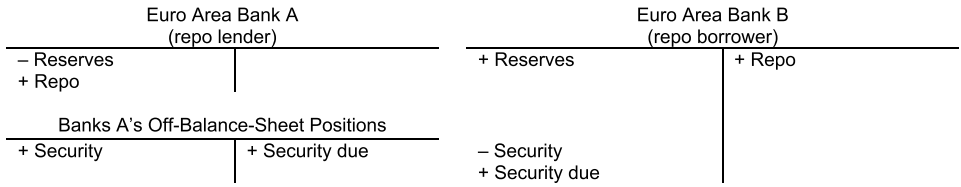


**Figure 16.** Secured interbank lending via an over-the-counter repo.

reserves on the NCBs' balance sheets. Second, the methodology clarifies how repo borrowers' IOUs are held as assets on the repo lenders' balance sheets to indicate the legal claim to the underlying securities, whilst the underlying securities pledged are best recorded as an off-balance-sheet position on the repo lenders' side and are defined as *encumbered* on the borrowers' balance sheets since the introduction of the Basel III regulations. Third, the methodology allows the collateral eligibility criteria to be represented as stipulations on the repo lenders' balance sheets. It explains how the inherent ambiguity of repos helps funding sovereign debt despite the self-contradictory 'monetary financing prohibition' inscribed in the European Treaties.

## IV. HORIZONTAL REPOS IN THE EURO AREA'S INTERBANK MARKET

### 1. Secured interbank borrowing and lending

Our second case study concerns horizontal repos which play a central role for interbank borrowing and lending in the Euro area. As the balance sheet mechanism used in the secured interbank market, horizontal repos constitute a lower-risk alternative to the unsecured interbank market.[148] The European repo market is more bank-centric than its dealer-centric counterpart in the US. It is true that participants in the European repo markets also comprise leveraged investors who are 'cash seeking' as well as 'cash suppliers' such as money market funds, hedge funds, or pension funds. Still, bank-to-bank activities lie at the heart of the European repo market.[149]

To start with, let us contrast the two basic options for interbank borrowing and lending. Figure 16 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 a swap of IOUs and consequently no new money creation. The second quadruple-entry consistent operation is the same as in the case of vertical repos. It comprises an asset swap on Bank B's balance sheet and an off-balance-sheet recording on Bank A's balance sheet.

Figure 17 depicts the alternative case 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'. No second quadruple-entry-consistent operation is involved, no off-balance-sheet position emerges, and no security is needed to facilitate the operation.

A first important distinction to grasp the design of the European repo market is that horizontal repos can be either a General Collateral Repo (GC repo) or a Special Collateral Repo (SC repo). Both GC and SC repos correspond to the mechanics displayed in Figure 16.

[148] Klára Bakk-Simon and others, 'Shadow Banking in the Euro Area: An Overview' (2012) ECB Occasional Paper Series no 133.

[149] Loriano Mancini, Angelo Ranaldo and Jan Wrampelmeyer, 'The Euro Interbank Repo Market' (2016) 29 Review of Financial Studies 1747.

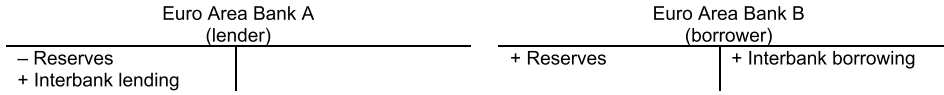


**Figure 17.** Unsecured interbank lending.

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 as long as 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 the same 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 security that is also in the collateral pool. 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.[150]

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 needs to deliver a specific security at maturity. 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 under Basel III regulations. The SC repo comes with a legal obligation to return the exact borrowed security—an equivalent security would not be acceptable. SC repos involve paying a special rate, which is influenced by how greatly sought after the asset is.[151]

The price for an SC repo is usually lower than for a GC repo. This difference points to the demand for a particular collateral which necessarily trades at lower rates. The 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 by unconventional monetary policy which affects securities' supply.[152] 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.[153] 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, eg 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.

[150] Stefania D'Amico, Roger Fan and Yuriy Kitsul, 'The Scarcity Value of Treasury Collateral. Repo-Market Effects of Security-Specific Supply and Demand Factors' (2018) 53 Journal of Financial and Quantitative Analysis 2103.

[151] Stefano Corradin and Angela Maddaloni, 'The Importance of Being Special: Repo Markets During the Crisis' (2017) ECB Working Paper Series.

[152] Cf Corradin and Maddaloni (n 151); Alfonso Dufour and others, 'Explaining Repo Specialness' (2020) 25 International Journal of Finance & Economics (April) 172.

[153] Claus Brand, Lorenzo Ferrante and Antoine Hubert, 'From Cash- to Securities-Driven Euro Area Repo Markets: The Role of Financial Stress and Safe Asset Scarcity' (2019) ECB Working Paper Series.

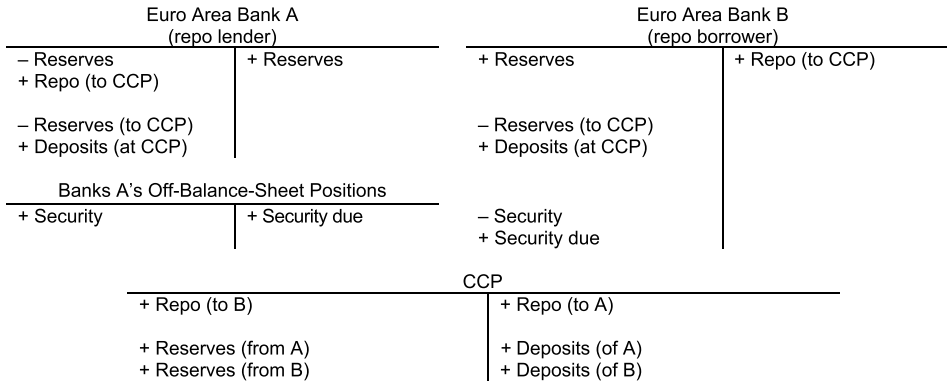


**Figure 18.** Secured interbank lending via repo organized through a CCP.

For instance, this may but does not have to be an SC repo through which Bank A seeks to obtain a specific security.

A second important distinction in the structure of the European repo market is that both GC and SC repos can be carried out over-the-counter or via a 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 (eg *Eurex Repo*), as soon as the repo contract is agreed, the CCP (eg *Eurex Clearing*) takes on the legal claim and liability with the respective sides of the trade.

Figure 18 visualizes 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 18 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.[154]

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 instruments of local and regional governments and supranational institutions.[155] By contrast, *Euronext Clearing*—formerly called *Cassa di Compensazione e Garanzia SpA*—specializes on clearing Italian government, corporate, and supranational bonds.

Historically, the significance of horizontal repos has increased in the Euro area since the GFC as short-term interbank borrowing and lending has shifted in large part from unsecured to secured money markets. Figure 19 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 ICMA and comprises GC repo and SC repo, both over-the-counter and organized via a CCP.[156] As the numbers are based on market participants'

[154] CCP12, 'CCP12 Primer on Initial Margin' (2018) White Paper.
[155] Brand, Ferrante, and Hubert (n 153).
[156] ICMA, 'European Repo Market Survey' (2022) Survey No 43—October 2022.

**Table 3.** Overview of 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[a] | United Kingdom | 3.8 m |
| Euronext Clearing | Italy | 0.68 m |
| LME Clear | United Kingdom | 0.43 m |

*Note:* [a] Includes Europe, Middle East, and Africa. *Sources:* Authors' own calculations based on CCP websites. Note that the numbers do not include open interest contracts.


**Figure 19.** Total repo business in Europe, 2001–2022 (in bn EUR). *Source:* ICMA, 'European Repo Market Survey' (2022) Survey No 43—October 2022.

self-disclosure, the data is less reliable 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 is not publicly available. Albeit merely an approximation, the ICMA data in Figure 19 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.[157] 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. In the 2010s, 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 also the Basel III regulations coming into effect.[158]

From 2017 onwards, the volume of horizontal repos increased again, which is connected to a second historical transformation of the European repo market, namely a shift in the relative

[157] Cf Gabor (n 19).

[158] ICMA, *Perspectives from the Eye of the Storm: The Current State and Future Evolution of the European Repo Market* (November 2015); ICMA, *Closed for Business: A Post-Mortem of the European Repo Market Break-Down Over the 2016 Year-End*' (February 2017).

importance of SC repos compared to GC repos throughout the last two decades. While GC repos were traditionally the more important instrument, these roles began to reverse after the GFC. By 2019, the turnover of SC repo was almost five times larger than that of GC repo.[159] Three reasons stand out for this transformation. 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 GC repos decline in volume and importance, which materialized as financial institutions sought to acquire more control over their collateral management.[160] Second, the Eurosystem's APPs 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 Public Sector Purchase Programme (PSPP) and the PEPP. At the same time, the APPs have increased the volume of euro-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 has 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 has effectively promoted the use of Italian bonds, which are not regarded as a safe haven and have continued to be used intensively after the GFC.[161]

In sum, horizontal repos play an important role on the European interbank market. Their purpose is to allow cash rich and cash poor banks to exchange reserves against collateral, without new money creation taking place. The distinction between GC and SC repos permeates the market structure, but both are identical on the level of abstraction that our balance sheet methodology adopts. GC repos that are cleared on CCPs based on their *collateral baskets* have the most far-reaching implications for stipulating which securities are eligible for horizontal repos. The design of collateral baskets played a paramount but still insufficiently conceptualized role in the Eurocrisis.

## 2. The transformation of CCPs' General Collateral baskets and its role in the Eurocrisis

CCPs are in the position to influence the elasticity space on their balance sheet and consequently on the repo counterparties' balance sheets by defining eligible 'collateral baskets'. This applies specifically to GC repo and associated 'GC baskets', which were important policy instruments particularly in the early years of the Euro area. The power to define which securities are eligible in a basket parallels in many respects the collateral framework of central banks.

While the Eurosystem's collateral framework is centrally decided upon by the ECB Governing Council and applies to all NCBs, the specific design of GC baskets varies 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 variation in between the GC baskets of CCPs is rather small because CCPs tend to follow the Eurosystem's decisions about eligible repo collateral.[162] In that sense, the GC repo collateral framework can be considered an 'extended private arm' of the Eurosystem's collateral framework as a *de facto* policy tool. Even though the ECB cannot directly control the design of CCPs' collateral baskets, the impact of changes to the Eurosystem's collateral framework are typically amplified by CCPs following suit.

[159] Schaffner, Ranaldo and Tsatsaronis (n 49).
[160] Michael Grill and others, 'Recent Developments in Euro Area Repo Markets, Regulatory Reforms and Their Impact on Repo Market Functioning' (2017) Financial Stability Review.
[161] Schaffner, Ranaldo and Tsatsaronis (n 49).
[162] Cf Eurex, 'Collateral Support' (*Eurex*, 2023) <https://www.eurex.com/ec-en/support/risk/collateral.

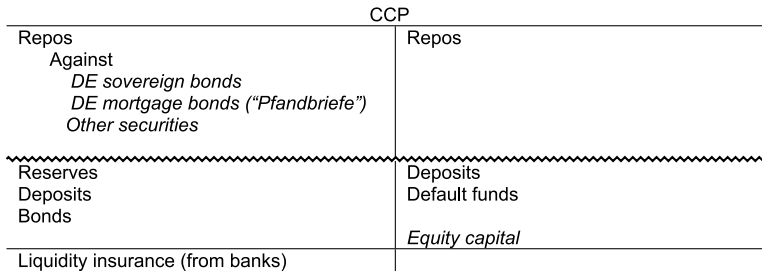


**Figure 20.** CCPs' balance sheet and eligible collateral following Eurex Clearing (as of 1999).

To substantiate this point, Figure 20 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 and highlights how the CCP is in a position to define the collateral that is eligible for repos.[163] The part below the wavy line depicts the actual assets and liabilities of the CCP. It holds reserves, deposits, and liquid securities as assets. Its liabilities comprise deposits as well as the 'default funds', which are loans received from each participating bank. The purpose of a default fund is that in a situation where a member is unable to pay, the default fund of this member is used, together with the CCP's own contributions, to cover losses. This leaves the default funds of non-defaulting members as a last resort.[164] As a contingent asset, CCPs are recipients of liquidity insurance from banks.

The 'list of eligible collateral' specifies the types of securities that counterparties can use to make their quotes for GC repo. It is written on-balance-sheet in a similar way as the Eurosystem's collateral framework and consolidates the brokerage of the repo by Eurex Repo and the clearing by Eurex Clearing. Figure 20 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 by the Giovannini Group.[165] 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 the report of the Giovannini Group explains, 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 for horizontal repos.[166]

At the time, the fragmentation into 15 different national repo markets was seen as an obstacle for the vision of full monetary integration.[167] The ECB perceived it as an impediment to the transmission of the single monetary policy.[168] Cross-border repo transactions were more expensive than domestic ones due to differences in the legal treatment of repos between EMU

[163] Cf Murau and Giordano (n 90).

[164] Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories, articles 45–48.

[165] Giovannini Group, 'EU Repo Markets: Opportunities for Change' (October 1999) <https://ec.europa.eu/archives/economy_finance/publications/archives/publication_summary1096_en.htm.

[166] See 29–35 of Giovannini Group (n 165) for an overview on the institutional setup of the repo markets in all 15 EU countries at the time.

[167] Braun (n 45).

[168] Javier Santillán, Marc Bayle and Christian Thygesen, 'The Impact of the Euro on Money and Bond Markets' (2000) ECB Occasional Paper Series.

Member States[169] and problems regarding the cross-border recognition of collateral.[170] 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.[171] 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'.[172]

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.[173] This 'Collateral Directive' provided binding guidelines that Member States had to translate into domestic law. Its stated goal was to create a harmonized 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). At the same time, it was supposed to be possible to deliver at maturity not only 'identical' but also 'equivalent' collateral, and repos were supposed to be given preferential treatment in case of the insolvency of one of the counterparties like in the US.[174]

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 harmonizing collateral regulations not only across countries but also between public and private repos. For instance, 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'.[175] Daniela Gabor and Cornel Ban refer to this as 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.[176]

These efforts were brought to fruition in March 2005 when Eurex was the first CCP to introduce general collateral pooling for private repos called 'Euro GC Pooling' and offered a harmonized GC basket that treated all Euro area government securities as equivalent.[177]

[169] Philipp Hartmann, Angela Maddaloni and Simone Manganelli, 'The Euro Area Financial System. Structure, Integration and Policy Initiatives' (2003) ECB Working Paper, 5.

[170] Valentina Stadler and Karel Lannoo, *The EU Repo Markets: The Need for Full Integration*, CEPS Research Report in Finance and Banking (Center for Economic Policy Studies (CEPS) 2000).

[171] Gabor and Ban (n 19).

[172] Giovannini Group (n 165) 5.

[173] Directive 2002/47/EC of the European Parliament and of the Council of 6 June 2002 on financial collateral arrangements.

[174] Gabor and Ban (n 19) 618.

[175] ECB (n 17) 68.

[176] Gabor and Ban (n 19).

[177] BearingPoint, *The Electronic REPO Market 2006, 3rd Edition: An Analysis of the Electronic Repo Market in the Euro-Zone* (BearingPoint 2006) 5 <https://www.criticaleye.com/inspiring/insights-servfile.cfm?id=131.

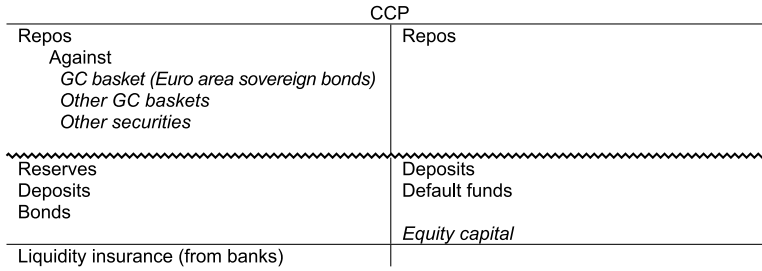


**Figure 21.** CCPs' balance sheet and eligible collateral following Eurex Clearing (as of 2005).

Figure 21 visualizes those changes on the idealized Eurex balance sheet. The GC basket based on Euro GC Pooling offered a new option for collateralizing 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 collateralize 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.

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.[178] The fragmentation of Euro area repo markets declined, and 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 arrangement to treat all Euro area bonds as equivalent collateral started to fall apart during the GFC.[179] Until February 2008, European repo rates were largely unaffected by the crisis dynamics. After the near-collapse of Bear Stearns in March 2008, Euro area GC repos even witnessed sharp growth rates which were taken as an indicator that Euro GC Pooling was working well. This changed, however, with the Lehman bankruptcy in September 2008 and the ensuing global run on repo. The risk aversion of repo lenders in the Euro area grew and their choice of collateral amounted to a flight-to-safety towards German and French bonds. The spread between A-rated Greek bonds collateralized repos and AAA-rated German collateralized repo increased from 0 to 60 basis points in September 2008.[180] Hence, distinct risk profiles for sovereign bonds based on their issuer emerged, bringing the first signs of fragmentation.

During the Eurocrisis, the arrangements for pooling Euro area sovereign bonds in GC baskets collapsed entirely. In September 2009, the G20 stipulated that standardized over-the-counter repo contracts had to be centrally cleared and started a shift of repo market activity towards CCPs.[181] Yet the fragmentation increased again as Greece's sovereign debt crisis unravelled. In October 2009, the newly elected Greek government publicly announced that in addition to Greece's debt to GDP ratio of 115.1 per cent, its budget deficit was considerably higher than expected and would exceed the 12 per cent mark. In consequence, the 'big three' rating agencies, Fitch, Moody's, and Standard & Poor's, downgraded Greece's credit rating between 22 October

[178] Braun (n 45) 403.

[179] Loriano Mancini, Angelo Ranaldo and Jan Wrampelmeyer, 'The Euro Interbank Repo Market' (2016) 29 Review of Financial Studies 1747.

[180] Peter Hördahl and Michael R King, 'Developments in Repo Markets During the Financial Turmoil' (2008) BIS Quarterly Review.

[181] Dietrich Domanski, Leonardo Gambacorta and Cristina Picillo, 'Central Clearing: Trends and Current Issues' (2015) BIS Quarterly Review, 59.

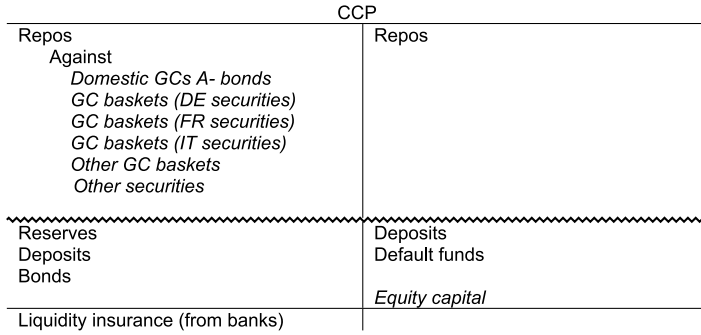


**Figure 22.** CCPs' balance sheet and eligible collateral following Eurex Clearing (as of 2010).

and 23 December 2009.[182] The downgrade made Greek sovereign bonds lose their status as regular eligible collateral for vertical repos at the Eurosystem, and also confronted CCPs with the question whether they should continue to clear Greek bonds. LCH.Clearnet, for instance, began developing a 'Sovereign Risk Framework' (SRF) in late 2009 to protect the CCP against increasing default risk while also guaranteeing access to funding for its repo market members. Effectively, the SRF started to treat sovereign bonds in a discriminatory way. In April 2010, LCH.Clearnet decided to decline the clearing of Greek bonds.[183] At that time, the interest rate spread between German and Greek bonds reached almost 9 per cent or 900 basis points.[184] When the SRF was officially published in October 2010, CCPs had stopped using Euro area-wide GC baskets.[185] Instead, several domestic GC frameworks had emerged such as 'GC French Bonds' and 'GC German Bonds'.[186] In consequence, a new form of fragmentation had emerged within the European interbank repo market, now between types of GC baskets.

Figure 22 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 became fragmented again as different domestic GC baskets appeared. Each domestic GC basket, such as German (DE) bonds, encompassed debt securities of a specific Euro area Member State.

For example, DE bonds comprised 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 basket was heterogeneous. In the German Corporate Bond GC Basket, for instance, securities required an 'A-' or higher rating from agencies such as Standard & Poor's.[187] Greek bonds, however, were no longer included in the GC baskets; they only returned in 2012 when the Eurosystem started accepting them again as collateral for vertical repos.[188] This change in the design of GC baskets demonstrates how CCPs act as the 'extended arm' of the Eurosystem and its decision to alter its collateral framework as a de facto policy tool.

[182] George Tzogopoulos, 'Experiencing an Unprecedented Crisis: The Stalemate in Greece' (2012) L'Europe en Formation (issue 2012/2 no 364) 25. Michael G Arghyrou and John D Tsoukalas, 'The Greek Debt Crisis: Likely Causes, Mechanics and Outcomes' (2011) 34 The World Economy 173.

[183] John Burke, 'LCH.Clearnet Margining Approach', Presentation to the ECB Money Market Contact Group (1 June 2011).

[184] Heather D Gibson, Stephan G Hall and George S Tavlas, 'The Greek Financial Crisis: Growing Imbalances and Sovereign Spreads' (2011) Bank of Greece Working Paper 124.

[185] Gabor and Ban (n 19) 631.

[186] Eurex Repo, 'Basket Specifications for Repo-Transactions of Eurex Repo GmbH' (2021) Eurex Repo (May) <https://www.eurex.com/resource/blob/2615564/00aafcbadf481bf02b8958089b948675/data/Basketspezifikationen_en_2021-05-01_final.pdf>.

[187] Eurex Repo (n 186).

[188] Clearstream, 'Greece: Bonds Issued or Guaranteed by the Greek Government Eligible in Eurosystem Credit Operations' (*Clearstream*, 13 March 2012) <https://www.clearstream.com/clearstream-en/securities-services/settlement/greece-bonds-issued-or-guaranteed-by-the-greek-government-eligible-in-eurosystem-credit-operations-1300842.

The visualization in Figure 22 helps to convey how Greece dropping out of the GC baskets created a vicious cycle that aggravated its financial strains. From the perspective of our balance sheet methodology, the newly emerged fragmentation of GC baskets implied—on the one hand—that Greek sovereign debt could no longer be funded[189] via the elasticity space on the 'off-balance-sheet balance sheets' of the private repo lenders who would engage in CCP-cleared horizontal repos. Arguably, while it is true that the Greek treasury was more indebted than it officially announced, it might have been in principle possible to fund its sovereign debt burden as long as there was a demand from financial market participants to hold Greek sovereign debt securities for the purpose of using in as repo collateral. Losing its status as eligible collateral for both vertical and horizontal repos in the Euro area substantially decreased the demand for Greek sovereign debt, making it virtually impossible for the Greek treasury to issue new debt at an acceptable interest rate and refinance itself by rolling over maturing debt. On the other hand, the fragmentation of GC baskets entailed that Greek banks and non-banks which held Greek bonds could no longer access repo markets with such collateral. This shrank considerably the availability of secured funding for commercial banks, which then reduced activity at sovereign auctions. An already skewed sovereign budget losing the regular buyers of its sovereign debt spiraled further out of control and threatened a sovereign default. To avoid this, other Euro area countries provided ad hoc loans in April 2010, followed by two bailout packages by the EU and the International Monetary Fund in May 2010 and July 2011.[190]

The experience of this 'Greek tragedy' indicates how the elasticity space on the 'off-balance-sheet balance sheets' of repo lenders has become a necessary ingredient for states to be able to fund their structural sovereign debt volumes. Let us recall how the Fed intervened into the US repo market in March 2020 at the onset of the Covid-19 crisis. It aggressively purchased US sovereign debt securities to prevent a repo market freeze because otherwise the private funding of US sovereign debt could have collapsed.[191] As a counterfactual, we may hypothesize that Greece's financial strain would have unfolded very differently, and much less severely, had there been a coordinated policy by the Eurosystem and European CCPs to provide elasticity space on the 'off-balance-sheet balance sheets' of the public and private repo lenders to stabilize the Greek debt burden.[192] In our interpretation, the 'Greek tragedy' was not caused by the fact that Greece was indebted in a currency that it did not control, as Paul De Grauwe has famously argued.[193] Rather, the origin was a financial governance regime that neglected the importance of the repo mechanism to provide elasticity space for the funding of sovereign debt and created a negative precedent for the funding of sovereign debt in other EMU Member States.[194]

In sum, our balance sheet methodology for horizontal repos helps us to understand and systematize the profound transformations of the Euro area interbank market since the inception of EMU. The methodology allows an on-balance-sheet representation of the changing private sector collateral rules in the form of CCPs' GC baskets that largely mirror those of the Eurosystem and thus form an extended private arm that amplifies the effects of changes to the Eurosystem's collateral framework. Creating an integrated Euro area-wide repo market with harmonized collateral rules for both central bank and private repos was a priority of the ECB and the European Commission in the early 2000s. This arrangement broke down in the GFC, with major implications during the Eurocrisis. The Greek sovereign debt crisis from 2009 onwards

[189] See Mehrling 2020 (n 127) and Murau, Haas, and Guter-Sandu (n 27) for our conception of funding applied here.
[190] Mark Copelovitch, Jeffry Frieden and Stefanie Walter, 'The Political Economy of the Euro Crisis' (2016) 49 Comparative Political Studies 811.
[191] Carolyn Sissoko, 'The Collateral Supply Effect on Central Bank Policy' (University of the West of England 2020).
[192] Vestergaard and Gabor (n 41).
[193] Paul De Grauwe, 'The European Central Bank. Lender of Last Resort in Government Bond Markets' (2013) 59 CESifo Economic Studies.
[194] Vítor Constâncio, 'Contagion and the European Debt Crisis' (2012) 16 Financial Stability Review 109.

can be explained by the fact that the cessation of a backstop for Greek bonds on the Eurosystem's balance sheets was mirrored on CCPs' balance sheets when they changed the composition of their GC baskets, and thus led to a complete inability for the Greek treasury to roll over sovereign debt at an acceptable interest rate and refinance itself, while Greek banks lost their ability to refinance themselves via the repo market, which had become key since the GFC.

### 3. The contradictory legal treatment of asset encumbrance and collateral re-use

Our final point in the case study on horizontal repos in the Euro area refers to the issue of security encumbrance, which was introduced with the Basel III regulations, and the *inherent ambiguity* regarding the whereabouts of the security during the maturity period of the repo. For vertical repos with the Eurosystem, we found that there is a tendency to interpret the second quadruple-entry consistent operation in a way which emphasizes that the security does *not* touch the repo lender's balance sheet. For horizontal repos, we perceive the opposite phenomenon: there is a tendency to give the impression that one and the same security used as repo collateral simultaneously appears on two balance sheets. Heretically speaking, we may refer to this as creating the impression of a structural 'bilocation' that is in fact endorsed by the existing regulatory regime.

Let us first look at the balance sheet of the repo borrower. The introduction of the Basel III regulations also stipulated for horizontal repos that the securities used as collateral are to be treated as encumbered on its balance sheet and hence do not leave the balance sheet during the maturity period of the repo.

Financial institutions started integrating the new stipulations into their accounting and reporting practices, which allows more empirical insights about the Euro area repo market structure to be generated and gives evidence about the status quo of encumbered securities. For instance, Deutsche Bank specifies in its annual report the volume of securities that are encumbered.[195] The aggregate volumes are collected and published by the European Banking Authority. In 2021, for instance, around 20 per cent of the encumbered assets on EU bank balance sheets were encumbered in repo borrowing with other counterparties (horizontal repos). Those were especially concentrated in France and Germany. Around 30 per cent of the encumbered securities were encumbered in transactions to secure central bank funding (vertical repos with the NCBs). The remaining 50 per cent were encumbered due to balance sheet operations other than repo.[196]

Across European countries, there is considerable heterogeneity in terms of encumbrance ratios and types of assets encumbered. For example, encumbrance ratios in 2021 varied from more than 50 per cent in Denmark to around 30 per cent in Italy, Germany, and France, and below 20 percent in Portugal and Austria, with non-Euro area countries consistently scoring below 10 per cent. Similarly, the ratio of encumbrance of central bank eligible assets was above 85 per cent for Greece, around 70 per cent for Italy, 60 per cent for Germany, and a little above 50 per cent for France. This reflects the use of central bank refinancing operations and the smaller pool of collateral eligible for vertical repos with NCBs.[197]

From the perspective of our balance sheet methodology, encumbrance interprets the second quadruple-entry consistent operation of the horizontal repo as if the collateral remained on the balance sheet of the repo borrower. This regulatory treatment of asset encumbrance creates a major tension with the common practice of *collateral re-use* on the side of repo lenders.

[195] Deutsche Bank, *Annual Report 2021* (2022) 165 <https://investor-relations.db.com/files/documents/annual-reports/2022/Annual_Report_2021.pdf.
[196] EBA, 'EBA Report on Asset Encumbrance' (2022).
[197] EBA (n 196).

The re-use of collateral implies that once a repo lender has obtained a security through a repo and thus acquired a legal claim to it during the maturity period of the repo, it is allowed to lend on the same security in another repo operation and borrow money itself by posting it as collateral.[198] The collateral re-use may be in the form of either a horizontal repo or a vertical repo (for instance with the Eurosystem). The EU's 2002 Directive on Financial Collateral Arrangements has explicitly endorsed collateral re-use.[199] The 2015 Regulation on Transparency of Securities Financing Transactions and Reuse has further enhanced the practices of re-use by making reporting mandatory to repositories.[200]

For disambiguation, collateral 're-use' is the same process as the 're-hypothecation' of collateral. Both terms are often used interchangeably.[201] The difference is the legal framework in which they take place: a security posted as collateral is 're-used' if the original repo involved a full legal transfer of ownership; this is the legal arrangement of the Euro area, established with the 2002 Directive and the associated TTCA. By contrast, a security posted as collateral is 're-hypothecated' if the original repo did not involve a full legal transfer of ownership and the security was merely pledged. This case applies to the US legal context.[202] Re-hypothecation is only possible if it is specified in the repo contract.[203] From the perspective of our balance sheet methodology, the difference between re-use and re-hypothecation refers back to different legal interpretations of the second quadruple-entry consistent operation and what ownership status it entails that the repo lender holds the security as asset on its 'off-balance-sheet balance sheet'.

The re-use of collateral plays a key role in the Euro area repo market. Manmohan Singh describes it as 'financial lubrication'.[204] Jeanette Capel and Anouk Levels provide several rationales for this. Accordingly, collateral re-use benefits banks as they can collateralize their own transactions, comply with Basel III liquidity standards, and generate additional returns on repos.[205] Due to the TTCA, the European repo market was the largest collateral re-use market in the world in 2016, with a total volume of 5.5 trillion EUR.[206] In 2014, more than 94 per cent of collateral securities received by banks were eligible for reuse, with a reuse factor of two.[207] In other words, banks re-use collateral once on average. This re-use factor has been continuously decreasing, as the factor was three in 2007 and 2.4 by the end of 2010.[208]

This common practice of collateral re-use poses a substantial conceptual difficulty regarding the regulatory choice of keeping the security encumbered: If in line with Basel III regulations the security remains encumbered on the balance sheet of the repo borrower and explicitly does not leave the balance sheet, how can the repo lender then be in the position to further lend it on as the 'Collateral Directive' endorses?

A possible rationalization is that the legal and accounting treatment of repos differ.[209] The security used as repo collateral stays in the books of the repo borrower from an accounting perspective, earmarked as being encumbered, whereas the legal ownership is transferred to the

[198] CGFS (n 43) 17.
[199] Directive 2002/47/EC of the European Parliament and of the Council of 6 June 2002 on financial collateral arrangements.
[200] Regulation 2015/2365 of the European Parliament and of the Council of 25 November 2015 on transparency of securities financing transactions and of reuse and amending Regulation 648/2012.
[201] CGFS (n 43).
[202] Gorton (n 36).
[203] Jeanette Capel and Anouk Levels, 'Collateral Optimisation, Re-Use and Transformation Developments in the Dutch Financial Sector' (2014) 12(5) DNB Occasional Studies 12.
[204] Manmohan Singh, 'Velocity of Pledged Collateral: Analysis and Implications' (2011) IMF Working Paper 2011/256.
[205] Capel and Levels (n 203).
[206] AMF, 'The Reuse of Assets: Regulatory and Economic Issues' (25 November 2016).
[207] Joachim Keller and others, 'Securities Financing Transactions and the (Re)Use of Collateral. An Analysis of the First Data Collection Conducted by the ESRB from a Sample of European Banks and Agent Lenders' (2014) ESRB Occasional Paper Series 6.
[208] Singh (n 204).
[209] Comotto (n 61).

repo lender who can therefore re-use the collateral. Yet an important implication of this is that the repo lender accepting the re-used collateral will be ignorant about the origin of the collateral that it now holds as asset on its 'off-balance-sheet balance sheet' while at the same time the identical collateral still seems to be in the asset book of the repo borrower. This would mean that one and the same collateral shows simultaneously on two balance sheets. Arguably, it requires a fair amount of training in financial 'double think' to perceive this argument as intellectually satisfying.

From our point of view, the simultaneous regulatory treatment of a security as encumbered on the balance sheet of the repo borrower and as suitable for re-use on the balance sheet of the repo lender is yet another case in point for the *inherent ambiguity* of the repo mechanism. On the one hand, the second quadruple-entry-consistent asset swap legitimizes *encumbrance* because the security does not touch the repo lender's balance sheet. On the other hand, the same operation legitimizes *re-use* because the repo lender can claim legal ownership by possessing the security on its 'off-balance-sheet balance sheet'. The only way to not perceive both regulatory treatments as blatantly contradictory is to maintain an ambiguous notion of the whereabouts of the security during the maturity period of the repo.

Why does such an arrangement prevail that allows a de facto *bilocation* of the security? One interpretation for would focus on the different nature of the Collateral Directive and the Basel III regulation. These are two different regimes—one legal and one regulatory—that have different policy goals. As Giuliano Castellano and Marek Dubovec point out, such legal and regulatory regimes are not necessarily coordinated, particularly in the context of credit creation.[210] Another interpretation, which does not necessarily contradict the first one, focuses on political economy aspects and points to underlying actor coalitions that stabilize this regulatory arrangement.[211] This is not to say that the actor coalitions have consciously brought it about but rather that the quintessential actors can all live with it and have little incentive to change anything. Three examples come to mind. First, central bankers and financial regulators fear that a more consistent regulatory regime might increase systemic risk. Repo markets are systemically relevant, and regulating them has turned out barely possible as they have become bigger and more pervasive. The US experience after the default of Drysdale Government Securities and Lombard-Wall in 1982 has shown that attempts to create more consistent regulation of repo markets to eliminate the inherent ambiguity have backfired and undermined financial stability. Second, the financial industry has little appetite for regulatory change as it thrives in the inherent ambiguity. Existing repo practices are profitable, and the industry wants to defend its business models. As the level of opacity about the horizontal repo markets is high, information flows about horizontal repo market activities can be well controlled. Reform attempts were a public-private cooperation, and the Euro GC Pooling was an industry initiative. Third, states benefit from repo markets since they generate demand for sovereign debt and contribute to funding their structural debt burden. The 'Greek tragedy' gives powerful evidence for what happens if repo markets stop using a sovereign bond as collateral and funding gets interrupted. Hence, it also suits the interest of fiscal policy makers if regulations allow repo markets to prosper and fund increased volumes of sovereign debt.

In sum, the current regulatory framework creates a fascinating arrangement where the re-use of the collateral promises financial lubrication and the encumbrance of the very same collateral

[210] Giuliano G Castellano and Marek Dubovec, 'Credit Creation: Reconciling Legal and Regulatory Incentives' (2018) 81 Law and Contemporary Problems 63.

[211] See for instance Kevin Young, 'Not by Structure Alone: Power, Prominence, and Agency in American Finance' (2015) 17 *Business and Politics* 443; Pepper D Culpepper and Raphael Reinke, 'Structure Power and Bank Bailouts in the United Kingdom and the United States' (2014) 42 Politics & Society 427; Milan Babić and others, 'How Does Business Power Operate? A Framework for Its Working Mechanisms' (2022) 24 Business and Politics 133.

promises enhanced financial safety. Both can be neatly quantified and are publicly reported. Still, the question remains if the general framing of the private repo market as the *secured* interbank market are not in fact an exaggeration if in fact the horizontal repos operate with bilocated collateral which—as endorsed by the current regulatory regime—is simultaneously encumbered on the balance sheet of the repo borrower and re-used by the repo lender.

## V. CONCLUSIONS

This article has used balance sheet methodology to provide a conceptual and empirical analysis of repos in Europe. We have proposed a methodology that, from a micro-level flow perspective, understands the repo mechanism as a combination of two quadruple-entry consistent balance sheet operations. From a macro-level stock perspective, we have developed an on-balance-sheet depiction of the collateral framework that conveys its role as a de facto policy tool for the entire monetary architecture.

The first quadruple-entry consistent operation clarifies under which condition a traditional form of money is created in addition to the creation of a repo IOU. If it is a vertical repo between a hierarchically higher and a hierarchically lower institution, money creation takes place; hence, repos with the Eurosystem always entail money creation. By contrast, if it is a horizontal repo carried out between two counterparties located on the same hierarchical level, as is the case in the Euro area interbank market, no new money is created and only pre-existing money is lent out. 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. We thus demonstrate that the creation of repos as *instruments* corresponds to two different *balance sheet mechanisms*.

The second quadruple-entry consistent operation implies that an additional credit creation operation takes place connected to the transfer of collateral. We draw on some of the latest advances in balance sheet methodology to clarify that the security used as collateral becomes an off-balance-sheet asset position of the repo lender combined with an IOU to repay it, while it is no longer held outright by the repo borrower with an IOU to repurchase it. Since this second quadruple-entry-consistent operation remains implicit, it allows flexible interpretations for both regulators and repo counterparties about the whereabouts of the security and the nature of the credit creation, which makes the repo mechanism inherently ambiguous. We find that vertical repos with the Eurosystem have a tendency to pretend that the security is 'nowhere', arguably to avoid direct on-balance-sheet funding of sovereign debt via the central bank. Horizontal repos, by contrast, seem to tend towards a 'bilocation' of the security used as collateral. Described as a 'financial lubricant' that fosters lending activity, the security may be re-used by the repo lender whilst at the same time the Basel III regulations treat it as encumbered on the balance sheet of the repo borrower.

As our third conceptual advancement, we have introduced a way to convey the collateral framework for repos on-balance-sheet. This addresses a major gap in how the composition of central bank balance sheets has so far been portrayed. It is common to depict the asset composition of the central bank balance sheet and draw conclusions on the types of instruments and issuers that the central bank supports. However, this only refers to the instruments that the central bank acquires outright and thus holds on-balance-sheet while neglecting those instruments that the central bank accepts as repo collateral and holds off-balance-sheet. Yet, it is of paramount significance if a given collateral can be 'monetized' via repo at the central bank or not—both for the institutions that hold the instruments as their asset and those that issue the instrument as their liability. Notably, the Eurosystem has traditionally prioritized repos over

outright purchases as its tool for monetary policy implementation. Our proposed notation style of the collateral framework that defines how the 'off-balance-sheet balance sheet' of the central bank can be used remedies this gap. We clarify that the design of the collateral framework is in fact a key policy tool for central banks. It also has significant indirect effects as CCPs for private repo markets tend to emulate in their general collateral baskets the choices of the central bank.

Drawing on those conceptual considerations, our analysis suggests that the ambiguity of the repo mechanism has been an integral part of repos' success story. 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. The inherent ambiguity of repos allows institutions to enhance the elasticity space on their balance sheet and circumvent stipulations 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. The Eurosystem has prioritized repos as a tool to promote the ongoing expansion of the credit network, while at the same time giving actors and regulators the impression that the collateralization with a security has a disciplining effect and allows for a greater degree of safety.

Moreover, our analysis points to the paramount importance of the securities accepted as collateral on private repo lender's 'off-balance-sheet balance sheet' for providing funding in sovereign debt markets, with the public balance sheets possessing the ability to influence key private agents. Our interpretation of the Greek crisis is that it was in fact the loss of this elasticity space on private balance sheets that created Greece's de facto bankruptcy. The loss in private markets was caused by the CCP GC baskets that indirectly amplified the Eurosystem's collateral framework, which is a vital policy tool to determine this elasticity space on the 'off-balance-sheet balance sheets'. Our framework allows us to show on-balance-sheet how CCPs have mimicked the transformation of the Eurosystem's collateral framework and thus magnified the Eurosystem's policy interventions to private repo markets beyond the standard monetary policy transmission mechanism or even unconventional monetary policy programmes. By highlighting the balance sheet composition, our methodology is in line with the Bank of Japan's emphasis on both *quantity* and *quality* of the balance sheets items on the asset side, as summarized by the turn in 2013 to a formal monetary policy framework of Quantitative and Qualitative Easing (QQE).[212] CCPs in Europe played the crucial role of transmission mechanism for such 'qualitative easing and tightening'. Therefore, the collateral framework for both vertical and horizontal repos has crucially shaped the dynamics of the Eurocrisis.

These findings sketch multiple avenues for future research which are relevant for scholars and students of financial regulation. First, it will be of interest to further explore the relationship betweenf collateral encumbrance and collateral re-use. Encumbrance may indeed be part of a satisfactory set of regulations strengthening the solvency and overall resilience of individual banks by accounting of the exposure to the security, but it does not tackle the *systemic* danger posed by the re-use of the legal claims obtained in repo transactions. In other words, repos have two types of credit risks: the risk of the default of the issuer of the 'original' security, and the risk of the default of the repo borrower. Encumbrance ensures that the first risk exposure is appropriately accounted for but cannot do the same for the second type. Second, we believe that it could be a worthwhile endeavour to further develop balance sheet methodology in a way that allows us to depict the re-use or re-hypothecation of collateral on-balance-sheet and consider what the divergencies in the regulatory constraints on reuse or re-hypothecation imply—eg a 140 per cent cap in the US and France[213]—or if it is appropriate to apply a money multiplier

[212] Haruhiko Kuroda, 'Quantitative and Qualitative Monetary Easing and Economic Theory' (Speech at the University of Zurich in Switzerland, 13 November 2017).

[213] Manmohan Singh and James Aitken, 'The (Sizable) Role of Rehypothecation in the Shadow Banking System' (2010) IMF Working Paper 2010/172.

logic on the re-hypothecation or re-use of collateral. Third, the European repo market could be further explored from the perspective of Basel III regulations. Basel III had a constraining effect on the use of repos by introducing leverage ratios and Liquidity Coverage Ratio. The 3 per cent tier 1 leverage ratio offered in Basel III is non-risk-weighted, whilst the Liquidity Coverage Ratio includes only *unencumbered* high-quality liquidity assets. Both of these regulations also make repos more expensive and shift funding from short- to long-term liabilities (thus away from the key segments of repo markets), and it remains unclear how they affect the quality of the collateral used.




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