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THE EURO-AREA REPO MARKET: STRUCTURE, PARTICIPANTS AND INTERLINKAGES

by Lorenzo Caverni[‡], Annalisa De Nicola[‡] and Mattia Persico[‡]

Abstract

This paper investigates the structure of the euro-area repo market and the role of its key participants, with a focus on primary dealers, drawing on granular data collected under the Securities Financing Transactions Regulation. We document structural features of the market. Outstanding volumes are almost evenly split between centrally cleared and non-centrally cleared segments, which differ markedly in participant composition, maturity structure, and trade characteristics. Within the non-centrally cleared segment – less explored yet systemically relevant – we identify a stable core-periphery network where primary dealers act as central nodes, connecting peripheral entities, such as non-bank financial institutions and non-dealer banks. Primary dealers play a structurally important role in safeguarding the proper market functioning: they channel liquidity from cash-rich agents to those in need of funding, thereby performing a crucial function in the redistribution of liquidity within the system, particularly during phases of reserve rebalancing.

JEL Classification: G21, G23, E40, D85.

Keywords: repo market, financial networks, intermediation, market structure, banks, non-bank financial intermediaries, securities financing transactions.

Sintesi

Questo lavoro analizza la struttura del mercato dei pronti contro termine dell'area dell'euro e il ruolo dei suoi principali partecipanti, con particolare attenzione ai primary dealers, sfruttando dati granulari raccolti ai sensi del Securities Financing Transactions Regulation. L'analisi consente di individuare alcune caratteristiche strutturali del mercato. I volumi delle operazioni risultano quasi equamente distribuiti tra il segmento a compensazione centrale e quello non centralmente compensato, che differiscono in modo significativo per composizione degli operatori, struttura delle scadenze e caratteristiche delle transazioni. All'interno del segmento non centralmente compensato – meno esplorato ma sistemicamente rilevante – identifichiamo un network stabile di tipo core-periphery, in cui i primary dealers fungono da nodi centrali, mettendo in collegamento gli operatori periferici, quali intermediari finanziari non bancari e banche non dealer. I primary dealers ricoprono un ruolo di rilevanza strutturale nel presidiare il corretto funzionamento del mercato: essi infatti convogliano la liquidità dai soggetti in posizione di eccesso verso quelli con esigenze di finanziamento, svolgendo così una funzione cruciale per la redistribuzione della liquidità nel sistema, soprattutto nelle fasi di riequilibrio delle riserve.

‡ Banca d'Italia, Directorate General for Markets and Monetary Policy Operations.

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1. Introduction[1]

The repo market is a vital component of the money market, as it serves the dual purpose of providing short-term funding and enabling the transfer of securities.

By channelling cash and securities throughout the financial system, the repo market enhances liquidity in the secondary debt market, improves price discovery and ensures settlement efficiency. In the primary market, repos allow investors to finance the purchase of newly issued securities, ensuring that participation is not constrained by immediate cash availability. In the secondary market, repo transactions enable investors to obtain leverage by borrowing cash, to cover short positions by borrowing securities, and more broadly to support price discovery through the continuous redistribution of collateral. Repos also allow market makers to manage their inventories more efficiently: they can quote and trade securities they do not yet hold, relying on the repo market to source them when needed. Finally, by providing timely access to the securities required for delivery, the repo market underpins the smooth functioning of settlement mechanisms and helps reduce settlement failures. The repo market is also crucial for the implementation of monetary policy, as it provides policymakers with insights into how reserves circulate among counterparties, and it constitutes one of the largest segments of the money market in major currency areas. Owing to its multifaceted functions, it is accessed by a wide range of market participants, whose engagement in repo transactions is shaped by their business models and economic functions.

In this paper, we investigate the structure of the euro area (EA) repo market and analyse the role and positioning of its key participants, with a focus on the intermediation function performed by primary dealers.

To this end, we first provide a descriptive assessment of the market's key features, focusing on the clearing dimension and maturity profile. Against this background, we highlight the functional roles of different participants and map their net position (defined as the difference between lending and borrowing positions) as well as their cross-sectoral exposure over time. We then deepen our analysis of the less-explored non-centrally cleared segment of the repo market and, by leveraging network analysis, document the fundamental intermediation function of primary dealers as central nodes in the redistribution of liquidity and collateral between cash lenders and borrowers.

Our paper relies on outstanding repo volumes in the euro-denominated repo market, collected under the Securities Financing Transaction Regulation (SFTR). The use of stock data, as opposed to transaction flows, allows us to identify persistent structural features of the market by capturing positions that accumulate over time and extend beyond daily trading activities, such as maturity mismatches and interlinkages across institutions and over time.

Our analysis shows that the EA repo outstandings are almost equally split between the centrally cleared and non-centrally cleared segments, although we document fundamental

[1] Any views expressed in this paper are the authors' and do not necessarily represent those of the Bank of Italy. We are grateful to Paolo Del Giovane, Gioia Cellai, Alberto Locarno, Salvatore Nasti, Simone Pezzini, Michelina Lo Russo, Stefano Siviero, Massimo Doria, Giuseppe Zingrillo and one anonymous referee for valuable comments and suggestions.

differences between the two. The centrally cleared segment is predominantly an interbank market, with most trades occurring in the 1-day tenor and in the security-driven segment. In contrast, the non-centrally cleared market involves a broader set of participants – banks and non-bank financial institutions (NBFIs) – with volumes skewed towards longer tenors and a relatively larger share of general collateral trades. This maturity structure – characterised by a non-negligible share of longer-term positions – reinforces the relevance of relying on stock data when assessing the non-centrally cleared segment.

When examining the market relevance of different participant types, we find that primary dealers are the most active players in the EA, holding outstanding positions with a wide array of counterparties. Their central role is even more prominent in the non-centrally cleared segment, where network analysis shows that they act as “core” entities, channelling liquidity and collateral flows towards “peripheral” participants (mainly NBFIs and non-dealer banks). We also find evidence that the detected “core-periphery” configuration for the non-centrally cleared repo market is highly persistent over time, signalling that the intermediation function of primary dealers constitutes a structural characteristic of the market architecture, consistently performed by a stable set of counterparties.

Related literature: Our contribution to the existing literature lies in advancing the structural analysis of the euro area repo market through the combined use of a less-explored dataset and network methodology. We differ from most existing studies along three dimensions: we rely on outstanding positions rather than transaction flows, we focus on the non-centrally cleared segment, and we adopt a structural, market-functioning perspective, abstracting from crisis episodes and policy interventions. While the structure of the euro area repo market has been widely examined in empirical research, most studies rely on data coming from electronic platforms (*e.g.*, Mancini *et al.*, 2016; Ranaldo *et al.*, 2019), which provide only partial coverage and lack over-the-counter transaction details. Central bank research often focuses on specific markets (*e.g.*, Affinito and Pozzolo, 2017; Craig and von Peter, 2014; Veld and van Lelyveld, 2014; Abbassi *et al.,* 2025) or specific episodes of market stress and policy intervention (*e.g.*, Arrata *et al.*, 2020; Corradin and Maddaloni, 2017; D’Amico *et al.*, 2014), leaving the system-wide and structural dynamics of the euro area repo market relatively underexplored. A parallel international literature documents the structure of repo markets in other jurisdictions, based on regulatory and supervisory data (*e.g.,* Garriott and Gray, 2016; Paddrik *et al.*, 2021; Huser *et al.*, 2024). While differing in institutional settings and scope, these contributions highlight the importance of comprehensive data for analysing secured funding markets and provide a useful international benchmark for the euro area. In this context, the Securities Financing Transactions Data Store (SFTDS) represents a key advancement, offering a comprehensive view of euro area securities financing transactions. To date, only a limited number of studies have exploited its analytical potential: Schöller (2026) examines the resilience of the euro-denominated repo market during episodes of elevated financial stress, applying network analysis to SFTR data; Hermes *et al.* (2025) provide a detailed mapping of the euro-area repo market using SFTR data; Bassi *et al.* (2024) explore how the implementation of SFTR enhances market transparency and alters the observable structure of repo transactions; the FSB (2026) and the ESRB (2026) use SFTR evidence to identify vulnerabilities and systemic

risks arising from collateral flows and market concentration. Our paper complements this emerging literature by shifting the focus towards the structural functioning of the euro area repo market, with particular attention to its bilateral segment. Methodologically, we extend the literature by applying network analysis to the non-centrally cleared segment. While network-based approaches have predominantly been applied in a financial stability or crisis-oriented context – often to study shock propagation, systemic liquidity risks, and resilience (*e.g.,* Allen and Babus, 2009; Minoiu and Reyes, 2011; Lee, 2013; Acemoglu *et al.*, 2015; Minoiu *et al.*, 2015; Demir and Önder, 2019; Schöller, 2026), our approach abstracts from such perspectives. Instead, we adopt a market-functioning view, using network analysis and stock data to uncover the structural organisation of intermediation relationships and shed light on the role and relative importance of different players within the system.

Structure of the paper. Section 2 provides an overview of the repo market, its economic functions and main characteristics; Section 3 illustrates key features of the euro area repo market and presents the main findings of the network analysis for the non-centrally cleared repo market, including data sources and methodology. Section 4 concludes.

2. The repo market

In a typical repo transaction, one party sells a security to another with an agreement to repurchase it at a specified future date and price. Although the transaction is not legally structured as such, a repo is economically equivalent to a collateralised loan, with the exchanged security serving as collateral.[2] Because the transaction is legally structured as a sale with a repurchase, the cash lender temporarily becomes the owner of the security, acquiring the rights to use it. This feature is essential, as it ensures that in the event of borrower default the lender can immediately dispose of the pledged security. This significantly reduces the counterparty credit risk compared with an unsecured loan. Other risks borne by the cash lender – such as interest rate risk, liquidity risk and credit risk associated with the collateral – can be mitigated through risk management practices, including the application of margins or haircuts.[3] The transfer of ownership also means that market participants may enter a repo transaction with the specific objective of sourcing a particular security.

Repos are fundamental pillars of the broader financial landscape. First, they enable borrowers – such as bank treasuries – to access low-cost, short-term financing, while offering lenders (*e.g.* money market funds) a low-risk, short-term investment. Second, they support liquidity in both primary and secondary bond markets. In the primary market, dealers use repos to fund purchases of newly issued securities. In the secondary market, repos allow investors (such as investment funds) to obtain leverage by borrowing cash or to cover short positions by borrowing securities, thereby facilitating price discovery. Most importantly,

[2] In theory, the collateral in a repo transaction may consist of any security. In practice, however, fixed-income instruments are predominantly used, most notably government bonds.

[3] Conversely, the cash borrower bears risks stemming from fluctuations in the market value of the collateral – which may trigger margin calls – as well as counterparty credit risk in the event that the lender fails to return the collateral at the end of the transaction.

repos enable market makers to manage bond inventories more efficiently, as they can quote securities they do not yet hold. Third, the repo market supports settlement systems by ensuring timely delivery of securities. Furthermore, it plays a critical role in monetary policy transmission given its importance for banks' funding and the formation of short-term money market rates.

A useful distinction of repo transactions is between General Collateral (GC) and Specific Collateral (SC) transactions. In a GC repo, the cash lender does not know ex ante the specific security that will be delivered as collateral, provided that it belongs to a predefined basket of securities with similar characteristics. By contrast, an SC repo involves lending against a particular security identified at the time of the transaction. This distinction offers a rule of thumb for understanding transaction motives: GC repos are typically cash-driven – *i.e.* motivated by the borrower's funding needs, as the cash lender is indifferent to the collateral – whereas SC repos are usually considered to be security-driven – *i.e.* motivated by the lender's need to obtain a specific security.[4]

Another key distinction relates to the clearing mechanism: centrally cleared versus non-centrally cleared repos.[5] In the former, a central counterparty (CCP) interposes itself between sellers and buyers, providing clearing services. This arrangement offers several advantages, including reduced counterparty credit risk – thanks to the CCP's "default waterfall"[6] of financial resources – lower market risk exposure through intraday margining, and reduced balance sheet consumption via multilateral netting.[7] Centrally cleared repos are often traded on electronic platforms, where liquidity is concentrated in short-term, standardised tenors. Non-centrally cleared repos, commonly referred to as "bilateral repos", are traded over-the-counter (OTC). They offer greater flexibility, allowing counterparties to negotiate tailor-made terms regarding maturity, collateral type and haircut levels. These repos also avoid costs associated with central clearing, such as margin requirements, while enabling more customised pricing compared to standardised market levels.[8]

In centrally cleared repo markets, two main access models emerge: direct access and sponsored access. Under the direct access model, eligible institutions become clearing

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4 To be more precise, only a subset of the SC repos is necessarily security-driven: those that trade "special" *i.e.* at a rate considerably lower than those of GC repos. This spread reflects the value of obtaining a particular security, implying that the cash lender (*i.e.*, the security borrower) is willing to forgo interest income in order to source that security e.g. for market-making purposes or to cover short positions.

5 Another distinction can be made with regard to the settlement mechanism of a repo, between bilateral and tri-party. In the former case, the trading parties are directly involved in the collateral management, in the latter case they delegate such activity to a third-party agent (a custodian bank or a Central Security Depository). The triparty agent handles collateral selection, settlement, and custody, although the trades themselves remain bilaterally negotiated – *i.e.,* the counterparty risk remains with the repo traders.

6 The term "default waterfall" refers to the hierarchical sequence of financial resources that a CCP uses to cover losses when a clearing member defaults. The initial margin and variation margin posted by the defaulting member are used first, then the CCP steps in with its own resources and finally contributions from non-defaulting members are called for.

7 "Balance sheet netting" refers to the possibility of reducing the counterparty exposure through the netting of financial assets (reverse repos) with financial liabilities (repos) when certain criteria are met: 1) repos and reverse repos must have the same counterparty and the same settlement date, 2) the party has a legally enforceable right to set off the netted amounts; 3) the party intends to settle on a net basis or to realise the asset and the liability simultaneously (the latter two criteria are less strictly applied under the US GAAP than under the IFRS). When transactions are centrally cleared, these criteria can be easily met and parties can achieve a positive impact from multilateral netting on their regulatory ratios (*i.e.* Leverage ratio, G-SIB framework through a reduction in the gross exposure reported on the balance sheet) and internal risk limits. See also Bassi *et al.* (2023).

8 For instance, the pricing may reflect the strategic value of the bilateral relationship, accommodate specific balance sheet constraints, or recognise differences in collateral quality not fully captured by standard market conventions.

members of the CCP and assume the full set of rights and obligations associated with membership, including margin requirements, fees, default fund contributions and default management. This model allows members to benefit from multilateral netting, but it also entails significant capital and operational costs. Direct access to CCPs is generally restricted to banks. By contrast, the sponsored access model enables buy-side participants – such as investment funds, pension funds, asset managers, and money market funds – that primarily operate in the non-centrally cleared segment and do not meet the eligibility criteria for direct participation to access the benefits of central clearing.[9] In this framework, the "sponsored member" becomes a direct participant of the CCP for margining and settlement, while the "sponsoring agent" retains responsibility for default fund contribution and default management. The sponsored access model offers several advantages, including improved liquidity and reduced counterparty risk. It also implies benefits for dealers, by lowering balance sheet consumption through the netting of sponsored trades.[10]

3. The euro area repo market

In this paper, we use a relatively underexplored regulatory dataset (Section 3.1) to examine the structure of the EA repo market. In Section 3.2, we provide a quantitative assessment of the market, highlighting the roles of different participants and providing a picture of their net position and cross-sectoral exposure. In Section 3.3, we then deepen our analysis of the less explored non-centrally cleared segment of the repo market and use network analysis to investigate the central role of primary dealers in the redistribution of liquidity and collateral between cash lenders and borrowers.

3.1 Data

The "Securities Financing Transactions Data Store" (SFTDS) is a regulatory dataset that collects data reported under the Securities Financing Transactions Regulation (SFTR)[11], which mandates EU market participants (with some exemptions)[12] to report daily to a trade repository (TR) their securities financing transactions – such as repos, securities lending, and marginal lending – as well as any subsequent modifications. The SFTDS, available at the ECB and NCBs, covers secured transactions executed by entities established in the EA and their branches, as well as euro-denominated transactions involving non-EA counterparties.

The strength of the SFTDS lies in its exceptional breadth and granularity. Unlike other datasets on the repo market – such as the ECB's Money Market Statistical Reporting

[9] Article 37 EMIR requires CCPs to admit only participants with sufficient financial strength and operational capacity to fulfil margin requirements and default fund contributions, also in case of market stress. NBFIs are usually excluded as direct member because they do not hold adequate capital and liquidity buffers, and lack the systemic resilience that banks possess. This is why their access is typically indirect (via sponsored clearing or intermediated models).

[10] In US, the use of the sponsored model has been growing since 2023; in UK, it is offered by LCH, but its use has been so far limited; in the EA, CCPs are still implementing initiatives to facilitate NBFIs' access to cleared markets.

[11] Regulation (EU) 2015/2365.

[12] Reporting obligation does not apply to the Bank for International Settlements (BIS), members of the European System of Central Banks (ESCB) and public bodies responsible for managing national public debt. In addition, are exempted from reporting requirements – although the obligation remains with the counterparty – non-financial undertakings whose balance sheet parameters fall below those set out in Article 3(3) of Directive 2013/34/EU for medium-sized enterprises.

(MMSR), which is limited to euro-denominated transactions reported by the largest banks – the SFTDS offers richer counterparty information, covers longer maturities, and includes a broader range of collateral types and currencies.[13] Thanks to its comprehensive scope, this dataset enables authorities to monitor systemic risks, assess market liquidity, and analyse the behaviour of both banks and NBFIs.

In this paper, we focus on euro-denominated repo and reverse repo transactions collateralised by securities, executed by financial intermediaries[14], excluding intragroup transactions. Our analysis relies on stock data, allowing us to identify persistent structural features of the repo market by capturing positions that accumulate over time, such as maturity mismatches and interlinkages across institutions.

Our sample covers daily data from January 2023 through December 2025.

3.2 Reading the market through its players

Transactions in the euro area repo market are predominantly security-driven. While this feature has long characterised the market, it was reinforced by the ECB's large-scale balance sheet policies. In an environment of abundant excess liquidity and collateral scarcity, most market participants had little need for short-term funding, leading to a decline in the use of the GC segment. Instead, they increasingly relied on the SC segment to obtain specific securities – either to invest cash in highly liquid, low-risk assets or to cover short positions. Since 2023, GC repo volumes have been increasing as excess liquidity in the Eurosystem began to recede following TLTRO repayments and the run-off of monetary policy portfolios. During the observation period, the growth in cash-driven repos was relatively stronger than in security-driven ones, with this upward trend expected to continue as the Eurosystem's balance sheet normalisation progresses.

Looking at the market through the lens of clearing, outstanding repos in 2025 are almost equally split between the cleared and non-centrally cleared segments.[15] In the centrally cleared segment, where trades mainly occur on electronic platforms and feature standardised tenors, half of the outstanding volume is concentrated in the one-day maturity.[16] The picture changes when examining the maturity profile of non-centrally cleared volumes: around 40% have maturities longer than one month and only 5% fall within the one-day tenor. This evidence underscores the importance of assessing repo dynamics based on stock data.[17] The maturity profile of repo volumes has remained relatively stable over the sample period. An interesting pattern can be observed towards the year-end, when shorter-tenor repos decline in favour of longer-term repos (especially from three to six months), as market participants secure refinancing ahead of the last trading days of the year

[13] SFTR mandates the reporting of detailed transaction-level information. See Bassi *et al.* (2024) for a comprehensive overview of SFTDS benefits.

[14] We do not analyse reverse repo activity carried out by CCPs outside of their clearing functions, whereby they invest cash received from their clients for margining purposes. Similarly, repo and reverse repo activity with Debt Management Offices (DMOs) are not covered in our data, despite their growing importance in recent years (see ESMA 2024).

[15] To disentangle between the two segments we consider the list of Central counterparties authorised to offer services and activities in the Union by ESMA (REGULATION (EU) No 648/2012).

[16] We define the one-day maturity as including spot next, tom next and overnight trades.

[17] The maturity profile of outstanding repos explains why our findings on the share of cleared versus non-centrally cleared segments differs from previous evidence mainly focused on flows (ECB, 2024).

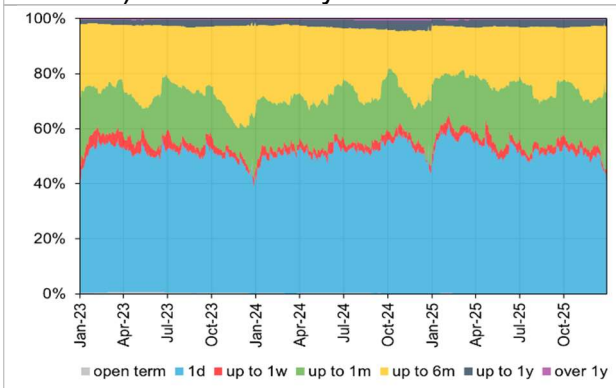
– typically amid heightened money market volatility and greater uncertainty over funding costs (Figure 1a).[18]

Turning to participants, our data show that Primary Dealers (PDs)[19] are key players in the euro area repo market, accounting for around half of outstanding volumes in the bilateral segment and close to 80% in the centrally cleared segment (Figure 1b).

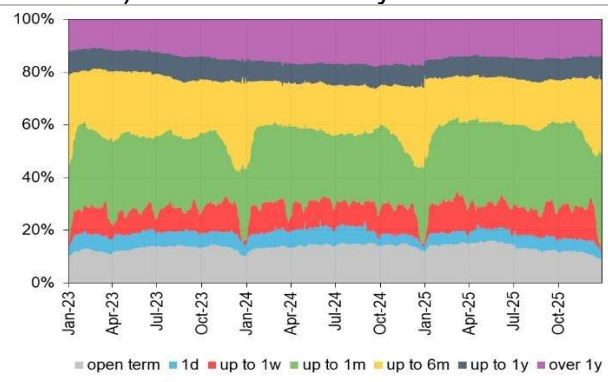
Figure 1 – The euro area repo market

a) Breakdown by maturity

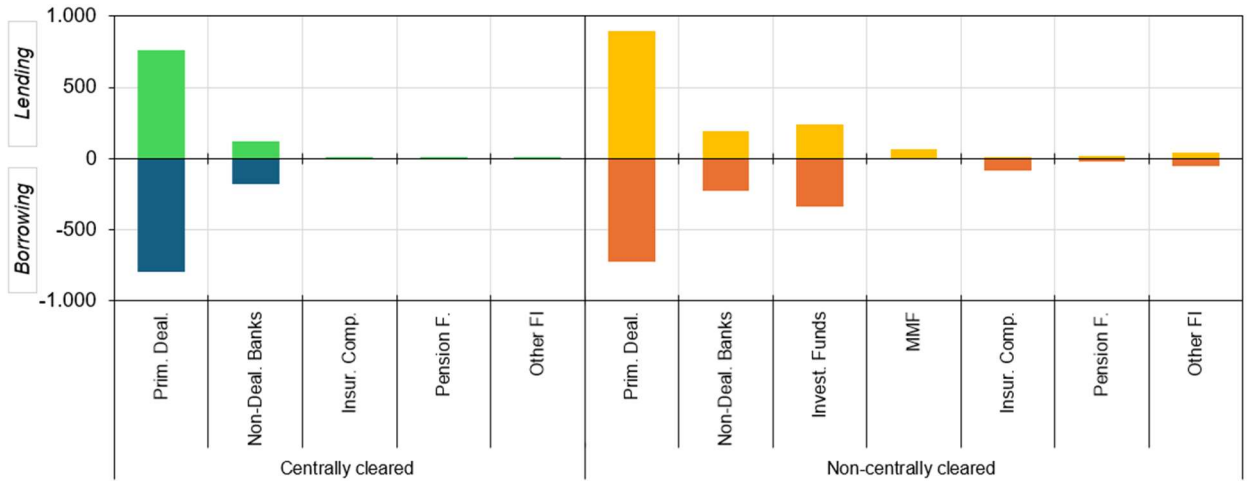
i) Centrally cleared



ii) Non-centrally cleared



b) Breakdown by participants



Sources: SFTDS, own calculations.
Note: (a) Daily data as of December 2025. (b) Volume in EUR billions, daily average over January–December 2025.

Our findings suggest that PDs, which are predominantly large banks, participate in the repo market for several purposes.[20] First, PDs make significantly greater use of GC baskets for funding: 17% of their outstanding repo (borrowing) positions are collateralised with GC baskets, compared with only 6% of their outstanding reverse repo (lending) positions. This

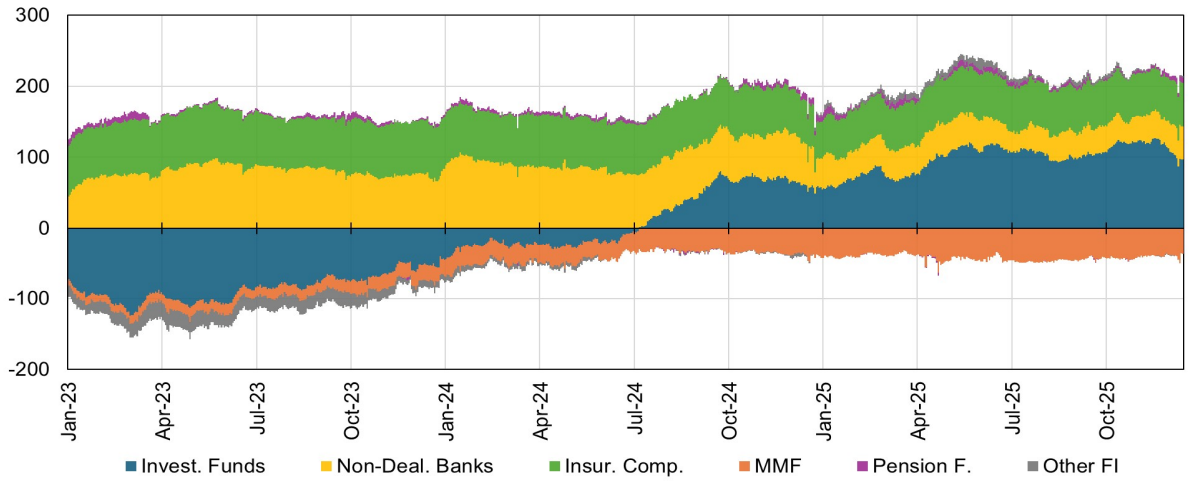
[18] During quarter-ends and year-ends banks actively manage their balance sheets to improve regulatory metrics, such as leverage ratio and G-SIB requirements, a practice known as "window dressing". In the EA repo market, this behaviour generates a drop in transaction volumes, which can lead to market strains and uncertainty in funding costs. See Bassi *et al.* (2023); Ranaldo *et al.* (2019); ECB (2024).

[19] We classify as primary dealers all those entities figured in the authorised primary dealers list published by ESMA. In our data, primary dealers are mainly dealer-banks and Other Financial Intermediaries (OFIs).

[20] Within these groups, separate actors coexist and operate, often autonomously and with different objectives (*e.g.* trading desks refinancing their security portfolios and the bank treasuries investing their excess cash).

highlights the role of repos as a key financing channel for primary market purchases of cash bonds. Second, examining their overall exposure reveals a broadly symmetrical pattern of activity across lending and borrowing activities, with average outstanding volumes of €1,658 bln and €1,526 bln, respectively, in 2025. Moreover, the maturity profiles of their lending and borrowing exposures are closely aligned. Taken together, this evidence suggests that PDs engage in repo transactions primarily as part of their 'matched book' dealing activity, aiming to balance borrowing and lending positions across maturities.[21] Third, their interaction with a wide array of counterparties – each with a distinct exposure profile – underscores their role as market intermediaries between end-users seeking funding and those providing liquidity. This intermediation function is particularly evident in the bilateral market (Figure 2). Specifically, PDs maintain net lending exposures to investment funds (€98 bln on average in 2025) – their most relevant clients – non-dealer banks (€39 bln), insurance companies (€61 bln) and pension funds (€4 bln), while holding a net borrowing position with money market funds (€43 bln).[22] The inter-dealer segment remains significant in the bilateral segment, accounting for roughly one-third of outstanding trades.

Figure 2 – Primary dealers' net positions in the bilateral segment: breakdown by counterparty sector



Sources: SFTDS, own calculations.
Note: Volume in EUR billions, daily data as of December 2025.

Although active on both sides of the market, non-dealer banks[23] tend to exhibit a net borrowing exposure, averaging €410 bln in repos versus €315 bln in reverse repos in 2025. While they operate in both centrally and non-centrally cleared segments, most of their activity occurs in the latter (approximately 60%). Their bilateral borrowing and lending relationships are mostly concentrated with PDs and non-dealer banks, with less than 15%

[21] For discussions on dealers' matched-book repo activity see BIS (2017), Baranova et al. (2016), Kirk *et al.* (2014).

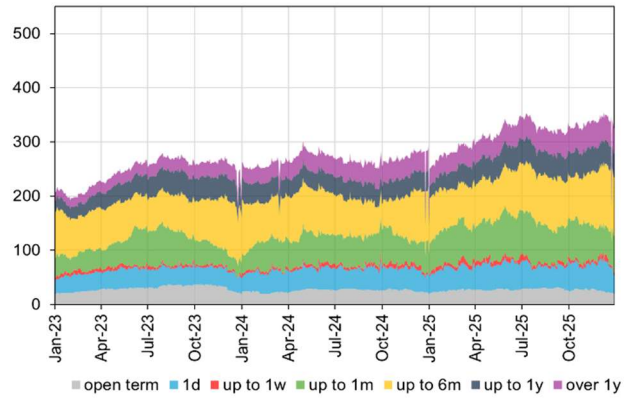
[22] PDs participate in the repo market for several additional purposes. For those PDs that act as market-makers – *i.e.* those that continuously provides buy and sell quotes for a particular asset in the financial market – repos enable the financing of securities inventories, while sourcing securities via reverse repos in the Specific repo segment allow them to economise on large holdings. Finally, as most PDs in our sample are banks, a portion of their repo activity likely also reflects traditional cash-management operations.

[23] We define 'non-dealer banks' as all entities classified as depository institutions according to the ESA which are not primary dealers.

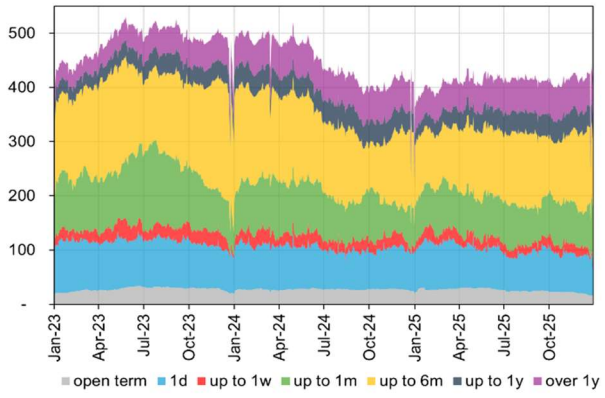
of the activity involving NBFIs. Their use of the repo market goes beyond short-term liquidity management, serving as an integral component of their asset-liability management (ALM) strategies. This is reflected in a maturity profile well differentiated across maturity bands (Figure 3) and skewed towards longer tenors, with 52% of outstanding volumes allocated beyond one month and 13% beyond one year. By entering longer-term repos under certain conditions, these institutions can obtain regulatory relief under NSFR and LCR requirements.[24] Non-dealer banks also rely on the repo market for short-term investments by leveraging rate differentials between repo transactions and the DFR.[25] Nearly one-third of their liquidity is invested in GC repos, owing to the liquidity and simplicity of these instruments.[26]

Figure 3 – Non-dealer banks positions: breakdown by maturity

a) Lending



b) Borrowing



Sources: SFTDS, own calculations.
Note: Volume in EUR billions, daily data as of December 2025.

Non-bank financial institutions (NBFIs) are significant participants in the euro area repo market, although their activity is almost entirely concentrated in the bilateral segment. Their near-complete absence from centrally cleared markets can be attributed to several factors. First, high entry costs: the fragmented nature of the euro area repo market means that trading repos requires access to multiple trading venues and CCPs, creating substantial administrative and operational burdens. Second, stringent eligibility criteria: CCPs impose requirements that are easier for heavily regulated banks to comply with; furthermore, the use of the "sponsored access" model remains limited. Third, margin requirements: CCPs demand margins that increase the cost of repo transactions.

Among NBFIs, Investment Funds (IFs)[27] are the most prominent actors in the bilateral repo segment. They are largely based outside the EA and typically enter repos with a small group of dealer banks. Our data show that IFs' activity in the repo market has grown notably since

[24] The impact of repos on the LCR and NSFR depends on several factors, including the nature of the collateral used, the counterparty involved, as well as the haircuts applied. See BIS (2017) and Faïk and Schneider (2024).

[25] Since mid-2024 non-dealer banks decreased their borrowing in SC repos; this may reflect the gradual increase of rates towards the Deposit Facility Rate (DFR) and the easing of the specialness phenomenon, reducing opportunities to borrow at particularly favourable rates. At the same time, their gross lending increased, likely reflecting the greater opportunities to earn a positive spread above DFR via reverse repos.

[26] This figure has been steadily rising since 2023 as excess liquidity is drained from the system.

[27] This category mainly includes hedge funds.

2023, with average outstanding volumes reaching €339 bln in borrowing and €237 bln in lending in 2025. IFs' participation in the repo market is usually associated with trading strategies in the cash market.[28] Interestingly, since 2023 IFs have reduced their sourcing of securities via repos and simultaneously increased their cash borrowing, leading their net position in the repo market to shift from net cash lending to net cash borrowing in 2024 (Figure 4). Although the factors underlying this trend are difficult to disentangle, a key contribution appears to be the improved sentiment towards the euro area, reinforced by expectations of an ECB monetary policy easing cycle. In this environment, IFs may have faced lower incentives to maintain short positions, while increasing their holdings of these securities as part of their investment strategies.[29] This, in turn, would imply a higher demand for repo financing and a reduced need to source specific securities. Additionally, subdued volatility may have reduced margin-related collateral requirements on derivative positions – *i.e.* the amount of securities that market participants need to post as collateral to cover potential valuation changes – thereby diminishing the need to source securities in the repo market. Regarding maturity profiles, IFs display a broadly similar distribution of activity across maturity bands in both repo and reverse repos. Their operations are concentrated in term transactions with maturities ranging from one week to one month, whereas overnight trades decreased during the observation period, accounting for only 4% of total borrowing volumes and 7% of total lending volumes in 2025. We also observe a clear seasonal pattern towards year-end, when IFs shift some of their borrowing from shorter to longer tenors (Figure 5). This likely reflects expectations that PDs will demand a premium to offset regulatory costs of repo activity on reporting dates.[30]

Figure 4 – Investment funds' lending and borrowing positions

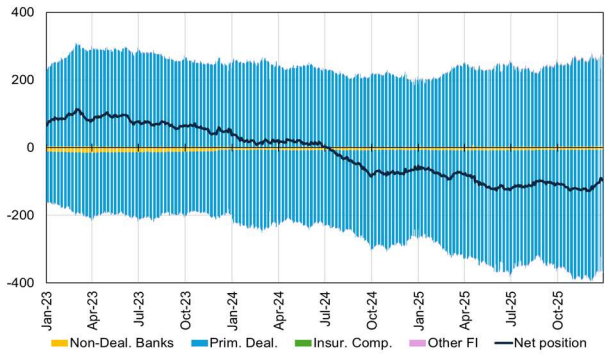
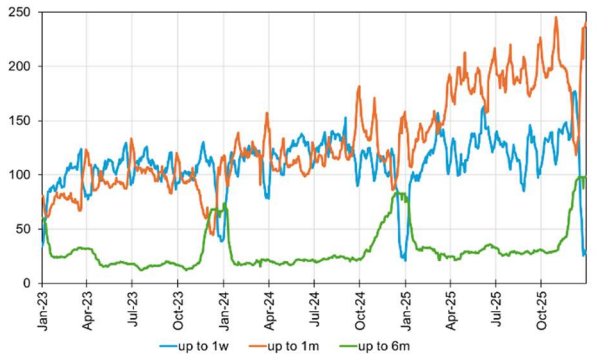


Figure 5 – Investment funds' borrowing position for selected maturities



Sources: SFTDS, own calculations.
Note: Volume in EUR billions, daily data as of December 2025.

[28] The repo market can support trading strategies in different ways. It allows IFs to obtain securities through reverse repos to meet delivery obligations arising from short positions in cash or futures markets. Conversely, by borrowing cash via repos, they can finance securities purchases; this enables leverage, whose magnitude also depends on transaction-related costs, such as margin requirements. See Ferrara *et al.* (2024) and ECB (2025).

[29] These might be directional trades or relative value strategies that seek to profit from price discrepancies across related securities. Examples of such strategies that might involve repo borrowing to finance bond purchases include the "long cash-future basis" trade, in which investors buy the bond and sell the associated futures contract; the "swap spread" trade, where they purchase the bond while taking the opposite position in a swap of the same maturity; and the "steepener" trade, in which they purchase a shorter-dated bond and sell a longer-dated one by a smaller amount.

[30] Banks may be willing to trade repos only if adequately compensated for the regulatory costs they incur.

Money market funds (MMFs) are cash-rich and risk-averse players that engage in bilateral repos exclusively as cash lenders, due to the safe and short-term nature of the instrument. Their reverse repo activity has tripled over the sample period, reaching an average of €63 bln in 2025. This likely reflects the positive remuneration offered by repos for the first time in years, following the exit from negative rates in late 2022 as a result of the ECB's policy rate hiking cycle. MMFs lend approximately half of their liquidity against GC baskets, making them the sector with the highest relative use of these instruments (Figure 6). MMFs place their liquidity mainly with PDs (74%) and, to a lesser extent, non-dealer banks. They exhibit a strong preference for very short-term transactions, reflecting both the short-term nature of their liabilities and the incentives embedded in their regulatory framework.[31] As a result, 41% of their reverse repos mature overnight, while only 26% last longer than one month. Despite this, the average share of reverse repos with maturities between one and six months has been increasing over the observation period, rising from 10% to 25% (Figure 7). Similarly to what is observed for IFs, MMFs significantly expand their use of this maturity bucket towards the year-end, reducing their use of shorter-dated transactions.

Figure 6 – MMFs lending position: breakdown by collateral category

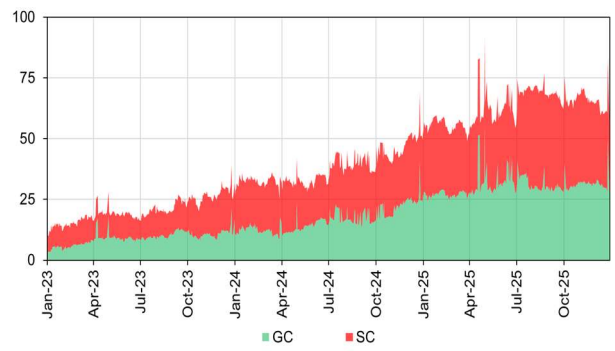
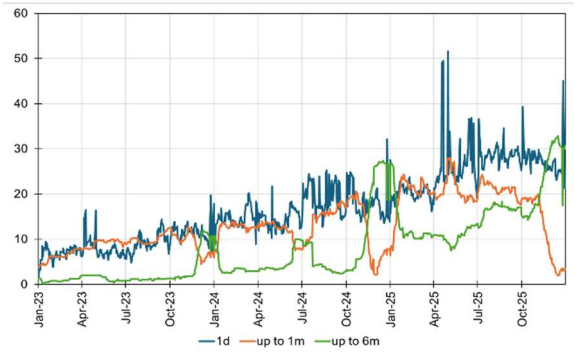


Figure 7 – MMFs' lending position for selected maturities



Sources: SFTDS, own calculations.
Note: Volume in EUR billions, daily data as of December 2025.

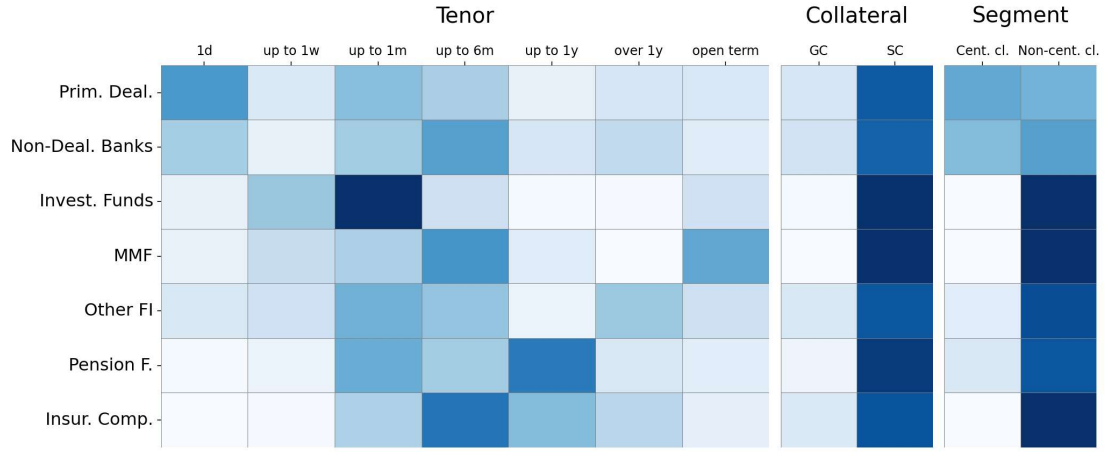
Among other NBFIs, Pension Funds (PFs) and Insurance Companies (ICs) participate in repo transactions on both sides of the market. Using repos to raise short-term funding helps them manage liquidity risk – for instance, to meet margin calls on derivatives portfolios or to cover unexpected claims. Conversely, reverse repos provide a short-term, secure and liquid instrument to diversify exposures, earn returns on excess cash, or source securities eligible for collateral in derivative transactions. Our data show that both EA and non-EA PFs participate in the EA repo market, with the former representing 65% of overall activity. In aggregate terms, the sector records similar outstanding volumes in lending and borrowing during 2025 (€26 bln and €24 bln, respectively), although their maturity profiles differ significantly. While lending is concentrated in short-term tenors – 72% of volumes mature within one week – PFs are the borrowers most reliant on long-dated repos, with 46% of their borrowing maturing after six months. This reflects a dual strategy: short-term reverse repos

[31] Money Market Funds Regulation (MMFR) requires MMFs to hold, on an ongoing basis, a minimum amount of liquid assets that mature or can be recalled within one day or one week, to meet any sudden withdrawals of investments. These requirements depend on the different types of MMFs. The choice of reverse repos as an instrument for liquidity deployment guarantees greater regulatory efficiency compared to alternatives such as unsecured deposits.

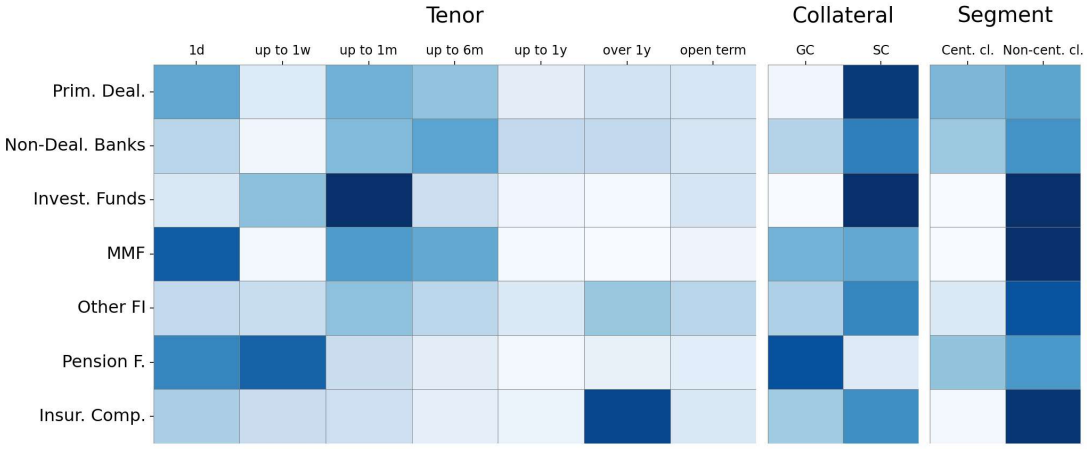
serve as readily available liquidity for margin calls,[32] while longer-term repos provide stable funding aligned with their liability structure. A closer look reveals jurisdictional differences. EA PFs act as net cash lenders (€16 bln), almost exclusively supported by GC baskets (96% of lending volumes), and trade with PDs (60%) and CCPs (40%).[33] Conversely, non-EA PFs are net cash borrowers (€14 bln), rely exclusively on PDs and operate in the SC segment. ICs use repos primarily as a financing tool to manage duration risk and meet margin calls or unexpected claims. Their average outstanding borrowing volume stands at €85 bln, compared to €11 bln in lending. ICs mainly borrow from PDs, although business with non-dealer banks has grown – modestly – over the past three years, reaching 15% of volumes in 2025. Similarly to PFs, ICs mainly borrow via term repos, with virtually no volumes maturing within one week while 38% mature after six months.

Table 1 – The market at a glance

a) Borrowing



b) Lending



Sources: SFTDS, own calculations.
Note: Daily average over January–December 2025. The heatmaps show the distribution of outstanding volumes for each participant sector across tenor, collateral type and segment. Shares are calculated across rows, that sum up to 1 in each sub-heatmap. Darker shades correspond to higher values within each row of the sub-heatmaps.

[32] According to De Nederlandsche Bank (2024), maturing reverse repos are among the first line of defence to meet potential margin calls.

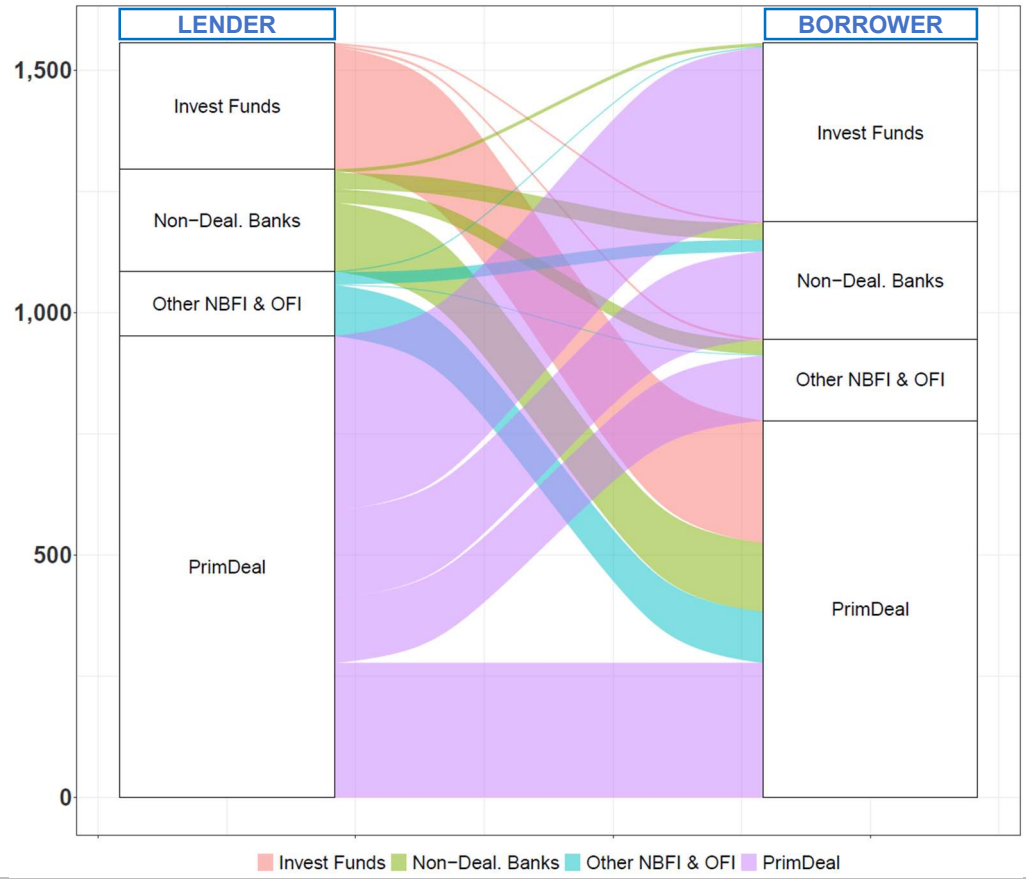
[33] Since mid-2022, pension funds have been able to engage in centrally cleared repo transactions with CCPs through Eurex's ISA Direct service, which provides them direct access to Eurex's cleared repo markets, enhancing their ability to manage liquidity and collateral efficiently while minimising counterparty risk (see EUREX 2022).

3.3 The non-centrally cleared market: a network analysis

The evidence presented above indicates that the euro-area repo market features a heterogeneous set of participants, each with a distinct exposure profile shaped by their economic roles and business models (Table 1). When examining cross-sectoral linkages, PDs emerge as liquidity hubs, collecting liquidity from cash-rich entities and channelling it to those in need of financing. Through this intermediation, they also perform an important redistribution function between the centrally cleared interbank segment – where they are the primary participants – and the non-centrally cleared market.

This section focuses on the less explored non-centrally cleared segment. Based on a network analysis, we document the central intermediation role played by PDs, which act as central nodes in the redistribution of both liquidity and collateral between cash lenders and borrowers (Figure 8).

Figure 8 – Non-centrally cleared repo market: cross-sector gross positions



Sources: SFTDS, own calculations.
Note: Data as of December 2025. Single-day exposure in billions of euros. The flows indicate lending positions from the sectors on the left side towards those on the right side. "Other NBFI & OFI" includes insurance companies, pension funds, money market funds and other financial institutions.

3.3.1 Network structure and metrics

Network Analysis examines complex systems by modelling their key elements as nodes and the relationships between them as links. This formal representation makes it possible to analyse the system as an interconnected whole, highlighting structural patterns and

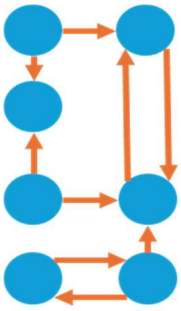
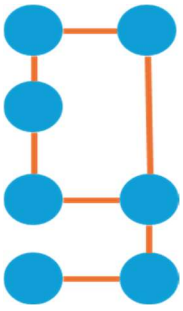
emergent behaviours that would not be observable when analysing components individually.[34]

Formally, a network is defined as a set of ordered pairs

$$G = (V, E)$$

whereby nodes (V) are connected through links (E). Networks can be directed or undirected. In the former, links (typically represented by arrows) indicate that the connection exists, and it is oriented from one node to another; in the latter, links are not oriented, and their presence simply denotes a connection (Figure 9). Networks can also be weighted, when links carry an intensity value, or unweighted, where a link simply represents the existence of a connection without quantifying its strength.

Figure 9 – Network examples

a) Directed network	b) Undirected network
	

Note. (a) Directed network with 7 nodes and 9 links. (b) Undirected network with 7 nodes and 7 links.

In financial applications, network analysis typically relies on directed weighted networks, since links between nodes represent cash flows or bilateral exposures that inherently have a direction. Consistently, our framework adopts directed weighted networks, where nodes represent EA market participants in the non-centrally cleared repo market, and links capture the positioning arising from repo and reverse repo transactions between them.[35] In this framework, a directed link indicates the existence of a lending position from one node to another as of a given date.

Accordingly, our network can be conceptualised as all the combinations of

$$\left(V_i, E_{i,j}, w_{i,j}\right) \forall\, i, j \in \{1, .., N\},$$

where

- N is the total number of EA financial counterparties with a non-zero exposure in the non-centrally cleared repo market on a given date;
- V_i is the node representing the counterparty *i*;

[34] Zinilli (2025).

[35] We include only transactions in which both parties have reporting obligations within the scope of the SFTR. This allows us to have consistency between the actual pairs of nodes and the potential connections between nodes. Accordingly, we exclude transactions carried out with counterparties established outside the EA, as they are not subject to the reporting requirements under the SFTR, and we therefore lack visibility into the trades executed among them.

- $w_{i,j} \in [0, +\infty)$ denotes the positive lending position in euro that counterparty i has towards entity j;
- $E_{i,j} \begin{cases} 1, if\ w_{i,j} > 0 \\ 0, if\ w_{i,j} = 0 \end{cases}$ indicates the existence of a connection from i to j.

Our network can be represented by the adjacency matrix M, an $N \times N$ square matrix containing all $E_{i,j}$

$$M = \begin{bmatrix} E_{1,1} & \dots & E_{1,N} \\ \vdots & \ddots & \vdots \\ E_{N,1} & \dots & E_{N,N} \end{bmatrix}$$

with the following properties:

- Zero diagonal: $E_{i,i} = 0\ \forall\ i \in \{1, .., N\}$, meaning that a market participant cannot be a lender to itself;
- Asymmetry: $E_{i,j} \neq E_{j,i}\ \forall\ i, j\ \in \{1, .., N\}$, meaning that the existence of a lending position from node i to node j does not imply the existence of a lending position from j *to* i.

To describe the network, we compute two metrics widely employed in the literature, both of which depend solely on the presence of links and abstract from the size of the underlying exposures.[36]

- Degree: a node-level metric indicating the number of connections a node has. In directed networks, the degree can be divided into out-degree – the number of links from a node – and in-degree – the number of links to a node. In our framework, for a given market participant, out-degree measures the number of counterparties to which it lends; conversely, in-degree measures the number of counterparties from which it borrows.
- Density: a network-level metric describing how connected nodes are within the network, computed by comparing the number of actual links to the maximum number of links that could exist in that network. Formally:

$$Density = \frac{\sum_{i=1}^{N} \sum_{j=1}^{N} E_{i,j}}{N \times (N-1)} \in [0,1]$$

  A density of 100% indicates a *complete* network (each node is connected to every other node), while values below 1% indicate a *sparse* network.

We also investigate the presence of a core-periphery structure. According to Borgatti and Everet (1999), core-periphery networks can be partitioned into two components: the core, consisting of densely interconnected nodes, and the periphery, composed of sparsely connected nodes that are primarily linked to the core but not to each other. This model does not specify the nature of the relationship between core and periphery, as it does not impose

[36] See Affinito and Pozzolo (2017), Caballero (2015), Covi and Gu (2022), Demir and Önder (2019), Minoiu and Reyes (2011), Minoiu *et al.* (2015) and Zinilli (2025).

any assumption on the direction of links connecting core and peripheral nodes.[37] The ideal core-periphery structure in an adjacency matrix M^* is defined as follows:

$$M^* = \begin{bmatrix} CC & CP \\ PC & PP \end{bmatrix} = \begin{bmatrix} \mathbf{1} & ? \\ ? & \mathbf{0} \end{bmatrix}$$

Here the core-to-core (CC) and the periphery-to-periphery (PP) blocks are sub-matrices of $\mathbf{1}$[38] and $\mathbf{0}$, while no assumptions are made about the core-to-periphery (CP) and the periphery-to-core (PC) blocks. In our analysis, to examine how intermediation occurs between core and peripheral participants, we adopt the *tiered* model of Craig and von Peter (2010, 2014), which imposes an additional condition: in a *tiered* core-periphery system each core entity must lend to and borrow from at least one entity in the periphery. Under this condition, the matrix M^* becomes:

$$M^* = \begin{bmatrix} CC & CP \\ PC & PP \end{bmatrix} = \begin{bmatrix} \mathbf{1} & \boldsymbol{RR} \\ \boldsymbol{CR} & \mathbf{0} \end{bmatrix}$$

As before, CC and PP blocks are sub-matrices of $\mathbf{1}$ and $\mathbf{0}$, but CP and PC blocks are now defined as "row-regular" ($\boldsymbol{RR}$) and "column-regular" ($\boldsymbol{CR}$) blocks, which contain at least one 1 in every row and column, respectively.[39] These conditions characterise the interactions between the core and the periphery, ensuring that in the ideal structure each core node has at least one lending position to and one borrowing position from a peripheral node. The degree to which our network fits a *tiered* core-periphery structure is assessed by minimising the distance d between the ideal matrix M^* and the observed network M. This distance is measured by the error score e, which is the sum of misclassified links in the four blocks of the matrix (CC, PP, CP, PC) normalised by the total number of links in the network. Its value ranges between 0 and 1: a score of 0 indicates a perfect fit between the observed network and the ideal core-periphery structure (Appendix A). Even if the definition of core-periphery network is not strictly verified in empirical data, it has been widely used in several studies to approximate financial networks.[40]

3.3.2 Findings

By leveraging our extensive dataset, we build a network representing the non-centrally cleared euro area repo market, as of 17 December 2025.[41] The network comprises 855 nodes – each corresponding to a market participant – and 2,661 links, which capture gross bilateral lending positions.[42] Within this network, 431 participants exhibit a negative net position (net borrowers), while 424 exhibit a non-negative net position (net lenders). By looking at the network structure, we find a significant dispersion in the connections: the

[37] This implies that peripheral nodes may exhibit only incoming links from the core, only outgoing links to the core, or a combination of the two.

[38] Excluding the diagonal, where the values are zero.

[39] Doreian *et al.* (2005).

[40] Craig and von Peter (2010, 2014) and Huser *et al.* (2024) apply this framework, respectively, to Bundesbank data on bilateral interbank exposures and to the overnight gilt repo market, while Fricke and Lux (2015) show that a core-periphery network provides a better fit for interbank overnight transaction data than do alternative network structures. Veld and van Lelyveld (2014) demonstrate that the core-periphery model is a "stylised fact" for the Dutch interbank market.

[41] We choose a date in the middle of the month to avoid potential bias induced by window dressing behaviours at quarter and year ends.

[42] Each directed link indicates the lending position from one node to another, while any borrowing position would be captured by a distinct, oppositely directed link.

majority of nodes (56%) have only one link (either in-degree or out-degree), 72% have at most two connections, and only a few exhibit higher degrees. The average number of links is 3.11, meaning that each entity is, on average, connected to just over three others. The low-density value (0.36%) confirms that the EA non-centrally cleared repo market forms a sparse network (Figure 10), consistent with the typical configuration observed for financial markets.[43]

To assess the role of PDs in this market, we construct an alternative network from which they are excluded (Figure 11). This network consists of multiple clusters of nodes, with very limited interconnections. Despite the large number of potential participants (818 out of 855 are non-PDs), the number of nodes actually present (372) is substantially lower than in the complete network, indicating that PDs act as the sole counterparties for most market participants.[44] Moreover, the average degree drops to 1.10, compared with 3.11 in the full network, reflecting a much sparser structure. Overall, this evidence suggests that the presence of PDs fundamentally shapes the network structure.

Figure 10 – The EA non-centrally cleared repo market network

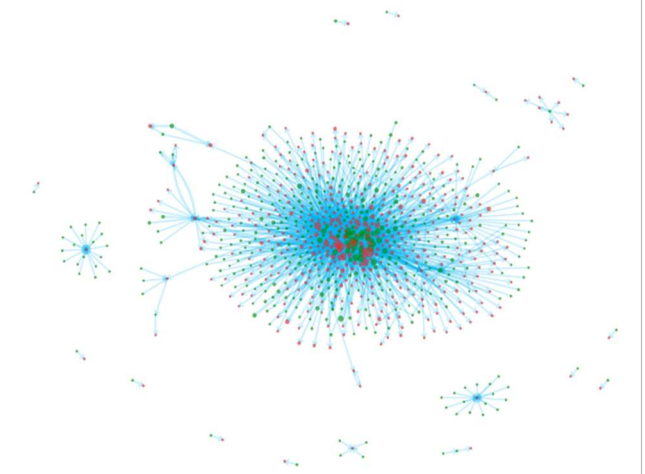


Figure 11 – The network excluding primary dealers

Sources: SFTDS, own calculations.
Note: Data as of December 2025. The light-blue arrows represent the positions between nodes. The red (green) dots indicate entities with a negative (positive) net position. The dot size is proportional to the absolute net position.

To deepen our understanding of the network topology, we explore the presence of a core-periphery structure and document several empirical findings.

First, we find that the non-centrally cleared repo market conforms to a *tiered* core-periphery configuration, as defined by Craig and von Peter (2010, 2014), with a relatively small core compared with the overall network size. Specifically, the core comprises 22 nodes (2.6% of market participants), while the periphery block is substantially larger, with 833 nodes. Core nodes are highly interconnected, with 287 links among them (out of a maximum of 462), resulting in a CC density of 62.1%. In contrast, links between peripheral nodes are extremely

[43] See Affinito and Pozzolo (2017), Allen and Babus (2009), Caballero (2015), Covi and Gu (2022), Craig and von Peter (2014, 2010), Demir and Önder (2019), Fricke and Lux (2015), Huser *et al.* (2024), Minoiu and Reyes (2011), Minoiu *et al.* (2015), and Veld and van Lelyveld (2014).

[44] The nodes that vanish correspond to participants that have connections exclusively with PDs. Once PDs are removed, these participants lose all their connections and are consequently excluded from the network.

scarce (513 out of 693,056 potential links, corresponding to a PP density of just 0.1%, Table 2), as they mainly trade with core nodes (most links are in the CP and PC blocks).

Table 2 – Core-periphery metrics

a) Number of connections (links)

		BORROWER	
		Core	**Periphery**
LENDER	**Core**	287	1,068
	Periphery	793	513

b) Density

		BORROWER	
		Core	**Periphery**
LENDER	**Core**	62.1%	5.8%
	Periphery	4.3%	0.1%

The presence of a core-periphery structure is confirmed by the low total error score of 0.32, which is substantially below unity.[45] This score corresponds to 688 misclassified links: 175 missing links in the core block – indicating that not all core nodes are connected to each other – and 513 errors in the periphery – indicating that links exist between peripheral nodes contrary to the theoretical model. In contrast, the CP and PC blocks exhibit zero errors, meaning that all core nodes lend to and borrow from at least one peripheral node. As a robustness check, we compare the error score with that of a Monte Carlo distribution obtained from 200 dimensionally equal random networks (built by two different processes), where any core structure would arise purely by chance (Appendix B). Notably, our observed error score falls well below the minimum value in the simulated distribution (0.53), reinforcing the significance of the detected core-periphery configuration.

Second, the core is composed almost exclusively of PDs, which engage in mutual lending and borrowing, act as liquidity hubs for the periphery, and serve as intermediaries between non-dealer banks and NBFIs. The degree of symmetry in ”coreness”, measured by the number of connections between core and peripheral entities in the lending (CP) and borrowing (PC) blocks, varies across institution types, even though CP and PC densities are broadly comparable. Core entities act as lenders for many peripheral banks and ICs, tend to borrow from MMFs and PFs and maintain balanced relationships with IFs. This heterogeneity suggests that the role of core entities within the periphery is not uniform, but rather shaped by the functional roles and strategic behaviours of their different counterparties. Analysis of peripheral dynamics reveals that non-dealer banks and PDs engage in linkages with other peripheral actors, though their exposure patterns remain predominantly peer-oriented. In contrast, NBFIs show no evidence of mutual linkages, suggesting a non-interconnected position with peers in the periphery (Table 3).

[45] An error score of 0.32 is in line with the values reported in Fricke and Lux (2015, 0.42), and in Veld and van Lelyveld (2014, 0.29), but significantly higher than that reported by Craig and von Peter (2010, 2014, 0.12).

Table 3 – Core-periphery structure of the EA non-centrally cleared repo market

			BORROWER								
			CORE		PERIPHERY						
			PDs	*Non-Deal.Banks*	*PDs*	*Non-Deal.Banks*	*IFs*	*ICs*	*MMF*	*PFs*	*OFIs*
LENDER	CORE	*PDs*	0,85	0,15	0,19	1,00	0,16	0,47		0,03	0,10
		Non-Deal.Banks	0,14	0,01	0,02	0,04	0,04	0,10	0,00	0,00	0,02
	PERIPHERY	*PDs*	0,26	0,06	0,05	0,09	0,04	0,11		0,00	0,03
		Non-Deal.Banks	0,55	0,04	0,07	0,13	0,01	0,08		0,00	0,04
		IFs	0,14	0,01	0,00	0,01					0,01
		ICs	0,06	0,00		0,00					0,00
		MMF	0,20	0,11	0,00	0,00					
		PFs	0,07		0,00	0,00					
		OFIs	0,10	0,02	0,01	0,02	0,00				0,01

Sources: SFTDS, own calculations.
Note. Data as of December 2025. The table shows gross positions between sectors, normalised to a 0-1 range (with 0 as the minimum, 1 as the maximum). Darker shades correspond to higher values within each block (CC, PP, CP, PC).

Third, the network structure tends to be stable over time. Building the network monthly from January 2023 to December 2025, reveals very little variation in the number of nodes and links, and in the computed metrics. The core-periphery configuration hardly changes: the number of core nodes ranges between 20 and 24, block densities change only marginally, and the error score remains around 0.3 (Figure 12, Appendix C). The estimated transition matrix, which measures the monthly frequency of node transitions across partitions, exhibits diagonal values close to unity, indicating a high degree of persistence in core-periphery assignments (Table 4). In 95.1% of cases, a core entity remains in the core in the following month (16 of these remain in the core throughout all periods), while the probability of a peripheral node migrating to the core is only 0.1%. This evidence indicates that the intermediation function of the core in the non-centrally cleared repo market is a structural feature of the market, persistently executed by a stable set of counterparties (PDs).

Figure 12 – Historical densities

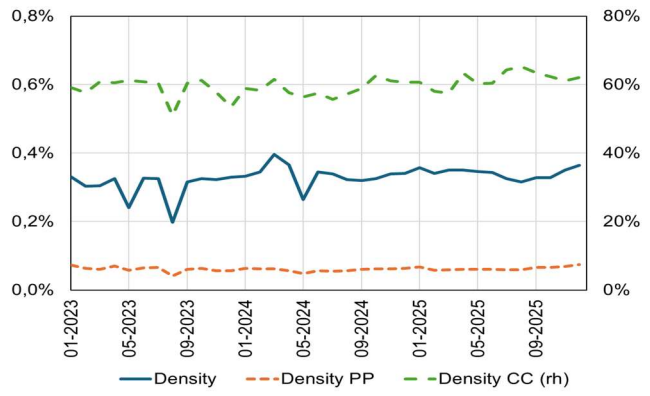


Table 4 – Transition matrix

	C	P	O
C	95.1%	4.9%	0.0%
P	0.1%	88.4%	11.5%
O	0.0%	11.8%	88.2%

Note. Table 4) the matrix reports the monthly frequencies of node transitions from partitions listed in the rows to those in the columns, over the period January 2023-December 2025. “C” denotes “core”, “P” denotes “periphery” and “O” denotes “out”, indicating nodes absent from the network.

We also investigate the core-periphery structure during year-ends to evaluate whether balance sheet constraints alter the role of core institutions within the framework. Our analysis does not reveal significant structural shifts in the network topology: both the number of core nodes and the intra-block density metrics remain broadly consistent with their

respective monthly and quarterly average values.[46] Furthermore, by examining bilateral links we find that relationships that persist throughout both the quarter preceding and the quarter following the year-end tend to survive at year-end. Taken together, the above evidence suggests that window dressing practices in the repo market – while known to significantly affect one-day repo rate– do not structurally disrupt enduring bilateral ties.[47]

4. Conclusion

Leveraging a novel and granular regulatory dataset, we investigate the structure of the euro area repo market to gain deeper insights into the role of its participants, with particular attention to primary dealers (PDs).

Our analysis shows that the market remains predominantly driven by SC transactions, although the relative importance of GC segment has increased as excess liquidity in the Eurosystem began to recede. Along the clearing dimension, outstanding repos are almost evenly split between the centrally cleared and non-centrally cleared segments, though they display markedly different characteristics. The centrally cleared segment – extensively investigated in previous research – is predominantly an interbank market dominated by standardised very short maturities (mainly one-day). By contrast, the bilateral segment is skewed towards longer maturities and accessed by a wider set of market participants with diverse economic functions and business models, which shape their repo market positioning.

By applying network analysis to the non-centrally cleared segment, we show that it conforms to a *tiered* core-periphery configuration, in which a small number of PDs act as "core" central intermediaries channelling liquidity and collateral flows towards a broad periphery composed mainly of NBFIs and non-dealer banks. This network configuration appears stable over time, indicating that the intermediation role of PDs is a structural feature of the market, consistently performed by a stable set of counterparties. The pronounced concentration of intermediation within a limited number of core entities, relative to the overall network, may amplify systemic vulnerabilities, with potential implications for money market functioning and financial stability, thereby contributing to the policy debate on the need to address dealers' balance sheet constraints.

Our analysis offers a contribution to policymakers and academics on the structural properties and interconnectedness of the euro area repo market. This appears particularly relevant as the repo market plays an increasingly important role in the transmission of monetary policy, especially in the context of ECB balance-sheet normalisation, in which market-based funding and the redistribution of reserves gain prominence. An interesting avenue for future research is to investigate how the network structure of the bilateral market influences repo pricing and whether banks charge an intermediation premium to redistribute liquidity across clients. Understanding the pricing behaviour is crucial to evaluate whether –

[46] This does not imply that the size of the exposure is unchanged, but rather that the link itself persists.

[47] In addition, the assessment of network persistence might also be impacted by the use of stock data (instead of flows) and by the exclusion of non-euro area cross-border exposures, which are more susceptible to window dressing practices by euro area counterparties.

and to what extent – the intermediation role of entities with limited balance-sheet capacity affects the smooth functioning of the money market.

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Appendix

Appendix A

To identify core nodes, we follow the approach in Craig and von Peter (2010, 2014) which minimises the distance d between the ideal matrix M^* and the empirical matrix M:

$$d = M^* - M = \begin{bmatrix} \mathbf{1} & \boldsymbol{RR} \\ \boldsymbol{CR} & \mathbf{0} \end{bmatrix} - \begin{bmatrix} CC & CP \\ PC & PP \end{bmatrix}$$

where

- CC, PP, CP and PC blocks denote all links, respectively, from core to core, from periphery to periphery, from core to periphery and from periphery to core of the empirical matrix (M);
- **1** and **0** identify square matrices of ones and zeros;
- $\boldsymbol{RR}$ and $\boldsymbol{CR}$ are, respectively, a ‘‘row regular’’ and a ‘‘column regular’’ block, which contain at least one link in every row/column (Doreian *et al.*, 2005).

The distance d is measured through the total error score e, which aggregates the errors – *i.e.*, the number of inconsistencies – between each block of the observed network and the ideal matrix, normalised by the total number of links in the matrix M:[48]

$$e = \frac{e_{CC} + e_{CP} + e_{PC} + e_{PP}}{\sum_{i=1}^{N} E_i}$$

with

- e_{CC} is the number of missing links in the CC matrix (excluding the diagonal), as it is assumed that all core nodes are linked to each other;
- e_{PP} is the number of links in the PP matrix, as peripheral nodes should not be connected to each other;
- e_{CP} is the number of rows in the CP matrix without any 1, as core nodes should have at least one lending position to a peripheral node;
- e_{PC} is the number of columns in the PC matrix without any 1, as core nodes should have at least one borrowing position from a peripheral node
- $\sum_{i=1}^{N} E_i$ is the number of total links in the M matrix.

The optimal list of core nodes is defined as the set of nodes that minimises the error e. Since the number of possible combinations increases exponentially with the dimension of the matrix (with n nodes there are approximately 2^n possible combinations), to find the solution to this minimisation problem we apply the simulated annealing algorithm.[49] This is a stochastic optimisation method that explores the solution space by probabilistically accepting worse solutions to escape local minima, gradually reducing randomness through a cooling schedule. In its general application the initial partition is randomly chosen; instead, we set as the starting point the core nodes with the highest degree centrality. As a

[48] See Craig and von Peter (2010, 2014) for further details.
[49] Kirkpatrick *et al.* (1983).

robustness check, we also run the optimisation algorithm using as the initial partition the nodes with the highest eigenvector centrality, obtaining consistent results.[50]

[50] Eigenvector centrality measures a node's influence in a network considering the importance of the nodes it is connected to. A node connected to highly influential nodes will have a higher eigenvector centrality, even if it has fewer connections.

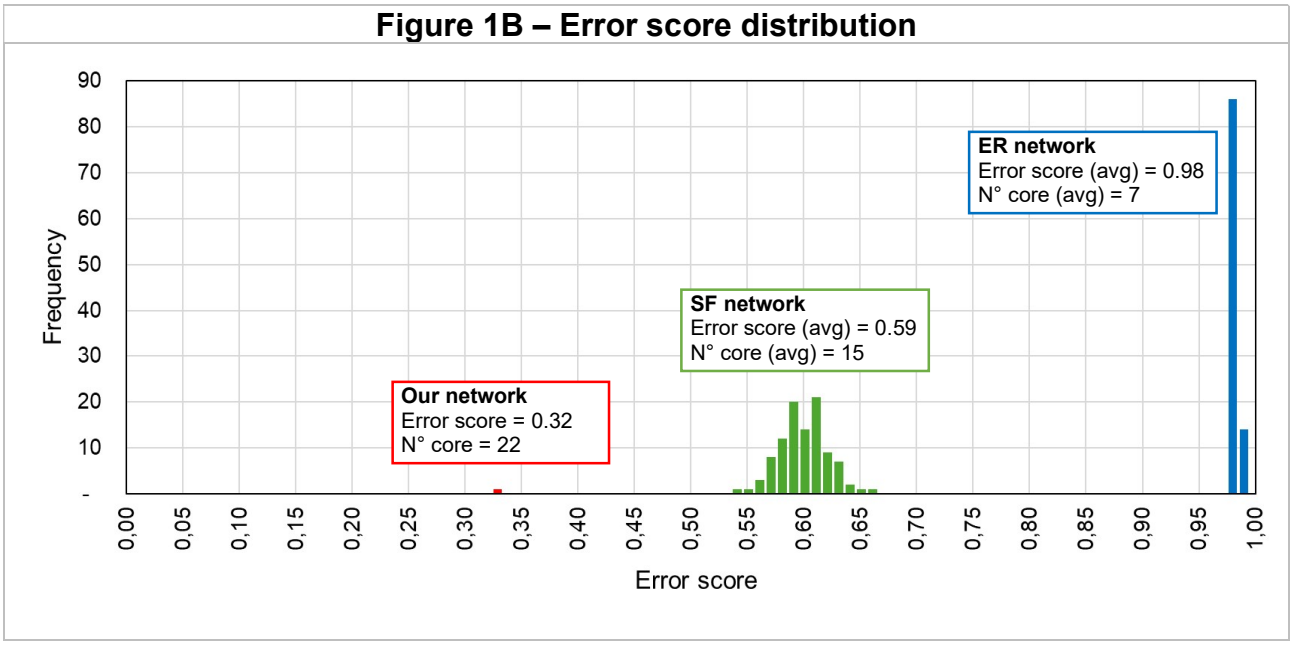
Appendix B

To test the significance of the error score, we create a Monte Carlo distribution by generating 200 random networks of the same size as ours (855 nodes and 2,661 links), using two different processes:[51]

- 100 Erdős–Rényi (ER) random graphs, generated by connecting each pair of nodes with a fixed and independent probability *p*, which corresponds to the graph's density;
- 100 scale-free (SF) networks, following the Barabási–Albert model, where the probability of a connection between nodes is proportional to their degree (*preferential attachment*); this structure is common in many financial networks.

Then, we compute the error score for each random network, obtaining an empirical distribution (Figure 1B). For ER random networks, the average number of core nodes is 7 with error scores highly concentrated around the mean of 0.979 (with a minimum of 0.974). By contrast, for SF networks the average error score is 0.595 (minimum 0.533) and the core nodes are, on average, 15. Thus, for both structures, we reject the hypothesis of the presence of a core-periphery, since the value of the error score is close to unity. Our value (0.325), instead, is well below the minimum of the simulated distribution, confirming that the non-centrally cleared euro area repo market can be described by a core-periphery model.

Figure 1B – Error score distribution



[51] Zinilli (2025).

Appendix C

Table 1C – Network historical metrics

Month	Number of nodes	Number of links	Average degree	Density	Number of core nodes	Error score
2023 - 01	801	2,118	2.64	0.33%	20	0.28
2023 - 02	858	2,233	2.60	0.30%	21	0.29
2023 - 03	874	2,326	2.66	0.30%	22	0.29
2023 - 04	842	2,299	2.73	0.32%	21	0.30
2023 - 05	1,021	2,502	2.45	0.24%	22	0.36
2023 - 06	855	2,382	2.79	0.33%	22	0.30
2023 - 07	856	2,379	2.78	0.33%	22	0.30
2023 - 08	1,162	2,663	2.29	0.20%	23	0.37
2023 - 09	865	2,353	2.72	0.31%	22	0.29
2023 - 10	860	2,406	2.80	0.33%	22	0.29
2023 - 11	861	2,386	2.77	0.32%	23	0.29
2023 - 12	834	2,287	2.74	0.33%	22	0.28
2024 - 01	851	2,404	2.82	0.33%	22	0.30
2024 - 02	844	2,456	2.91	0.35%	23	0.30
2024 - 03	753	2,241	2.98	0.40%	23	0.25
2024 - 04	821	2,461	3.00	0.37%	24	0.28
2024 - 05	1,008	2,676	2.65	0.26%	24	0.33
2024 - 06	858	2,533	2.95	0.34%	24	0.30
2024 - 07	866	2,543	2.94	0.34%	24	0.30
2024 - 08	898	2,593	2.89	0.32%	24	0.32
2024 - 09	900	2,589	2.88	0.32%	23	0.32
2024 - 10	898	2,615	2.91	0.32%	23	0.31
2024 - 11	876	2,601	2.97	0.34%	23	0.31
2024 - 12	864	2,542	2.94	0.34%	22	0.30
2025 - 01	831	2,467	2.97	0.36%	22	0.29
2025 - 02	866	2,555	2.95	0.34%	23	0.29
2025 - 03	859	2,581	3.00	0.35%	23	0.30
2025 - 04	866	2,619	3.02	0.35%	23	0.29
2025 - 05	868	2,606	3.00	0.35%	23	0.30
2025 - 06	874	2,621	3.00	0.34%	24	0.31
2025 - 07	904	2,653	2.93	0.32%	23	0.30
2025 - 08	923	2,690	2.91	0.32%	23	0.31
2025 - 09	906	2,686	2.96	0.33%	22	0.32
2025 - 10	907	2,698	2.97	0.33%	22	0.32
2025 - 11	869	2,644	3.04	0.35%	22	0.32
2025 - 12	855	2,661	3.11	0.36%	22	0.32

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