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The use of the Eurosystem's
monetary policy instruments and its
monetary policy implementation
framework in 2022 and 2023

No 355

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Abstract

The Eurosystem implements its monetary policy through a set of monetary policy instruments (MPIs). The period covered by this report (2022-23) was dominated by high inflation, which led to a change from an easing to a tightening monetary policy environment in line with the mandate of the European Central Bank (ECB) to pursue price stability. This report focuses on the accompanying shift in the use of MPIs. Key ECB interest rates were hiked to an unprecedented extent and at exceptional speed, leading to an exit from negative interest rates. This was accompanied by a gradual phasing-out of reinvestments under the asset purchase programmes, revisions to the conditions of targeted longer-term refinancing operations (TLTROs) and their subsequent substantial early repayments, and a phasing-out of pandemic collateral easing measures. This report discusses these developments and provides a full overview of the Eurosystem's monetary policy implementation from 2022-23.

JEL: D02, E43, E58, E65, G01

Keywords: monetary policy implementation, refinancing operations, asset purchase programmes, central bank counterparty framework, central bank collateral framework, central bank liquidity management, non-standard monetary policy measures

Non-technical summary

This paper provides a comprehensive overview of the Eurosystem's MPIs from 2022-23 and continues the series on this topic started in 2012.¹ As the review period was dominated by high inflation and a consequent shift from an easing to a tightening monetary policy environment, the report focuses on four main themes related to the monetary policy tightening.

First, the ECB hiked its key interest rates for the first time in more than 11 years, and at an unprecedented pace. Interest rates were raised a total of ten times, leading to a cumulative increase of 450 basis points within 14 months (July 2022 to September 2023). The deposit facility rate (DFR) stood at 4% in September 2023. The pass-through of policy rate hikes to unsecured money market rates was swift and complete, while the pass-through to secured money market rates was slightly slower, before improving in the second half of 2023. Chapter 2 discusses the factors behind these dynamics.

Second, the ECB started to phase out its asset purchase programmes. The Governing Council announced in December 2021 that it would discontinue net purchases of securities under the pandemic emergency purchase programme (PEPP) at the end of March 2022, and in March and December 2022 it announced a step-by-step reduction in the pace of net asset purchases and reinvestments under the asset purchase programme (APP). At the peak of its asset purchase programmes, the Eurosystem held securities for monetary policy purposes corresponding to around 38% of euro area GDP, which had declined towards 32% of euro area GDP by the end of 2023. Chapter 3 covers the normalisation of asset purchase programmes, as well as the introduction of the Transmission Protection Instrument (TPI) in July 2022.

Third, banks repaid substantial amounts of their outstanding TLTROs due to maturing TLTRO III operations and early repayments. In October 2022, the Governing Council decided to recalibrate the terms and conditions of ongoing TLTRO operations from November 2022 onwards, to ensure consistency with the broader monetary policy normalisation. Following this amendment, a wide array of banks utilised early repayment options, further contributing to a reduction in excess liquidity. At the end of 2023, €392 billion of TLTRO III was outstanding, corresponding to 17% of the initially borrowed amount. Chapter 4 goes into these developments in more detail.

Fourth, in March 2022 the ECB announced that it would gradually phase out the temporary pandemic collateral easing measures, in order to gradually restore the Eurosystem's pre-pandemic risk tolerance level and avoid cliff effects in collateral availability (as the collateral framework is the second layer of risk protection for the Eurosystem). Chapter 5 examines these developments. During the period under

¹ See Eser et al. (2012), Alvarez et al. (2017), Bock et al. (2018), Sylvestre and Coutinho (2020), and Corsi and Mudde (2022).

review, the Governing Council also decided to change the remuneration of minimum reserve requirements (MRRs) twice, which is explained further in Chapter 6. Finally, Chapter 7 describes the Eurosystem's first layer of risk protection: its counterparty framework.

Overall, the change in monetary policy direction led to a decline in the Eurosystem balance sheet. Whereas the previous report in this series covered the period of fastest growth in the balance sheet's history, 2022-23 was marked by normalisation following the end of easing. A period of stabilisation (with the balance sheet peaking at over €11 trillion in the summer of 2022), was followed by a gradual decline to almost €9.3 trillion by the end of 2023.

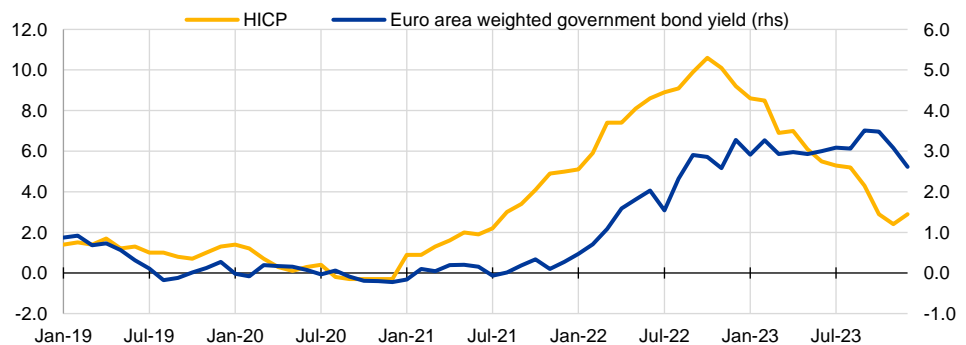
1 Introduction to the Eurosystem's MPIs in 2022 and 2023

This report focuses on the Eurosystem's monetary policy implementation in a period that was dominated by high inflation (2022-23). In line with the ECB's mandate to pursue price stability, there was a significant adjustment in monetary policy from easing to tightening. While the previous report² in this series concentrated on the ECB's response to the economic fallout from the outbreak of the COVID-19 pandemic (during 2020 and 2021), this report examines the shift in the use of MPIs against a background of inflation that was considerably higher than the ECB's target of 2% over the medium term. The combination of high inflation and monetary policy tightening led to a sharp increase in euro area bond yields (Chart 1).

Chart 1

Euro area inflation and ten-year euro area weighted government bond yields

(percentages)



Source: Bloomberg.

Notes: Government bond yields (ten-year maturity) are weighted by GDP, based on the 11 largest euro area countries. HICP = Harmonised Index of Consumer Prices.

This report will discuss the monetary policy tightening with a focus on four main themes.

- **The ECB ended the period of negative interest rates by hiking its key interest rates (interest rates on the main refinancing operations (MROs), marginal lending facility (MLF) and deposit facility (DF)), with an initial rate hike of 50 basis points in July 2022.** This was the first step in an exceptionally fast cycle of ten consecutive interest rate increases up to the end of 2023. Overall, interest rates rose by a cumulative 450 basis points within 14 months (Chart 2). At the start of the reference period (January 2022), the DFR was at a negative level of -0.50%, and it had increased to 4.00% by September 2023. Chapter 2 will discuss the policy rate increases in more depth, including the impact on money market rates. Given that rates were raised in an

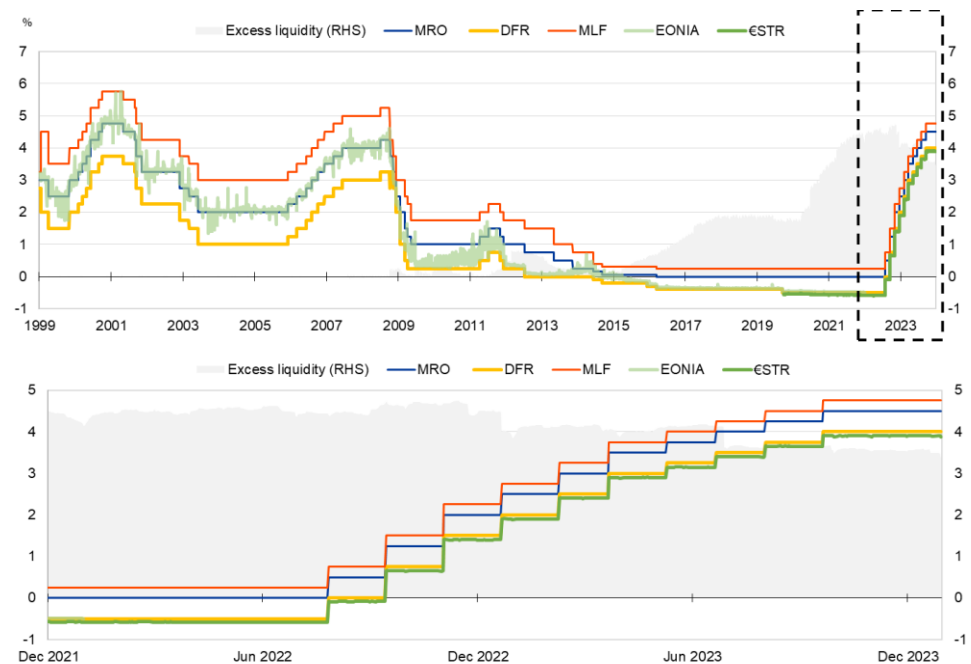
² See Corsi and Mudde (2022).

environment with high level of excess liquidity, short-term money market rates continued to trade below the DFR.

Chart 2

Developments in excess liquidity, key ECB interest rates and unsecured overnight euro area money market rates

(left-hand scale: percentages, right-hand scale: EUR trillion)



Source: ECB.

- The ECB started phasing out its asset purchase programmes.** As of the end of March 2022, net asset purchases under the PEPP were discontinued, whereas net asset purchases and reinvestments under the APP ended in July 2022 and July 2023 respectively. Chapter 3 will cover this in detail.
- There were substantial repayments of the third series of TLTROs (TLTRO III).** These resulted from maturing operations (with the biggest amount due in June 2023) and voluntary repayments. The latter were mainly driven by a recalibration of TLTRO conditions as of November 2022, which made them less favourable and reduced incentives for continued participation. Chapter 4 focuses on Eurosystem credit operations more generally, including this aspect. The phasing-out of asset purchase programmes and repayments of TLTRO III contributed to a decrease in excess liquidity (Chart 2).
- Pandemic collateral easing measures were gradually phased out.** While these were initially put in place to facilitate access to Eurosystem credit operations and increase the volume of eligible collateral, the ECB decided to phase them out in order to gradually restore the Eurosystem's pre-pandemic risk tolerance, while avoiding cliff effects in collateral availability. Chapter 5 covers developments in the Eurosystem collateral framework.

Table 1
Overview of monetary policy measures in 2022-23

December 2021	Reduction in the APP announced: Q2 2022 – €40 billion per month Q3 2022 – €30 billion per month €20 billion from October 2022 onwards (previously €20 billion since November 2019)
	Discontinuation of net asset purchases under the PEPP at the end of March 2022 Extension of reinvestment horizon for the PEPP until at least the end of 2024 (previously end of 2023)
	Final operation of TLTRO III and pandemic emergency longer-term refinancing operation (PELTRO)
March 2022	Revision of the purchase schedule for the APP: €40 billion in April €30 billion in May €20 billion in June
	Extension of the Eurosystem repo facility for central banks (EUREP) until 15 January 2023
	Announcement of phasing-out of pandemic collateral easing measures between July 2022 and March 2024
June 2022	End of the special conditions (applicable from 24 June 2021 to 23 June 2022) under TLTRO III
	Announcement of intention to raise ECB interest rates by 25 basis points in July 2022
	Ad hoc meeting on 15 June 2022: the Governing Council decides that it will apply flexibility in reinvesting redemptions coming due in the PEPP portfolio, with a view to preserving the functioning of the monetary policy transmission mechanism. It also decides to mandate the relevant committees to accelerate the design of a new anti-fragmentation instrument.
July 2022	First rate hike: the three key ECB interest rates are raised by 50 basis points (DFR to 0.00%, MRO rate to 0.50%, MLF rate to 0.75%)
	End of net asset purchases under the APP
	TPI added to Governing Council's toolkit
	Gradual phasing-out of pandemic collateral easing measures (step one of three)
September 2022	DFR to 0.75%, MRO rate to 1.25%, MLF rate to 1.50%
	Formal suspension of the two-tier system (TTS), by setting the multiple of the reserve requirements exempt from a negative DFR to zero
October 2022	DFR to 1.50%, MRO rate to 2.00%, MLF rate to 2.25%
	Recalibration of TLTRO III
	Remuneration of minimum reserves set at DFR (previously: MRO rate) as of December 2022
November 2022	Start of recalibrated terms and conditions for TLTRO III
December 2022	DFR to 2.00%, MRO rate to 2.50%, MLF rate to 2.75%
	Amendment to reinvestments under the APP as of March 2023 €15 billion on average per month until end of Q2 2023
February 2023	DFR to 2.50%, MRO rate to 3.00%, MLF rate to 3.25%
March 2023	DFR to 3.00%, MRO rate to 3.50%, MLF rate to 3.75%
	Offering of seven-day US dollar operations on a daily basis (between 20 March and 30 April)
May 2023	DFR to 3.25%, MRO rate to 3.75%, MLF rate to 4.00%
June 2023	DFR to 3.50%, MRO rate to 4.00%, MLF rate to 4.25%
	Discontinuation of reinvestments under the APP as of 1 July 2023
	Gradual phasing-out of pandemic collateral easing measures (step two of three)
July 2023	DFR to 3.75%, MRO rate to 4.25%, MLF rate to 4.50%
	Remuneration of minimum reserves set at 0% (previously: DFR) as of September 2023
September 2023	DFR to 4.00%, MRO rate to 4.50%, MLF rate to 4.75%
December 2023	Amendment to reinvestments under the PEPP: H1 2024: full reinvestments under the PEPP H2 2024: reduction of PEPP portfolio by €7.5 billion per month on average Intention to discontinue reinvestments under the PEPP at the end of 2024.

Source: ECB.

Notes: APP = asset purchase programme; PEPP = pandemic emergency purchase programme; TLTRO = targeted longer-term refinancing operations; PELTRO = pandemic emergency longer-term refinancing operations; DFR = deposit facility rate; MRO = main refinancing operations; MLF = marginal lending facility; TPI = Transmission Protection Instrument

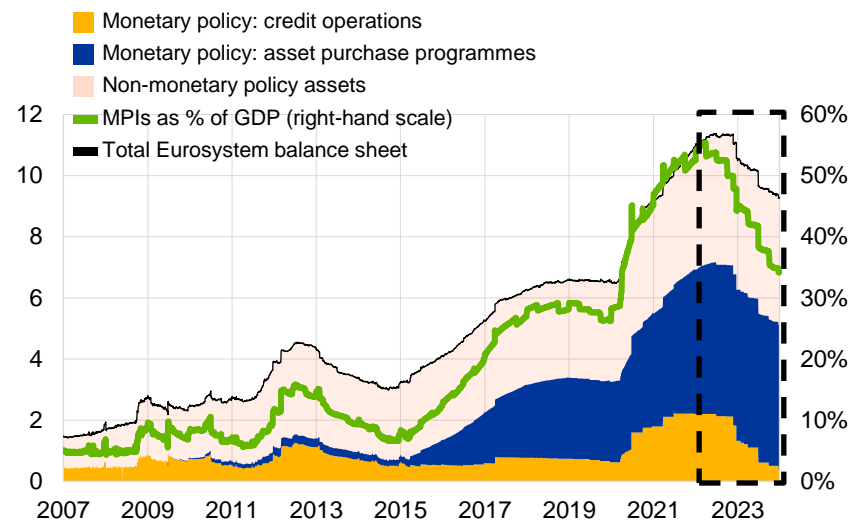
Overall, the change in monetary policy direction led to a decline in the Eurosystem balance sheet. After a period of the fastest growth in the history of the balance sheet during 2020-21, 2022-23 was marked by normalisation following the

end of easing. A period of stabilisation (with the balance sheet peaking at over €11 trillion in the summer of 2022), was followed by a gradual decline (Chart 3). The share of monetary policy assets in the Eurosystem balance sheet decreased from 81% to 74% between the fourth quarter of 2021 and the fourth quarter of 2023. On the liabilities side, the share of central bank reserves increased slightly from 50% to 51% in the period under review, as depicted in the stylised composition of the Eurosystem balance sheet (Table 2). This was just below the peak of the Eurosystem balance sheet at 52% (end of June 2022).

Chart 3
Development of the Eurosystem balance sheet

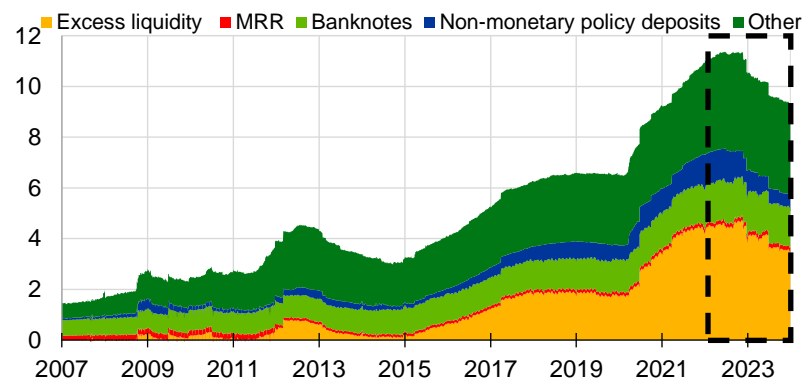
a) Eurosystem assets: how liquidity is provided

(left-hand scale: EUR billion, right-hand scale: percentages)



b) Eurosystem liabilities: how liquidity is used

(EUR billion)



Source: ECB.

Notes: Credit operations include MROs, LTROs, TLTROs and MLFs. Asset purchase programmes include covered bond purchase programmes 1 and 2, Securities Markets Programme (SMP), and APP and PEPP operations. MPIs include lending operations and outright purchases.

Table 2

Stylised composition of the accounting Eurosystem balance sheet as at end-2019, end-2021 and end-2023

ASSETS	Q4 2019	Q4 2021	Q4 2023	Peak of Eurosystem balance sheet (Q2 2022)
Securities held for monetary policy purposes	56%	55%	68%	56%
Lending to euro area credit institutions (a)	13%	26%	6%	25%
Non-monetary policy assets (b)	31%	19%	27%	19%

LIABILITIES	Q4 2019	Q4 2021	Q4 2023	Peak of Eurosystem balance sheet (Q2 2022)
Banknotes	28%	18%	23%	18%
Central bank reserves (c)	39%	50%	51%	52%
Non-monetary policy deposits	14%	17%	8%	15%
Capital and reserves and other	20%	15%	18%	15%

Source: ECB.

Notes: (a) includes refinancing operations and MLF; (b) includes FX, gold, euro-denominated own fund portfolios, emergency liquidity assistance and other; (c) includes current account, including required reserves and DF.

Given these developments, the main focus of this report will be the ECB's monetary policy normalisation and tightening, with a thorough overview of developments in the Eurosystem's monetary policy implementation framework during 2022 and 2023. After reaching record high levels, the volume of outstanding monetary policy operations (MPOs) declined during the period covered in this report (Chart 3). This report focuses on the monetary policy normalisation and therefore follows a slightly different structure from previous reports, while still highlighting the main developments in all elements of the monetary policy implementation framework. As well as discussing the hiking of policy interest rates, unwinding of asset purchase programmes, and phasing-out of TLTRO III and of collateral easing measures, the report will also cover developments in the MRRs (Chapter 6) and the counterparty framework (Chapter 7). Four boxes highlight specific elements over the review period, including measures to incorporate climate change considerations into monetary policy implementation.

2 ECB policy rates: exceptionally fast hikes in interest rates and impact on money market rates

This chapter describes how ECB monetary policy rate hikes transmitted to the euro area money markets. While pass-through to the unsecured money market was full and complete, pass-through to secured markets was sluggish in the initial phase of the hiking cycle, before improving amid an easing of collateral scarcity issues.

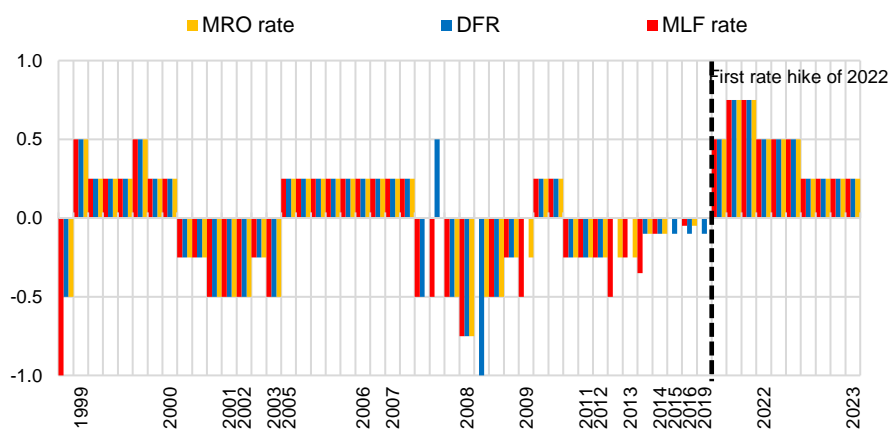
2.1 Hiking cycle and decline in excess liquidity

The ECB initiated the process of policy normalisation in 2022, gradually unwinding its accommodative monetary policy stance. Among other measures, it began a series of interest rate hikes starting in July 2022, raising the DFR from negative to positive territory by a cumulative 450 basis points by the end of 2023 (Chart 2).

The speed and scale of the consecutive rate adjustments stand out in the history of the monetary union. The DFR reached a record high of 4.00%, while the rate on the MRO climbed to its highest level since 2001 (4.5%), following ten consecutive hikes of 75, 50 or 25 basis points from July 2022 to September 2023 (Chart 4).

Chart 4
Changes in the key ECB policy rates

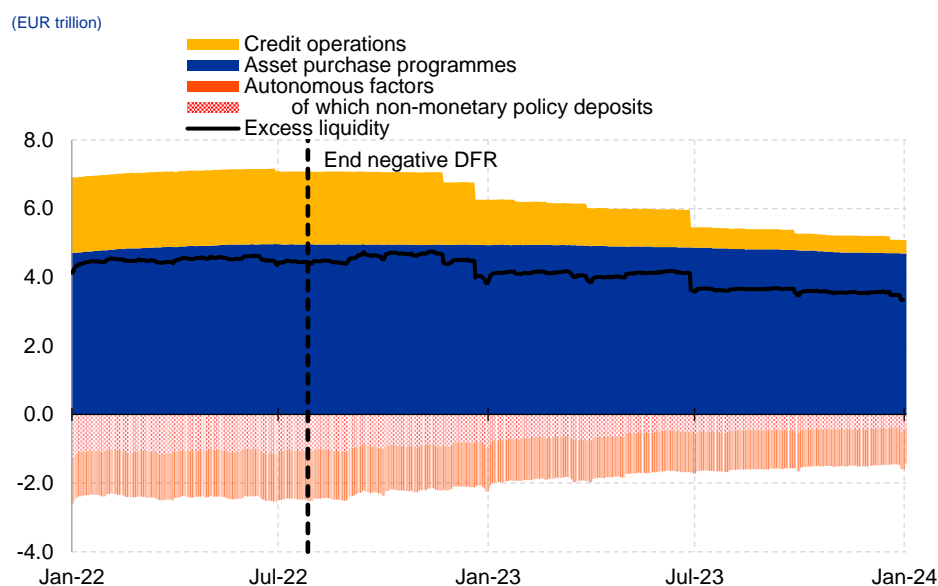
(percentage point changes)



Source: ECB.

The decline in excess liquidity did not occur in parallel with the monetary policy hiking cycle starting in July 2022. It started later, particularly from November 2022 onwards, as a result of early repayments of TLTRO borrowings (see also Chapter 4). Since July 2022, excess liquidity has declined by €1.1 trillion (Chart 5).³ The reduction in excess liquidity resulted primarily from the maturity of €1.7 trillion of Eurosystem credit operations, which had been borrowed by banks under TLTRO III. A reduction in Eurosystem securities holdings in asset purchase programmes also contributed to the decline, with redemptions that were not reinvested resulting in a €0.3 trillion decrease in excess liquidity. Conversely, the evolution of autonomous factors released €0.9 trillion of excess liquidity back into the system. This mainly reflected a gradual decline in institutional customers' non-monetary policy deposits with the Eurosystem, as those funds eventually ended up as excess liquidity at the accounts of commercial banks.⁴ Despite the contraction, the overall level of excess reserves in the system remained ample (above €3.5 trillion) throughout the entire period under review.

Chart 5
Evolution of excess liquidity and components



Source: Eurosystem calculations.

Notes: The negative DFR period ended on 27 July 2022, when it moved from -0.50% to 0%.

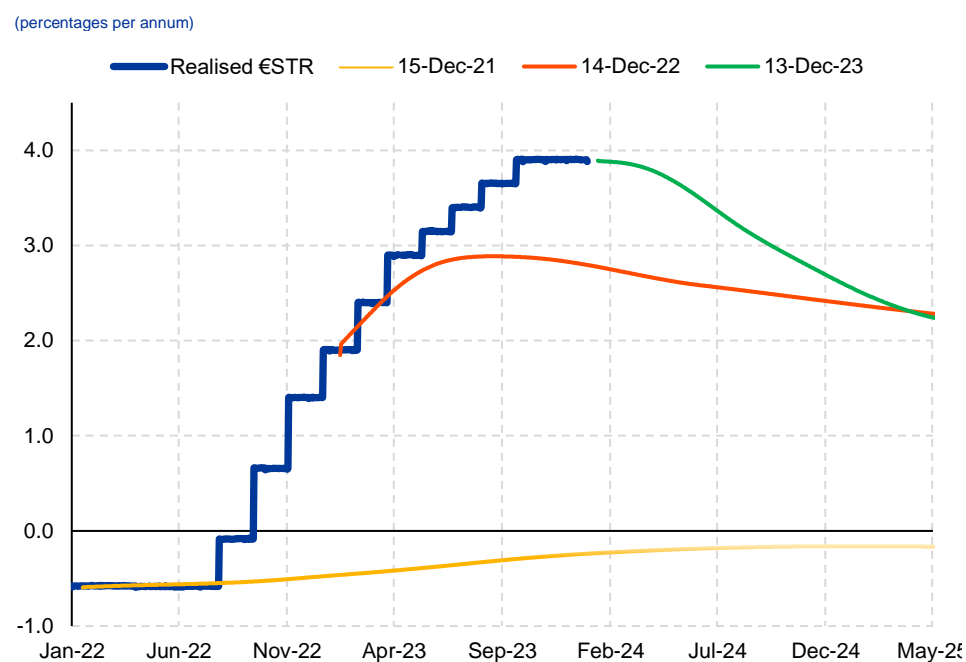
³ Excess liquidity is the money in the banking system that is left over once credit institutions have met their MRRs. More specifically, it is the sum of banks' holdings in their current account and deposit facility at the central bank minus their MRRs.

⁴ Institutional customers' non-monetary policy deposits comprise deposits of governments, foreign central banks and clients of the Eurosystem's reserve management services. When these non-monetary policy deposits decrease, autonomous factors reduce, leading to an increase in excess liquidity. The reduction in non-monetary policy deposits was driven by the return to positive interest rates, which prompted counterparties to shift their deposits to the market in search of a better return. To avoid an abrupt outflow of non-monetary policy deposits into the market, the ECB temporarily adjusted the applicable remuneration. It temporarily suspended the 0% interest rate ceiling as of September 2022 and adjusted the ceiling to a euro short-term rate (€STR) of -20 basis points in May 2023.

2.2 Money market developments

Market participants' expectations for future policy rates, as mirrored in the euro short-term rate (€STR) forward curves⁵, have reacted swiftly to the monetary policy tightening. However, market pricing initially underestimated the magnitude of the change that materialised in the review period (Chart 6). In December 2021, seven months before the start of the first interest rate hike, the €STR forward curve began to shift up, as markets priced in the start of ECB policy normalisation but at a much slower pace: the forward curve reflected an expected DFR level of 0% from early 2024. During 2022, the €STR forward curve adjusted further upwards. In December 2022, a DFR of 3% was priced in by June 2023 (shift from a yellow to an orange line in Chart 6). As the DFR reached this level earlier than anticipated by previous market pricing, the €STR forward curve repriced during 2023 to rates corresponding to a DFR of 4% (from an orange to a green line in Chart 6, reaching 4% by the end of June 2023).

Chart 6
€STR forward curves



Source: Bloomberg and ECB calculations.

Notes: The date of each forward curve refers to the day before a meeting of the Governing Council.

⁵ The €STR overnight index swap (OIS) forward curve is one way to measure market participants' interest rate expectations. It is derived from the OIS curve, i.e. contracts through which two counterparties exchange a floating interest rate for a fixed one, whereby the former is the €STR and the latter reflects the expected rate over the duration of the contract at the time of the contract. The €STR forward curve represents a benchmark for key overnight rates in the euro area.

2.2.1 Pass-through to unsecured money market rates

The transmission of the ten interest rate hikes to the overnight unsecured money market rate was swift and more or less complete in each maintenance period.⁶ The €STR moved up by nearly the same magnitude of each policy rate hike on the first day of the relevant reserve maintenance period.

While the immediate pass-through was broad-based across counterparty sectors in the wholesale unsecured market, it was less complete for some deposits, reflecting the stronger market power of banks to negotiate deposit rates with their counterparties in a context of ample liquidity (Chart 7).

Specifically, non-financial corporations (NFCs) and governments experienced the lowest immediate pass-through rate to their overnight deposits with banks, at 88%, although pass-through to most sectors improved during the remainder of the maintenance period. This lower pass-through to NFCs and governments likely results from the fact that these counterparties started to increase their short-term deposits with banks in view of new macroeconomic uncertainties (linked to commodity price volatility and inflation). In turn, banks charged them for accepting these additional overnight funds, to compensate for the balance sheet costs they incurred as a result (capital and regulatory charges, without any benefits in terms of liquidity regulation).

Since the start of the policy rate hiking cycle, longer-term unsecured money market rates have reacted more slowly to policy rate changes than the €STR: the one-week EURIBOR adjusted by 94%, while the one-month EURIBOR adjusted by 93%. This is attributable to banks seeking to negotiate lower deposit rates for tenors up to one month due to the lack of regulatory value of these funds. It is potentially also linked to relatively low turnover in longer maturities compared with overnight activity, in a context of rapid rate hikes.⁷

The spread between the €STR and DFR has remained largely unchanged at 10 basis points since November 2022, despite the decline in excess liquidity. The stability of the spread marks a deviation from the historical relationship between excess liquidity and the €STR-DFR spread when considering previous levels of excess liquidity (See Box A).

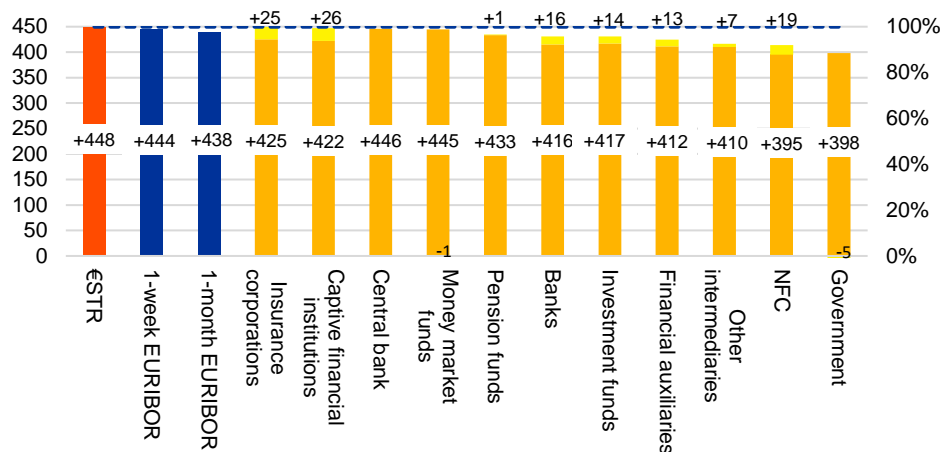
⁶ Euro area banks are required to hold a certain amount of funds in their current accounts at their national central bank (NCB). These funds are called minimum reserves, and banks' MRRs are usually set for a period of six to seven weeks, known as the "reserve maintenance period". See also the [indicative operational calendars for reserve maintenance periods](#).

⁷ The EURIBOR methodology was revised after the LIBOR scandal and is confirmed as being compliant with the [EU Benchmarks Regulation](#). The contribution made by the panel banks follows a three-level waterfall approach, including transactions from the observation period (Levels 1 and 2.2), derived or historical transactions (Levels 2.1 and 2.3), and internal models grounded on transactions from nearby markets (Level 3). As of December 2022, around 20% of the contributions underlying the six-month EURIBOR tenor (standard tenor in euro derivatives markets) were based on Level 1 and Level 2.2 pillars.

Chart 7

Transmission of policy rate hikes to unsecured money market borrowing rates for each maturity and counterparty sector

(left-hand scale: basis points; right-hand scale: percentages)



Source: Money market statistical reporting (MMSR), Bloomberg and Eurosystem calculations.

Notes: This chart shows the pass-through at two different points in time: on the first day of the maintenance period and by the end of the maintenance period (added on top or below the yellow bars). The first-day pass-through is calculated by taking the differences between the last day of the maintenance period and the first day of the following maintenance period for each of the ten policy hikes, and the results per hike are then summed up to show the cumulated difference for the ten hikes. The red bar shows overnight borrowing transactions covered by the €STR definition. The blue bars show one-week and one-month transactions covered by the EURIBOR definition. In contrast to the calculation of the overnight pass-through, the calculation for EURIBOR corresponds to the direct difference between those rates one week and one month before the start of the hiking cycle (19 July 2022 and 26 June 2022 respectively) and those rates one week and one month before the last rate hike (13 September 2023 and 21 August 2023 respectively). The rate change for depositing cash with MMSR reporting banks by counterparty sector (yellow bars) refers to borrowing transactions with overnight maturities. The light yellow parts show the change during the remainder of the maintenance periods, the amounts being indicated above or below the respective bars.

2.2.2 Pass-through to secured money market rates

In the repo market, pass-through of policy rate hikes was slower than for unsecured money market rates at the beginning of the hiking cycle in July 2022. However, pass-through eventually improved further in the second half of 2023 (Chart 8). There were two main drivers behind this, which can be distinguished for (i) repo transactions driven by a need to place cash and (ii) repo transactions driven by a need to source or fund specific collateral.

First, in the second half of 2022 (particularly in September 2022), there was an expectation that the supply of cash in the repo market would increase. This was driven by the return to positive rates and uncertainty regarding the remuneration applicable to certain non-monetary policy deposits⁸, which increased repo market participants' power to negotiate prices to accept cash in return for collateral at their

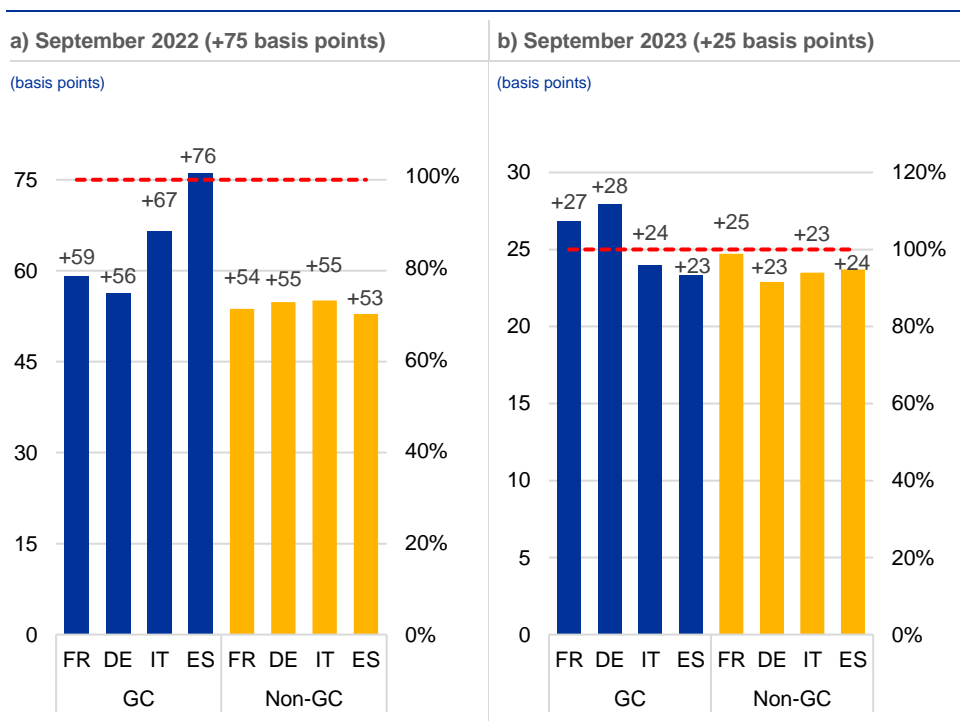
⁸ In September 2022, some counterparties temporarily reduced their non-monetary policy deposits with the Eurosystem because of uncertainty about the remuneration that would be applied to these deposits when interest rates turned positive. Non-euro area counterparties primarily exhibited this behaviour, though it did not extend to government deposits, which maintained a more stable trajectory. The reduction in deposits with the Eurosystem predominantly impacted the repo trading with general collateral that is generally used to transact with cash. The effect also varied across euro area countries, with downward pressure on repo rates being particularly larger for transactions conducted with collateral from Germany and France.

convenience. As a result, repo rates on transactions motivated by the need to place cash (general collateral repo transactions referred to as “GC repo”) experienced downward pressure in some countries, leading to a partial pass-through of rate hikes to GC repo rates. This explains why GC repo initially only adjusted by 75% and 79% for German and French collateral respectively in September 2022 (panel a of Chart 8, blue bars), although this improved over time. An immediate full pass-through was seen in September 2023 (panel b of Chart 8, blue bars).

Second, until the first half of 2023, the scarcity of certain government securities – as a result of (i) the Eurosystem’s asset holdings from asset purchase programmes and (ii) securities being mobilised as collateral by banks for their participation in TLTRO III – also exerted downward pressure on repo rates. However, collateral availability subsequently improved due to strong sovereign net debt issuance, TLTRO III repayments that facilitated the release of securities pledged as collateral with the Eurosystem and the reduction in the Eurosystem’s asset holdings (Chart 9). These factors led to a positive net supply of collateral available to the repo market in the second half of 2023, alleviating the downward pressure on repo rates. This explains why the pass-through of monetary policy rate changes to repo rates, motivated by the need to source specific collateral (non-GC repo deals), was only 71%-73% for German, French, Italian and Spanish collateral in September 2022 (panel a of Chart 8, orange bars), but rose to 92%-99% in September 2023 (panel b of Chart 8, orange bars).

Chart 8

Change in one-day repo rates for each jurisdiction since the policy rate hike decision (basis points)

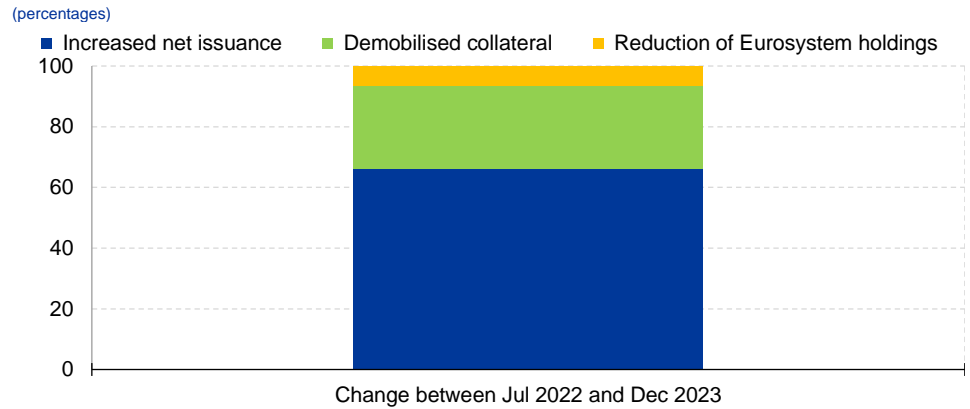


Source: BrokerTec, MTS and ECB calculations.

Notes: Repo rates capture spot-next, tom-next and overnight maturities. "GC" refers to general collateral (cash-driven repo trades), and "non-GC" refers to non-general collateral repo trades (collateral-motivated repo trades). The bars represent the changes in the average rate of trades that settled on the first day of the new monetary policy compared with the last day of the previous maintenance period.

Chart 9

Breakdown of factors contributing to availability of government bonds (since reaching the peak in the Eurosystem's balance sheet)



Source: ECB.

Notes: Chart displays the breakdown of factors contributing to the reduction of the Eurosystem footprint. It considers the change in the total nominal amount of European government bonds outstanding, Eurosystem outright holdings and mobilised collateral since July 2022. Eurosystem outright holdings refers to European government bonds held by the Eurosystem via purchase programmes, adjusted with European government bonds lent back via the securities lending against cash programme. Mobilised collateral with the Eurosystem includes European government bonds mobilised as collateral for open market operations.

Box A

The evolution of excess liquidity and its impact on the €STR

This box explores how the reduction in the Eurosystem balance sheet has affected the euro unsecured overnight money market and the €STR in particular. The decline in excess liquidity resulting from the balance sheet reduction has not disrupted the pass-through of changes in key ECB interest rates to unsecured money market rates. However, in 2023 an asymmetry emerged in the reaction of the spread between the €STR and the ECB's DFR: this spread has been less responsive to the reduction in excess liquidity compared with the earlier increase in liquidity.

Lower liquidity has not narrowed the spread between the €STR and the DFR

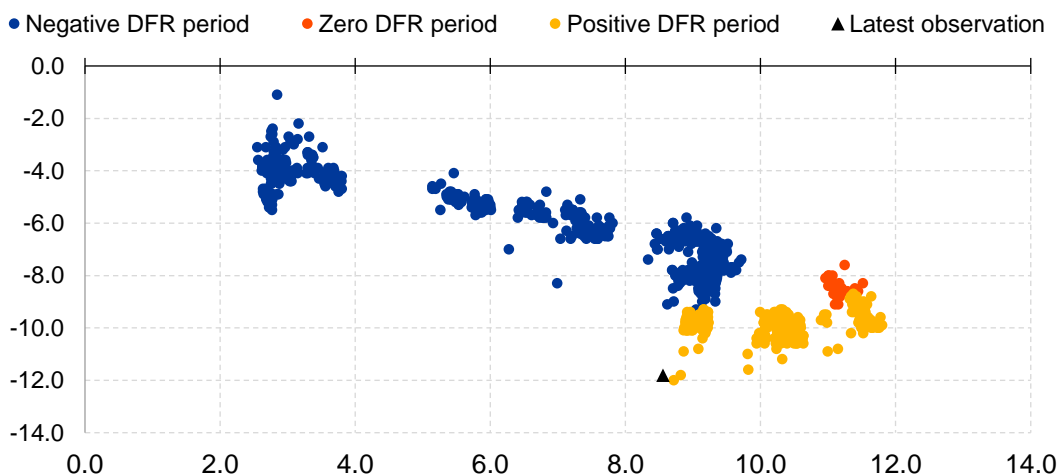
Following the first rate hike on 27 July 2022, excess liquidity declined by €1.1 trillion by the end of 2023. The relationship between the €STR and the DFR shows a historical negative pattern: the higher the level of excess liquidity, the wider the spread between the €STR and the DFR. Historical data would therefore suggest that a (significant) decline in excess liquidity should cause the spread between the €STR and the DFR to narrow.

However, the recent €1.1 trillion reduction in excess liquidity has not compressed the spread (Chart A.1): it widened during the second half of 2022 and then stabilised at around -10 basis points from November 2022 onwards.

Chart A.1

Relationship between excess liquidity as a share of total bank assets and the €STR/DFR spread

(x-axis: percentages; y-axis: basis points)



Sources: ECB (Market Operations Database), BSI, Bloomberg and Eurosystem calculations.

Notes: The excess liquidity displayed in the chart excludes liquidity that is remunerated at 0% under the TTS. Accordingly, the tiering allowance (six times the MRRs) is subtracted from the total excess liquidity level for the period between 1 October 2019 and 27 July 2022. The resulting excess liquidity is divided by the total amount of banking sector assets to control for growth of the banking sector. The negative DFR period was from 1 October 2019 to 27 July 2022. The zero-DFR period was from 27 July to 13 September 2022. The positive DFR period started on 14 September 2022, when the rate was increased from 0% to 0.75%. The latest observation refers to 29 December 2023.

Drivers

There are two main factors causing downward pressure on unsecured borrowing rates. The first is the return to positive rates and the end of the TTS (see also Chapter 6), which led to a significant reactivation of supply in the unsecured segment. While Chart A.1 takes this factor into account by correcting for the TTS, a second factor is at play: banks incur balance sheet costs when accepting

additional overnight deposits. Concurrently, these banks possess market power relative to other financial market participants who lack access to the ECB's DF but need to place their liquidity holdings with a bank. This dynamic enables banks to maintain low borrowing rates in a market where the supply of liquidity exceeds demand.

During the period of negative rates and following the introduction of the TTS in October 2019, excess liquidity effectively available for trading was lower than the headline figure for excess liquidity. This is because part of the excess liquidity held with the Eurosystem benefited from favourable remuneration at 0%, compared with money market rates around or below the DFR. With the first rate hike in July 2022 the DFR went to 0%, which meant the effective deactivation of the TTS for remuneration of excess reserves. This resulted in an additional €1 trillion of excess liquidity becoming available for trading (Chart A.2, panel a). One effect of the release of additional tradable funds was to bolster banks' trading in unsecured overnight deposits.

According to the MMSR dataset, unsecured borrowing volumes rose from a daily average of €120 billion during the negative DFR period in 2021 and 2022 to €210 billion towards the end of 2023 (with €STR volumes increasing from a daily average of €48 billion to €60 billion in that same period). This increase involved volumes from all counterparty sectors but was particularly pronounced for NFCs (which are not included in the calculation of the €STR), because they built liquidity buffers in view of macroeconomic uncertainties linked to inflation and commodity price volatility (Chart A.2, panel b). The return to positive rates and the end of the TTS therefore led to an increase in supply in the unsecured segment.

More generally, in the context of excess supply, banks benefited from greater market power in negotiating interest rates with customers, as evidenced by the greater dispersion of rates in their contributions to the calculation of the €STR, with the majority tilting the rate lower. While investors supplying funds preferred shorter-dated maturities as they expected the ECB to raise interest rates, banks had limited appetite to accept such deposits. These deposits do not provide benefits for regulatory liquidity metrics and increase regulatory costs because of the larger size of the total balance sheet. To compensate for the negative effect of these deposits on their leverage ratios, banks tend to charge a premium to depositors, contributing to a wider spread between the €STR and DFR.⁹

⁹ The leverage ratio requirement forces banks to hold additional capital when they expand their balance sheets to accommodate deposits from non-bank customers. As equity is more costly than other forms of financing, banks then transfer these extra costs to their non-bank customers. This is particularly evident around the reporting days at quarter-ends and year-ends, resulting in downward spikes in money market rates.

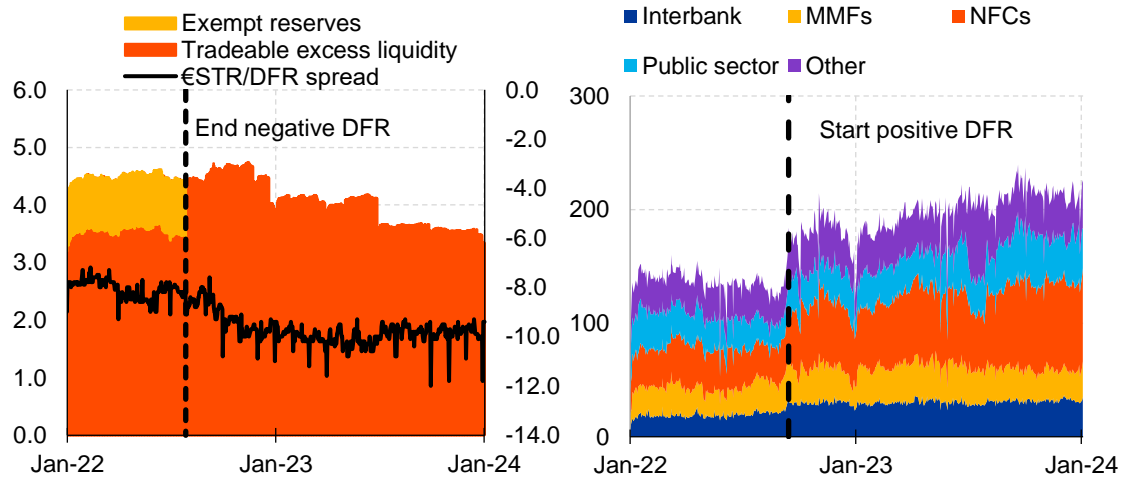
Chart A.2

Trading activity

a) Tradable excess liquidity and the €STR/DFR spread b) Unsecured borrowing by counterparty sector

(left-hand scale: EUR trillion; right-hand scale: basis points)

(EUR billion)



Sources: ECB (MMSR), Bloomberg and Eurosystem calculations.

Notes: Panel a: the negative DFR period ended on 27 July 2022, when the rate moved from -0.5% to 0%. "Exempt reserves" refers to the portion of excess liquidity exempt from negative remuneration under the TTS. Panel b: the positive DFR period started on 14 September 2022, when the rate was increased from 0% to 0.75%. The turnover reflected in the chart includes all €STR overnight deposits, deposits from NFCs, call accounts and some other residual borrowing with maturities up to one year. MMFs: money market funds; NFCs: non-financial corporations. "Other" includes investment funds (excluding MMFs), pension funds and insurance funds, and other residual sectors.

3 Asset purchase programmes: moving from net purchases to phasing-out

The Eurosystem started to purchase securities under the APP in October 2014. The purchases were initially limited to asset-backed securities and covered bonds, and acquisition of government bonds was launched in March 2015. The APP was part of a package of non-standard monetary policy measures to support the monetary policy transmission mechanism and provide the required amount of policy accommodation to ensure price stability. In March 2020, the PEPP was added as a temporary non-standard monetary policy measure to counter the serious risks to the monetary policy transmission mechanism and the outlook for the euro area price stability posed by the spread of coronavirus (COVID-19). Both the APP and the PEPP are asset purchase programmes of private and public sector securities. Over the years, the Governing Council has taken several decisions to recalibrate the pace of purchases and reinvestments, to ensure that the APP and PEPP continued to contribute to the appropriate monetary policy stance. This section covers the main steps in the gradual phasing-out of PEPP and APP purchases over the reference period, as well as the introduction of the TPI in July 2022.

3.1 Gradual phasing-out of PEPP and APP purchases

The normalisation process began when the Governing Council announced in December 2021 that it would discontinue net purchases of securities under the PEPP at the end of March 2022 (Chart 10). At the time of the announcement, monetary policy security holdings amounted to €3.12 trillion for the APP and €1.58 trillion for the PEPP (at amortised cost, Chart 11).

Chart 10

Governing Council announcement timeline for phasing-out of PEPP and APP purchases

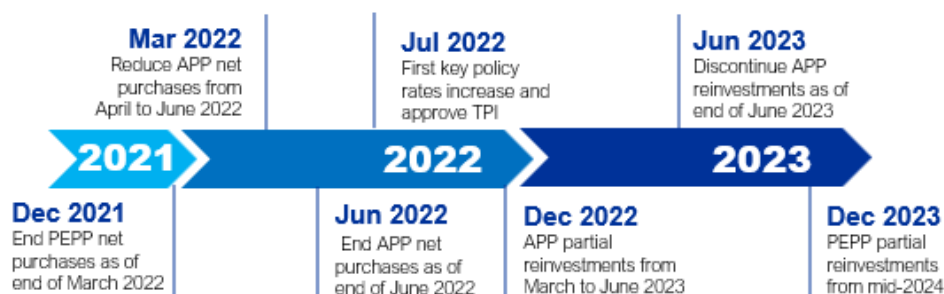
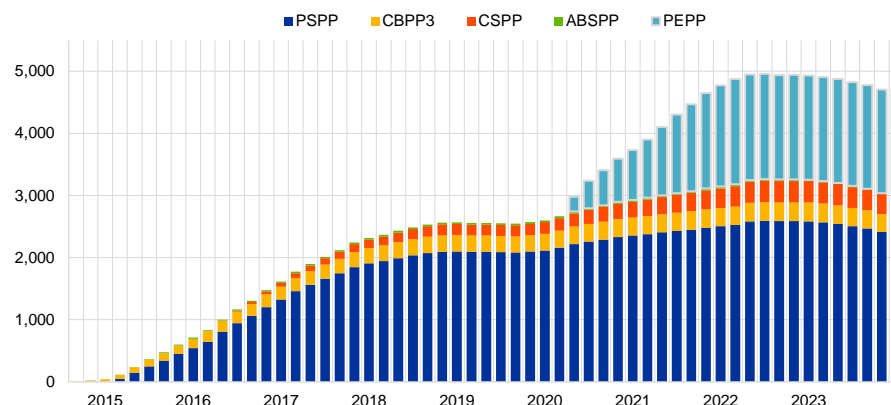


Chart 11**Eurosystem combined holdings for the APP and PEPP over time**

(EUR billion)



Source: ECB.

Note: Holding at amortised cost. Bimonthly data frequency. PSPP = public sector purchase programme; CBPP3 = third covered bond purchase programme; CSPP = corporate sector purchase programme; ABSPP = asset-backed securities purchase programme; PEPP = pandemic emergency purchase programme

With the phasing-out of net asset purchases under the PEPP, the programme had largely delivered on its dual role.¹⁰ First, together with the other components of the monetary policy framework, the PEPP purchases helped deliver the necessary monetary policy accommodation to offset the negative impact of the pandemic on (the outlook for) inflation. Second, the flexible nature of the PEPP across time, asset classes and jurisdictions helped to ensure its efficient role in stabilising the market across the entire euro area. At the same meeting (December 2021), the Governing Council extended the reinvestment horizon for the maturing principal payments from securities purchased under the PEPP until at least the end of 2024. This underpinned the role of PEPP reinvestments in safeguarding the transmission mechanism across the entire euro area, by maintaining a substantial Eurosystem presence in bond markets.¹¹

In March 2022, against the background of inflation continuing to surprise on the upside, the Governing Council announced a step-by-step reduction in the pace of its net asset purchases under the APP. APP monthly net purchases were reduced from their initially announced trajectory¹² to €40 billion in April, €30 billion in May and €20 billion in June. Afterwards, the net purchase calibration was expected to follow a data-dependent approach, reflecting the evolving assessment of the outlook. In June 2022 the Governing Council decided to cease net asset purchases under the APP as of 1 July 2022 and only reinvest (in full) the principal payment proceeds from maturing securities. This initial normalisation period resulted in an upward shift in the euro area yield curve, accompanied by an increase in volatility (Chart 12). This reflected market participants' reactions to the uncertainty surrounding the new inflation and cyclical environment as well as implications for

¹⁰ See Böninghausen et al. (2022) and Lane (2020).

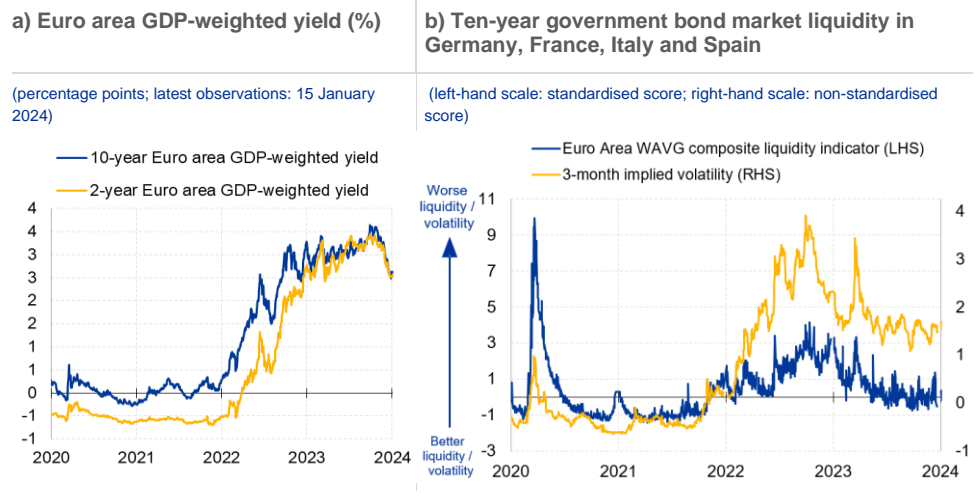
¹¹ See also the [account of the monetary policy meeting](#) of the Governing Council of the ECB in December 2021.

¹² At its December 2021 meeting, the Governing Council announced APP purchases of €40 billion in the second quarter of 2022, €30 billion in the third quarter and €20 billion from October 2022 onwards, for as long as necessary.

future monetary policy, including the exit from “lower bound” monetary policy calibration¹³ and the prospect of a reduced Eurosystem market footprint.

Chart 12

Development of euro area yields and selected market behaviour indicators



Source: ECB and Bloomberg.

Notes: Implied volatility based on three-month swaptions. Euro area liquidity indicator based on a GDP-weighted average of four composite liquidity indicators of the ten-year government bond market in Germany, France, Italy and Spain. Higher values indicate lower levels of liquidity and higher levels of volatility.

Monetary policy security holdings under the PEPP and the APP reached their peaks at the end of their net asset purchase phases (March 2022 and June 2022 respectively). At their respective peaks, PEPP holdings amounted to €1.70 trillion and APP holdings amounted to €3.26 trillion.¹⁴ At the peak at the end of March 2022, the Eurosystem held securities for monetary policy purposes corresponding to slightly below 40% of euro area GDP.

Having ended net asset purchases under both purchase programmes, the Governing Council had to decide how to proceed with ongoing reinvestments in both programmes.¹⁵ The Governing Council communicated that reinvestments under the PEPP would continue until at least the end of 2024. In the case of the APP, the Governing Council decided at its meeting in December 2022 that it should decline at a measured and predictable pace of €15 billion per month through partial reinvestment of the principal payments from maturing securities between March and June 2023. This measured and predictable pace was chosen to remain consistent

¹³ See Lane (2022).

¹⁴ All at amortised cost.

¹⁵ The normalisation of the Eurosystem’s monetary policy securities holdings (by revising reinvestment policies) was seen as a necessary complement to an ongoing increase in key ECB interest rates, signalling the Governing Council’s willingness to tighten decisively by aligning all its instruments.

with the overall monetary policy stance, preserve market functioning, and maintain firm control over short-term money market conditions.¹⁶

This period in the first half of 2023 was characterised by a deterioration in market liquidity conditions and an increase in market volatility, especially in relation to some banking stress episodes, but also as a reflection of the substantial increase in bond yields. However, as the Eurosystem maintained a continuous market presence over the partial roll-off period, the market absorbed both the start of quantitative tightening and expectations of the full roll-off of the APP very smoothly overall. In specific terms, there is evidence that a number of private sector investors stepped up their presence in euro area government bond markets during that time.¹⁷ Risks to the uniform transmission of the monetary policy stance in relation to the pandemic remained contained, owing to the flexibility in PEPP reinvestments and announcement of the TPI in July 2022 (see below).

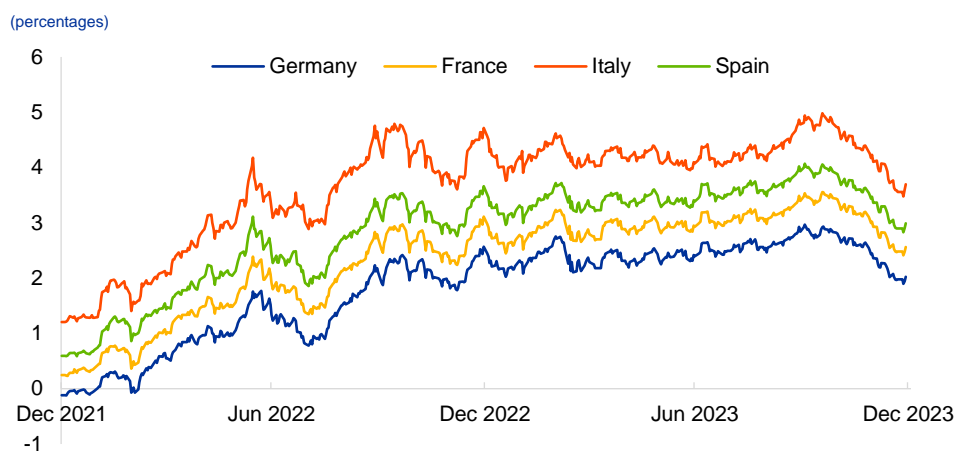
The process then continued in 2023, with the final two steps in the normalisation of the Eurosystem balance sheet. In June 2023, the Governing Council confirmed that reinvestments would be discontinued under the APP as of July 2023, allowing the APP portfolio to decrease as assets reached their maturity. In December 2023, it announced its intention to reduce the PEPP portfolio by €7.5 billion per month on average over the second half of 2024 and to discontinue reinvestments under the PEPP at the end of that year. Liquidity conditions in euro area bond markets improved from mid-2023 along with a gradual decline in volatility, and these two indicators became more closely correlated, as had been the case since 2015 except for during the pandemic (Chart 12, panel b). The smooth market absorption trend continued for the last part of the year, despite the record high net issuance of euro area government bonds in 2023 (accounting for lower Eurosystem purchases). Fragmentation concerns remained very limited, as reflected by relatively stable differences between the sovereign bond yields of different countries (Chart 13).

¹⁶ As discussed by ECB President Christine Lagarde during the [December 2022 press conference](#), the key elements were: (i) starting in early March 2023 the decline of the APP portfolio, (ii) at a “predictable and measured pace, (iii) the reduction amounting to EUR 15 bn per month on average until the end of the second quarter of 2023, and (iv) a subsequent reassessment in order to determine the appropriate pace at which to continue the process.

¹⁷ See also Ferrara et al. (2024).

Chart 13

Ten-year government bond yields of selected countries



Source: Bloomberg.

At the end of the review period, APP holdings had declined to €3.0 trillion (as reinvestments ended after June 2022), while – due to the full reinvestments – PEPP holdings remained largely unchanged at €1.7 trillion (both figures at amortised cost). Box B compares the impact of net purchases with their gradual phasing-out on risk-free interest rates in the euro area.

3.2 Introduction of the TPI

In July 2022, the Governing Council decided to introduce a new instrument as a permanent addition to the Eurosystem’s toolkit: the TPI.¹⁸ The Governing Council deemed it necessary to establish the TPI to support the effective transmission of monetary policy. The TPI aims to ensure the orderly transmission of monetary policy across the entire euro area and safeguard the singleness of monetary policy, in particular during monetary policy normalisation. It can be activated to counter unwarranted, disorderly market dynamics that pose a serious threat to the transmission of monetary policy across the euro area.

Subject to fulfilment of certain established criteria¹⁹, the Eurosystem would be able to conduct secondary market purchases of securities²⁰ issued in jurisdictions experiencing a deterioration in financing conditions not warranted by country-specific fundamentals. This would enable it to effectively counter risks to the transmission mechanism, with the extent of TPI purchases depending on the severity of the risks affecting monetary policy transmission. Purchases would not be restricted ex ante.

¹⁸ In this respect, the TPI complemented the PEPP reinvestment flexibility, which was focused on countering pandemic-related risks to transmission, and [Outright Monetary Transactions](#), which the Governing Council retains discretion to conduct for countries that fulfil the requisite criteria.

¹⁹ For more details see the corresponding [press release](#).

²⁰ TPI purchases would be focused on public sector securities (marketable debt securities issued by central and regional governments as well as agencies, as defined by the ECB) with a remaining maturity of between one and ten years. Purchases of private sector securities could be considered, if appropriate.

At the time of its announcement, the TPI was necessary to support the effective transmission of monetary policy. Two elements supported the effectiveness of the TPI²¹: its announcement acted as an immediate stabilising force, and its potential activation at any point in time would allow an active response to an emerging threat to the transmission mechanism. The instrument is therefore an effective means of pursuing the intermediate objective of safeguarding the transmission mechanism, which is a precondition of the ECB delivering on its price stability mandate. It can preserve the smooth transmission of monetary policy to an extent that could not be achieved with other instruments available to the Eurosystem, given their specific design features and purposes. In addition, the TPI's specific design features and safeguards ensure that potential side effects, such as a conflict with the monetary policy stance and other policies, are avoided.

The Governing Council may decide to activate the TPI at any specific point in time based on a comprehensive assessment of market and transmission indicators, an evaluation of the eligibility criteria and a judgement that the activation of purchases under the TPI is proportionate to the achievement of the primary objective. TPI purchases would be terminated in the event of either a durable improvement in the transmission process of the affected jurisdiction(s) or an assessment that persistent tensions were due to country fundamentals. The TPI has not been activated to date.

²¹ See also the [account of the monetary policy meeting](#) of the Governing Council of the ECB in July 2022.

Box B

(A)symmetric impact of (unwinding) asset purchases on risk-free interest rates²²

It is crucial to understand how central bank asset purchase policies influence interest rates. The downward impact of net asset purchases predominantly on longer-term interest rates is well documented in the literature²³, while evidence relating to the effect of unwinding purchases remains scant. In theory, unwinding of asset purchases is expected to have a smaller impact than net asset purchases. First, when a central bank engages in buying assets, it sends a signal about the future path of short-term rates. Unwinding purchases might not have the same signalling effect.²⁴ Second, unwinding of asset purchases starts after a prolonged period of improved market functioning, which potentially weakens its upward impact on risk-free interest rates. Third, purchases are typically unwound more slowly than they are built up. This box compares the impact of net asset purchases and their unwinding on risk-free rates in the euro area, evaluated in terms of the direction, magnitude and persistence of effects.²⁵ It shows that the impact of unwinding of asset purchases is overall smaller than the impact of net asset purchases. In addition, it confirms that the signalling effect is less important for unwinding purchases.

Comparing the effects of net asset purchases and their phasing-out

Using a statistical method, we measured the impact of balance sheet policies in the Eurosystem on risk-free interest rates (captured by overnight index swap (OIS) rates), over time.²⁶ We used daily data on the total stock of purchases under the APP and PEPP and distinguished between two time periods: net asset purchases (1 November 2019 to 30 June 2022) and unwinding of asset purchases (1 March to 20 December 2023).²⁷ Both net asset purchases and their unwinding are symmetrical in terms of the direction of their impact on risk-free interest rates, but there are differences in the magnitude and persistence of the effects. Net asset purchases lowered the two-year and ten-year OIS rates, while unwinding of purchases raised them (Chart B.1). In both cases the full impact arrived with some delay, as it took some time for asset supply and demand in the markets to adjust in reaction to central bank purchasing policies. The effect of net asset purchases

²² This box is based on an analysis by A. Samarina and F. van Loo, of De Nederlandsche Bank. The analysis presented in this box is based on developments until December 2023. Going forward, the impact may be stronger or weaker than during the period under review, depending on the circumstances.

²³ See e.g., De Santis and Holm-Hadulla (2020), Altavilla, Carboni, and Motto (2021), and Eser et al. (2023). For an overview of previous studies, see also Mudde et al. (2024).

²⁴ See Schnabel (2024). While the literature points to a strong signalling channel in the U.S. (e.g. Bauer and Rudebusch, 2014), the evidence in the euro area is mixed (e.g., Andrade et al. (2016); Altavilla, Carboni, and Motto (2021), Geiger and Schupp (2018)).

²⁵ In this box, unwinding of asset purchases refers only to letting the purchased bonds mature without reinvesting them. It does not imply bond sales.

²⁶ The box makes use of the local projections methodology, which is used to predict the future impact of a change in one variable (stock of purchases) on another variable (interest rates), by looking at historical data. It allows the effects of shocks or policies to be calculated over different time horizons. The estimated local projections model is formalised as $Y_{t+h} = \alpha_h + \beta_h \text{stock_purch}_{t-1} + \gamma_h X_t + \varepsilon_{t+h}$, where t denotes the working day; h is the projection horizon, set to 40 days; and stock_purch_{t-1} is measured as total stock of purchases (in € billion) and included with the first lag to derive the impulse responses of the dependent variable. The estimated effect can be treated akin to a daily flow effect, showing the impact of EUR 1 bn increase or decrease in stock of purchases. Y_{t+h} are the ten-year and two-year OIS rates (Chart B.1) and the term premium and expectations component of the ten-year OIS rate (Chart B.2) respectively. X_t includes the lags of the dependent and explanatory variables (bond market volatility, total stock of purchases, and daily change in total nominal amount issued), and the end-of-month dummy. The identification is based on the assumption that the total stock of purchases on a particular day is exogenous and therefore not likely to be affected by the OIS rates on the same day.

²⁷ The analysed period of net asset purchases runs from 2019 after a short reinvestment phase. This period is sufficiently long and the excess liquidity conditions are more similar to the ones during the unwinding phase, which allows for a better comparison between the two phases.

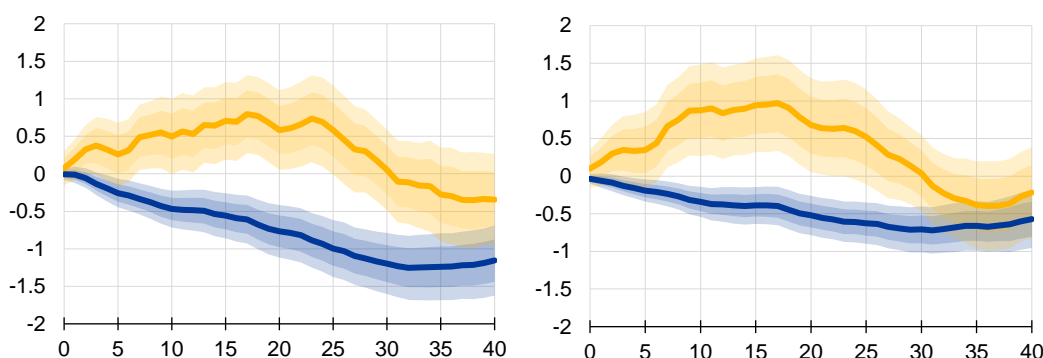
persisted for a longer period, reaching its maximum downward impact on OIS rates after around 30 days, while the effect of unwinding purchases was more short-lived – it reached its maximum upward impact on OIS rates before 20 days and vanished afterwards. The magnitude of the effects differed across long and short-term rates. An increase of €1 billion in the stock of purchases during the net asset purchases phase decreased the ten-year OIS rate by 1.25 basis points after 30 days.²⁸ In contrast, the effect of unwinding purchases was smaller: a decrease of €1 billion in the stock of purchases increased the ten-year OIS rate by 0.8 basis points after 18 days. For the two-year OIS rate, however, the maximum effect of unwinding purchases was larger. The smaller magnitude of the net asset purchases effect in this case was offset by longer persistence. If we cumulate the impact over time, it shows that the overall impact of net asset purchases is larger. This overall impact is especially relevant, as asset purchase trades are not a one-off event, but take place on a daily basis for a prolonged period.²⁹

Chart B.1

Effects of €1 billion increase (during net asset purchases phase, blue) or decrease (during unwinding phase, yellow) in total stock of purchases on OIS rates

Left panel: impulse response of ten-year OIS; right panel: impulse response of two-year OIS

(x-axis: days; y-axis: percentages)



Source: De Nederlandsche Bank calculations based on ECB and Bloomberg data.

Notes: y-axis: basis points; x-axis: days since the change in stock of purchases. The solid blue and yellow lines show the calculated effects on two-year and ten-year OIS rates of a €1 billion increase (during the net asset purchases phase) or decrease (during the unwinding phase) in total stock of purchases. The dark and light shaded areas denote the 68% and the 90% confidence intervals, respectively.

To further explain the different effects of net asset purchases and their unwinding, we decomposed the ten-year OIS rate into a term premium and an expectations component.³⁰ The term premium compensates investors for fixing interest rates for a longer period. The expectations component captures market expectations for short-term rates over the holding period of a bond. Earlier research shows that net asset purchases compressed the term premium (which turned negative at

²⁸ This effect may seem larger compared with literature (such as Albertazzi et al., 2020). This analysis only focuses on the short-term effect of flows and is hence largely a temporary effect. In addition, it should not be extrapolated by adding up the daily peak effects over a longer period. While our results for net asset purchases are in line with previous studies for the euro area, the magnitudes of the effects cannot be directly compared, plausibly due to methodological and sample differences.

²⁹ This analysis has some caveats. The results are based on the assumption of *ceteris paribus* and may not fully account for other potential factors that may influence interest rates, such as complementary measures (e.g., PEPP flexibility, TPI), state-contingency, or anticipation effects, amongst others. In addition, the use of daily data makes it difficult to consider the effects as lasting and extrapolate the results over longer horizons.

³⁰ The breakdown of the spot OIS rates into average expected rates and term premia is based on a term structure model fitted to the euro area OIS curve, based on the method of Joslin et al. (2011).

some point), due to increased demand for bonds. Following the same logic, the unwinding of asset purchases would be expected to increase the term premium. The expectations component would have an indirect impact on the signal that asset purchases give about future interest rates. This link is likely to be stronger for net asset purchases, which strengthened the signal that rates would not be raised for an extended period. The unwinding of asset purchases started after the first rate hike but gave no clear signal about the number of hikes or the peak rate.

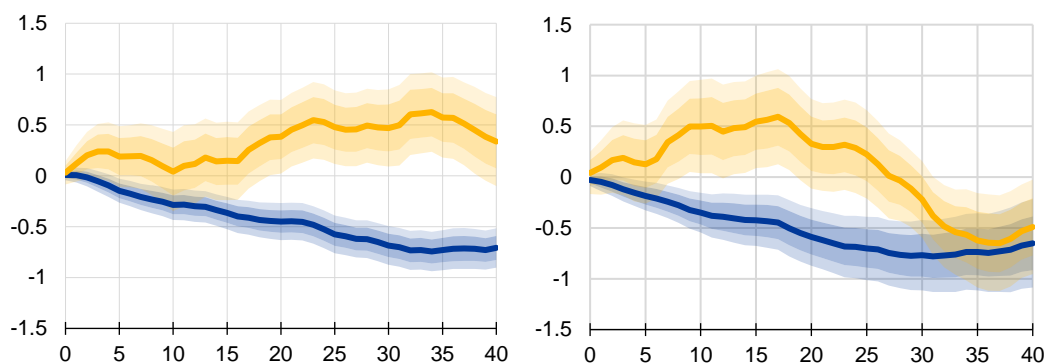
The results indicate that the ten-year term premium responded significantly to both net asset purchases and their unwinding, but in opposite directions, implying that the compensation for risk was affected in both phases (Chart B.2). This means that a change in the supply of bonds with longer maturities in the market (triggered by asset purchases) explains some of the movements we see in yields. These effects persisted in both phases and were comparable in terms of magnitude (in absolute value). Net asset purchases had a strong and lasting signalling impact – captured by a significant decline in the ten-year expectations component – as they indicated an extended period of low interest rates (combined with forward guidance). By contrast, the non-persistent effect of unwinding purchases on the expectations component suggests that they do not have a clear impact on future policy rate expectations, while they work mainly through the repricing of interest rate risk. In addition, unwinding purchases in the euro area started after some policy rate hikes had been realised, and did not contain a discernible signal regarding the path of future policy rates.³¹

Chart B.2

Effects of €1 billion increase (during net asset purchases phase, blue) or decrease (during unwinding phase, yellow) in total stock of purchases on ten-year OIS term premium and expectations component.

Left panel: impulse response of ten-year term premium; right panel: impulse response of ten-year expectations component

(x-axis: days; y-axis: percentages)



Source: De Nederlandsche Bank calculations based on ECB and Bloomberg data.

Notes: y-axis: basis points; x-axis: days since the change in stock of purchases. The solid blue and yellow lines show the calculated effects on the term premium and expectations component of the ten-year OIS rate of a €1 billion increase (during the net asset purchases phase) or decrease (during the unwinding phase) in total stock of purchases. The dark and light shaded areas denote the 68% and 90% confidence intervals, respectively.

Conclusion

This analysis provides tentative evidence of asymmetry in the effects of net asset purchases and their phasing-out in the euro area. While both balance sheet policies impact interest rates, net asset

³¹ In recent ECB communications, policy rates are considered “the primary tool for setting the monetary policy stance”, while quantitative tightening is “part of the accessory instruments” (ECB press conferences of 15 December 2022 and 2 February 2023).

purchases have a greater and more lasting impact than unwinding purchases. These insights into this terrain help us to understand the possible impact of Eurosystem asset purchasing policies.

4 Credit operations: large-scale TLTRO repayments

Credit operations are a fundamental element of the Eurosystem’s monetary policy implementation framework. The Eurosystem traditionally provides liquidity to euro area banks in regular one-week and three-month refinancing operations. From 2009 to 2021, the Eurosystem complemented its regular operations with longer-term credit operations, with TLTROs attracting the largest participation.³² By coordinating with other central banks in the swap network³³, the Eurosystem can also provide liquidity in foreign currencies. In particular, euro area banks have been able to secure regular short-term funding in US dollars from the Eurosystem since 2013. These measures, alongside asset purchase programmes, have helped to steer interest rates and manage the amount of liquidity in the financial system in recent years.

This chapter groups these credit operations into three categories.

- **The third TLTRO programme (TLTRO III)**, consisting of ten operations, which provided three-year funding to banks at an interest rate potentially below the DFR, contingent on banks meeting a predetermined lending benchmark.
- **Regular refinancing operations**, covering the MROs and LTROs, which provide one-week and three-month liquidity respectively, at the rate on MROs (or average rate on MROs, as applicable). These have been priced at 50 basis points above the DFR since September 2019. The MLF serves as an overnight liquidity backstop, and has been priced at 75 basis points above the DFR since September 2019.
- **US dollar operations** have offered euro area banks one-week US dollar liquidity since 2013.³⁴ The pricing has been the one-week US dollar OIS rate plus 25 basis points since 18 March 2020. The arrangement serves as a liquidity backstop for the smooth functioning of the foreign exchange swap segment. Central banks may decide, through coordinated action, to adjust the frequency and/or maturity of the US dollar tenders if market conditions change.

³² The ECB also offered PELTROs in 2020 and 2021, to provide an effective liquidity backstop to the euro area banking system and help preserve the smooth functioning of money markets during the extended pandemic period.

³³ The ECB is part of a swap line network of standing bilateral arrangements with five other major central banks – the Bank of Canada, Bank of Japan, Swiss National Bank, Bank of England and Federal Reserve System – that enables participating central banks to obtain currency from each other. This network of swap lines is a set of available standing facilities that provide an important backstop to ease strains in global funding markets, helping to mitigate the effects of these strains on the supply of credit to households and businesses. As of April 2020, these swap lines have been used to lend US dollars and Swiss francs to euro area banks, as well as euros to UK banks. Currently, euro area banks only demand US dollars. To improve the effectiveness of the swap lines in providing US dollar funding, the network has agreed to provide a US dollar operation with a seven-day maturity on a weekly basis since 2013.

³⁴ Operations with an 84-day maturity were available between March 2020 and July 2021.

The main developments in each of the three categories are described below (see Sections 4.1, 4.2 and 4.3). All credit operations are reverse transactions secured by ECB-eligible collateral (see Chapter 5), and are accessible to any bank meeting the counterparty criteria (see Chapter 7).

4.1 Large-scale TLTRO III repayments

The third TLTRO programme consisted of a series of ten TLTRO III operations, each with a maturity of three years, which were conducted on a quarterly basis from September 2019 to December 2021. Six of the ten TLTRO III operations matured during the period under review, including the operation that registered the highest participation of the whole series (TLTRO III.4, with a volume of €1,308 billion). Under those conditions, banks' reliance on Eurosystem funding (including MRO, MLF, LTRO and PELTRO, as well as TLTRO) markedly decreased from €2,202 billion at the beginning of January 2022 to €410 billion by the end of December 2023. Although there was a possibility of early repayment on a quarterly basis from September 2021, these early repayment options were not as extensively used³⁵, and more substantial repayments only followed after the amendments to the TLTRO conditions in October 2022.

Amendments to TLTRO III conditions during COVID-19, in combination with the interest rate hiking cycle at a later stage, incentivised banks to keep the borrowed funds even after the special interest rate periods (and until the TLTRO III conditions were recalibrated). While the programme was launched before the emergence of COVID-19, its terms were adjusted in March, April and December 2020 to support bank lending (see also the previous report).³⁶ The introduced incentives triggered high participation and encouraged banks to maintain outstanding loans to NFCs and households (compared with prior to the pandemic), with the exclusion of loans for house purchases. The pricing scheme provided banks with an incentive to keep the borrowed funds until at least the end of the special interest rate periods in June 2022, as the interest rate on TLTRO could be as low as DFR -50 basis points, i.e. -1 percentage points, at that time. As the interest rate on TLTRO III operations was indexed to the average policy rate over the life of each operation, it was also more attractive for banks to keep funds until their maturity even after the special interest rate periods had ended, in the event of an increase in interest rates (Chart 14).

In October 2022, the terms and conditions of ongoing TLTRO III operations were recalibrated to ensure consistency with the broader monetary policy normalisation process. The Governing Council decided to recalibrate the interest rate on all outstanding TLTRO III operations from 23 November 2022 until the

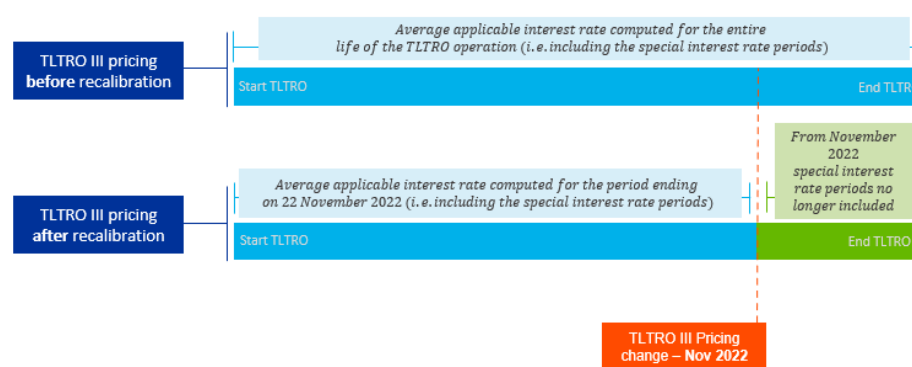
³⁵ The highest early repayments before November 2022 were made in September 2021 (€79 billion), June 2022 (€74 billion) and December 2021 (€60 billion), and were mostly used to roll over outstanding amounts into new operations with a longer residual maturity.

³⁶ See Corsi and Mudde (2022) for the previous report, or Barbiero, Boucinha and Burlon (2021).

maturity date or early repayment date of each operation, by indexing it to the average applicable key ECB interest rates over this period, rather than the average policy rate over the life of each operation (Chart 14).³⁷ The recalibration of the TLTRO III terms and conditions aimed to reinforce the transmission of policy rate increases to bank lending conditions. Alongside this modification, three additional monthly voluntary early repayment dates were introduced for banks wishing to terminate or reduce borrowings before maturity (in November 2022, January 2023 and February 2023), which contributed to repayments of outstanding TLTRO III before their maturity.³⁸

Chart 14

Recalibration of TLTRO III terms and conditions



Note: The special interest rate periods (the special interest rate period and the additional special interest rate period) applied from June 2020 to June 2021 and from June 2021 to June 2022. For more details, see also the [FAQ on TLTRO III operations](#).

Following this amendment to the conditions, a wide array of banks utilised early repayment options as of November 2022. There were substantial early repayments in November (€296 billion) and December 2022 (€447 billion)³⁹. Approximately 80% of these amounts were attributable to TLTRO III.4⁴⁰ and were due to mature in June 2023. The effective use of voluntary early repayment dates helped to smooth the concentration of mandatory repayments due to the maturity of TLTRO III.4 on 28 June 2023, reducing it from €1,308 billion to €478 billion (Chart 15). Combining TLTRO early repayments and redemptions since November 2022, a total of €1.7 trillion was paid back by the end of 2023. Given that these funds were mostly repaid from excess liquidity holdings and market funding sources, with only very marginal recourse to other Eurosystem credit operations, the repayments substantially contributed to the reduction of the Eurosystem's excess liquidity (by €1.4 trillion since mid-November 2022, when it reached a historical maximum).

³⁷ See corresponding [press release](#).

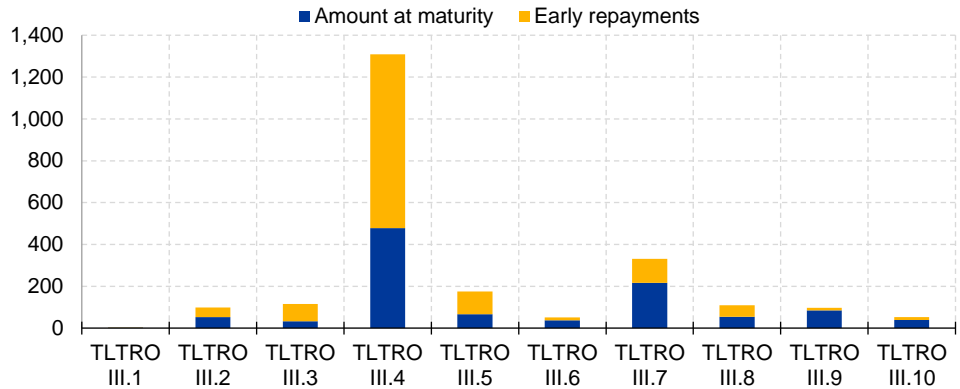
³⁸ December 2022 was already a regular, quarterly repayment option.

³⁹ In addition to the early repayment in December 2022, €52 billion of TLTRO III.2 funds also had to be repaid upon maturity.

⁴⁰ TLTRO III.4 took place just after the recalibration of TLTRO III conditions in April 2020. For more details, see the corresponding [press release](#).

Chart 15
TLTRO III repayment profile

(EUR billion)

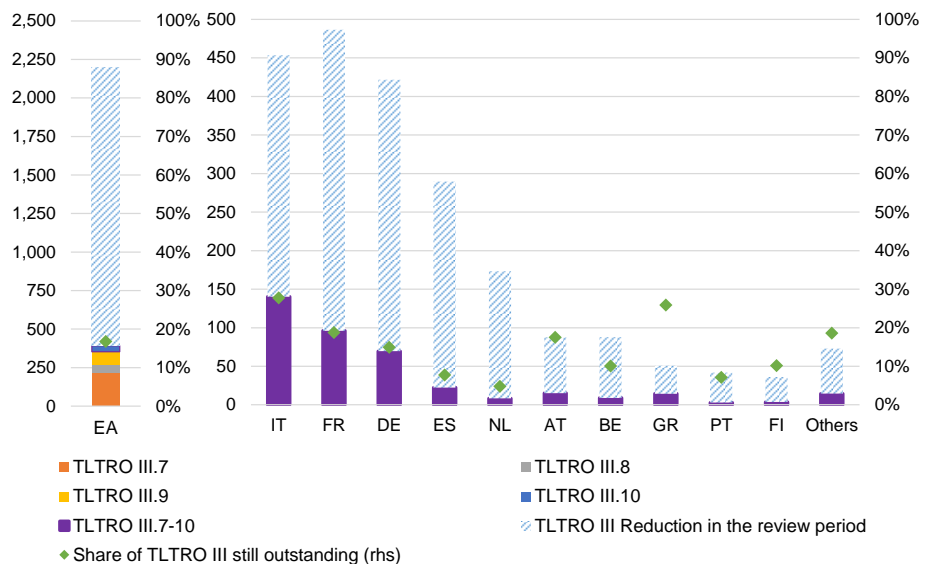


Source: Eurosystem.
Note: Snapshot date: end of December 2023.

The outstanding amounts of TLTRO III stood at €392 billion at the end of 2023, reflecting 17% of the originally borrowed amount. Outstanding amounts in December 2023 were highly concentrated in TLTRO III.7, which matured in March 2024. 77% of the outstanding amounts in December 2023 were borrowed by banks located in Italy, France, and Germany (Chart 16).

Chart 16
Evolution of TLTRO III outstanding amounts across countries

(left-hand scale: EUR billion; right-hand scale: percentages)



Source: Eurosystem.

4.2 Low use of regular refinancing operations and the MLF

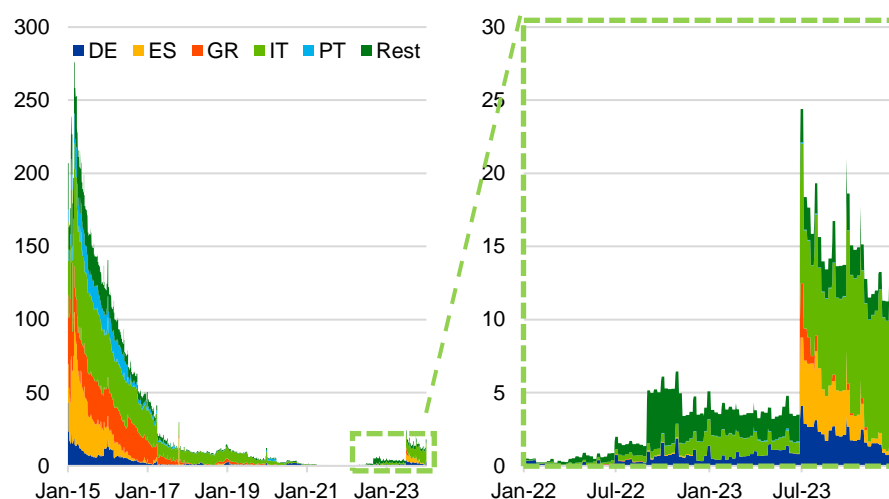
There was a slight and temporary resurgence in the use of regular refinancing operations, which mainly acted as a bridge from TLTRO III.4 to market funding.

While participation in regular refinancing operations was minimal for a long time due to the more favourable conditions offered by TLTROs and ample liquidity conditions in general, some banks returned to them in order to transition from TLTRO III to market funding. The most notable participation in regular refinancing operations took place in June 2023, coinciding with the TLTRO III.4 maturities (Chart 17). As a result, outstanding amounts climbed from €3.5 billion to €24.4 billion, their highest level since October 2017. After this, outstanding amounts from regular refinancing operations gradually decreased and stabilised at around €13 billion. The 50% decline suggests that most banks quickly found more suitable alternative funding sources or had no need for central bank liquidity and utilised the regular refinancing operations only as a transitory step.

Chart 17

Outstanding amounts from regular refinancing operations, by country

(EUR billion)



Source: Eurosystem.

A limited number of banks also had recurrent recourse to the regular refinancing operations.

There are three main factors that explain regular recourse to standard refinancing operations, either by continuously rolling over the operations when they mature or having intermittent recourse to them at month-ends or quarter-ends. First, some banks rely on these operations for fulfilment of their MRRs, because they are not active in the money market. Second, other banks participate in MROs during month-ends and in LTROs at quarter-ends, in order to improve

regulatory metrics such as the Liquidity Coverage Ratio (LCR).⁴¹ Third, some banks participate to cover for events that were not anticipated in their funding plans.

The low aggregate recourse to regular refinancing operations reflects the ample excess liquidity conditions (above €3.5 trillion over the review period) and relatively high costs of these operations compared with market funding alternatives. In this environment, many banks opted to repay the TLTRO III using their own excess liquidity, in order to reduce their individual balance sheets. Other banks opted to substitute part of the TLTRO III funding either with borrowing in the secured money market or with debt issuance at prices below the MRO rate.

Recourse to the MLF was occasional and due to unexpected outflows or idiosyncratic technical failures. The MLF allows eligible counterparties to obtain overnight liquidity at an interest rate of 25 basis points above the MRO rate (since June 2014). It is designed to cover specific liquidity shortfalls caused either by market developments or by technical issues affecting the settlement of counterparties' payments when the counterparty is not able to find alternative funding on the market or lacks the infrastructure for secured operations. Over the review period, recourse to the MLF averaged €53 million per day, which represents an increase in comparison with the daily average of €12 million in the previous review period. There was no participation in the MLF for almost one-third of the days in the review period, and use of the facility exceeded €100 million on only 74 days. Recourse to the ECB DF is discussed in Chapters 6 and 7.

4.3 Frequency adjustment of US dollar credit operations

The frequency of US dollar tenders was temporarily increased from weekly to daily in March and April 2023, triggered by higher uncertainty in financial markets following the failure of certain banks outside the euro area. Spring 2023 was marked by volatility in financial markets, with the spotlight on interest rate risk in banks' balance sheets. In response, the ECB and other major central banks came together to temporarily offer seven-day US dollar operations on a daily basis from 20 March 2023 until 30 April 2023⁴² (compared with the previous weekly frequency).

Euro area banks made limited use of the new daily operations (Chart 18).

However, participation in the regular weekly tenders temporarily increased from USD 200 million to USD 400 million in March and April 2023, although this was not comparable to the increase of USD 112 billion observed in March 2020. Given the low demand the measure was not extended, and the frequency returned to once a

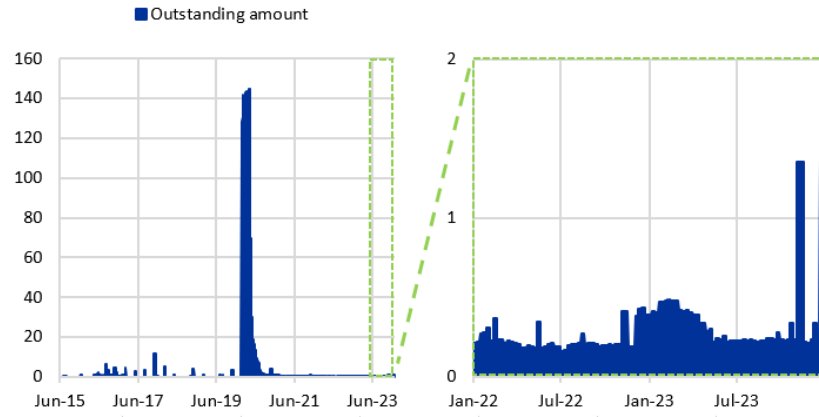
⁴¹ Under the LCR regulation, banks are required to hold an adequate stock of unencumbered high-quality liquid assets (HQLA) to meet their expected net cash outflows over a 30-day stress scenario. Commercial banks' exposures to central banks are among the HQLA treated most favourably in the LCR regulation, which means reserve accumulation is a way for banks to improve their LCR, in particular if they pledge non-HQLA as collateral. See Kedan and Veghazy (2021).

⁴² The central banks involved were the Bank of Canada, Bank of England, Bank of Japan, European Central Bank, Federal Reserve and Swiss National Bank. For more details, see the corresponding [press release](#).

week as of 1 May 2023. Since then, recourse to this facility has remained stable at around USD 200 million, with the usual quarter-end spikes (Chart 18).

Chart 18
Outstanding amounts in USD tenders

(EUR billion)



Source: Eurosystem.

5 Collateral framework

The Eurosystem collateral framework regulates collateralisation of Eurosystem credit operations and provides a second layer of protection against counterparty default (in addition to the Eurosystem’s counterparty framework; see Chapter 7).⁴³ During the period under review, the collateral easing measures introduced in response to the pandemic started to be gradually phased out.⁴⁴ In addition, the Eurosystem made the necessary adaptations to ensure the consistency of its collateral framework with the covered bond legislative package⁴⁵, made additional clarifications to the eligibility criteria applicable to sustainability-linked bonds (SLBs), and implemented the 2022 review of the risk control framework for monetary policy credit operations.

5.1 Gradual phasing-out of collateral easing measures and other framework developments

In March 2022, the ECB announced a timeline for the gradual phasing-out of the temporary pandemic collateral easing measures.⁴⁶ Having introduced these measures in April 2020, the ECB announced that they would be gradually phased out between July 2022 and March 2024, in order to restore the Eurosystem’s pre-pandemic risk tolerance while avoiding cliff effects in collateral availability. In taking its decision, the Governing Council considered (in a forward-looking manner) the impact of this gradual phasing-out on the collateral available for Eurosystem counterparties, particularly with regard to their ability to continue mobilising collateral until the maturity of the outstanding TLTRO III. The gradual phasing-out allowed ample time for the Eurosystem’s counterparties to adapt to the discontinuation of the temporary measures.

The first step was implemented on 8 July 2022. It mainly involved halving the temporary reduction in valuation haircuts across all eligible marketable and non-marketable assets from 20% to 10%. This measure accounted for approximately 40% of the total collateral generated by the set of collateral easing measures. Its halving represented a gradual restoration of the Eurosystem’s pre-pandemic risk tolerance levels. Other measures with more limited impact and scope were also phased out during this step: (i) eligibility was discontinued for marketable assets that fulfilled minimum credit quality requirements on 7 April 2020 but whose credit ratings

⁴³ For further information on how the collateral framework has been developed over the years, see Bindseil et al. (2017).

⁴⁴ For further details, see [Box 7 of the ECB Economic Bulletin, Issue 3/2022](#), prepared by Bakker et al. (2022).

⁴⁵ Directive (EU) 2019/2162 of the European Parliament and of the Council of 27 November 2019 on the issue of covered bonds and covered bond public supervision and amending Directives 2009/65/EC and 2014/59/EU (OJ L 328, 18.12.2019, p. 29–57) and Regulation (EU) 2019/2160 of the European Parliament and of the Council of 27 November 2019 amending Regulation (EU) No 575/2013 as regards exposures in the form of covered bonds (OJ L 328, 18.12.2019, p. 1–6).

⁴⁶ See corresponding [press release](#).

had subsequently fallen below the minimum acceptable rating threshold, (ii) the concentration limit for unsecured bank bonds was restored from 10% to 2.5%, and (iii) the temporary easing of certain technical requirements for the eligibility of additional credit claims (ACCs)⁴⁷ was phased out.

The second step, which was intended to fully phase out the temporary reduction in collateral valuation haircuts, took effect in June 2023. The remaining temporary reduction in valuation haircuts was halved with the implementation of a new haircut schedule resulting from the regular review of the ECB's risk control framework for credit operations.⁴⁸ This step aimed to improve the overall consistency of the risk control framework and mainly comprised an increase in valuation haircuts for marketable and non-marketable assets to return to the Eurosystem's pre-pandemic risk tolerance level.

The third and final step will be to phase out the remaining pandemic collateral easing measures. These include acceptance of various ACCs introduced during the pandemic, such as loans guaranteed by the government and certain public sector entities. This will follow a comprehensive review of the ACC frameworks and take into account banks' collateral needs in order to continue to participate in Eurosystem credit operations (including outstanding TLTRO III until December 2024). On 30 November 2023, the Governing Council approved the discontinuation of short-term debt instruments for use as collateral under the ECB Guideline on temporary collateral measures⁴⁹ as well as some specific features of the ACC frameworks.⁵⁰ At the same time, it decided to reinstate the €25,000 minimum size for domestic credit claims accepted as collateral for domestic use, and to extend the validity of ACC frameworks with their remaining features until at least the end of 2024.

Several changes were made to collateral eligibility rules during the period under review, with the aim of ensuring greater consistency between jurisdictions. Since 8 July 2022, the Eurosystem accepts as collateral only new European Economic Area covered bonds that are compliant with the Covered Bond Directive.⁵¹ The Eurosystem also further clarified the eligibility criteria for SLBs – they must have coupon structures linked to certain sustainability performance targets that relate to one or more of the environment objectives⁵² – by introducing the definitions of “SLB issuer group” and “sustainability performance target” in the General

⁴⁷ This relates mainly to a full restoring of the frequency of the ACC loan-level reporting requirements and the acceptance requirements for banks' own credit assessments from internal rating-based systems.

⁴⁸ See corresponding [press release](#).

⁴⁹ Guideline of the European Central Bank of 9 July 2014 on additional temporary measures relating to Eurosystem refinancing operations and eligibility of collateral and amending Guideline ECB/2007/9 (ECB/2014/31) (OJ L 240, 13.8.2014, p. 28–38)

⁵⁰ See [Decisions taken by the Governing Council of the ECB \(in addition to decisions setting interest rates\)](#), 30 November 2023.

⁵¹ Directive (EU) 2019/2162 of the European Parliament and of the Council of 27 November 2019 on the issue of covered bonds and covered bond public supervision and amending Directives 2009/65/EC and 2014/59/EU (OJ L 328, 18.12.2019, p. 29–57). For covered bonds issued before 8 July 2022, the General Documentation referred to the adapted provisions of the UCITS Directive. Legacy bonds therefore remained eligible if they complied with the UCITS requirements at the time of their issuance.

⁵² These objectives are set out in the EU Taxonomy Regulation (Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088) (OJ L 198, 22.6.2020, p. 13–43)) and/or the United Nations Sustainable Development Goals.

Documentation. On 20 December 2022, announcing the outcome of the most recent review of its risk control framework for collateralised credit operations, the ECB said it would implement a new valuation haircut schedule for credit operations based on its pre-pandemic risk tolerance levels. In addition, some NCBs decided to terminate their national ACC frameworks either in full (Germany and Latvia) or in part (Spain, France, Portugal and Finland) during 2022-23.⁵³

The collateral framework also benefited from changes within the Eurosystem credit assessment framework during the period under review. In 2023, the Eurosystem accepted additional credit assessment sources within the Eurosystem credit assessment framework, which is used to determine the eligibility and valuation haircuts of collateral assets for Eurosystem credit operations.⁵⁴ In April 2023, the Governing Council decided to accept the Bank of Greece's in-house credit assessment system, raising the number of accepted NCB credit assessment systems to nine. In November 2023, it also decided to accept a fifth external credit assessment institution (ECAI), Scope Ratings GmbH, following a thorough assessment of the company's application by the Eurosystem based on its acceptance criteria for ECAIs. This acceptance has several implications, including a more diversified set of credit opinions considered for monetary policy purposes.⁵⁵

5.2 Eligibility and mobilisation of collateral

Eligible marketable assets increased during the period under review, mainly due to the issuance of government securities. Between the first quarter of 2022 and the fourth quarter of 2023, eligible marketable assets increased from €16,565.5 to €18,307.5 billion. Roughly 48% of this amount was attributable to government securities (Chart 19a), which continue to represent the largest share in the eligible marketable asset universe. The remaining increase was attributable to unsecured bank bonds (24%), other marketable assets⁵⁶ (12%), covered bonds (10%), corporate bonds (4%) and asset-backed securities (1%).

While eligible marketable assets increased during the period under review, the amount of collateral mobilised in the Eurosystem decreased, mainly following the phasing-out of collateral easing measures and the maturity of the fourth TLTRO III operation in June 2023.⁵⁷ While the outstanding amount of TLTRO operations maturing in June had already been reduced due to voluntary repayments (see Chapter 4), there was still a significant amount to be repaid (€506.3 billion). This repayment was followed by a significant drop (of €292 billion) in mobilised collateral. However, two-thirds of the drop in collateral was explained by the phasing-out of the eligibility of residential real estate loans as part of the French ACC framework and

⁵³ This refers to the discontinued eligibility of residential real estate loans under the France ACC framework, discontinued eligibility of COVID-19 guaranteed credit claims under the Finland and Spain ACC frameworks, and phasing-out of short-term debt instruments under the Portugal ACC framework.

⁵⁴ For more information, see: [Eurosystem credit assessment framework](#).

⁵⁵ See Gomes and Piloju (2024).

⁵⁶ Other marketable assets include debt issued by supranational issuers and agencies.

⁵⁷ Additional TLTRO III repayments took place during the period under review, but the repayment in June 2023 stands out for its size.

the 10% reversal of the haircut reduction introduced during the pandemic (see Box C). The collateral freed up due to the repayments exceeded the collateral drop stemming from the phasing-out of the French residential real estate ACCs and the haircut reversal, so there was an overall increase in over-collateralisation.

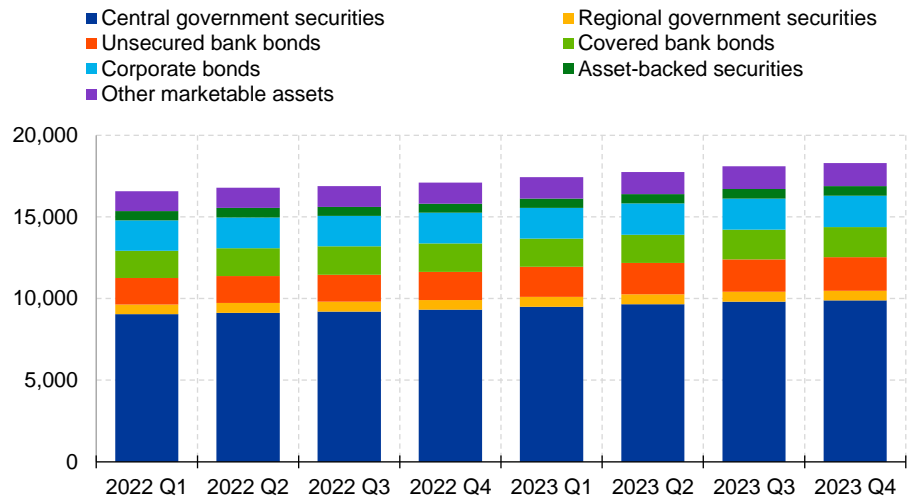
During the period under review, marketable assets represented the bulk of the decrease in mobilised collateral. However, this decrease was broadly proportional, since marketable assets have the largest share in the mobilised collateral. Mobilised collateral decreased from €2,813.9 billion in the first quarter of 2022 to €1,761.9 billion in the fourth quarter of 2023 (Chart 19b). For marketable assets, the largest decreases were recorded for government securities and covered bonds (around 29% and 24% of the overall decrease in collateral respectively). Unsecured bank bonds, asset-backed securities, corporate bonds and other marketable assets were demobilised to a lesser extent and accounted for 15% of the overall decrease in collateral. For non-marketable assets, credit claims (including additional credit claims) accounted for 32% of the overall decrease in collateral, mostly due to the phasing-out of several elements of some national ACC frameworks. The composition of the mobilised collateral remained more or less unchanged during the period under review, with marketable assets accounting for 67% and non-marketable assets for 33% both at the start of 2022 and at the end of 2023. There were some changes in the composition of marketable assets: the share of asset-backed securities in total mobilised collateral rose from 15% in the first quarter of 2022 to 20% in the fourth quarter of 2023; the share of unsecured bank bonds decreased from 5% in the first quarter of 2022 to 4% in the fourth quarter of 2023; and the share of government securities decreased from 18% in the first quarter of 2022 to 11% in the fourth quarter of 2023. These developments were mainly driven by a lower demobilisation of asset-backed securities compared with that of other collateral after refinancing operations had been repaid.

Chart 19

Eligible marketable assets and use of collateral

a) Developments in eligible marketable assets

(EUR billion)

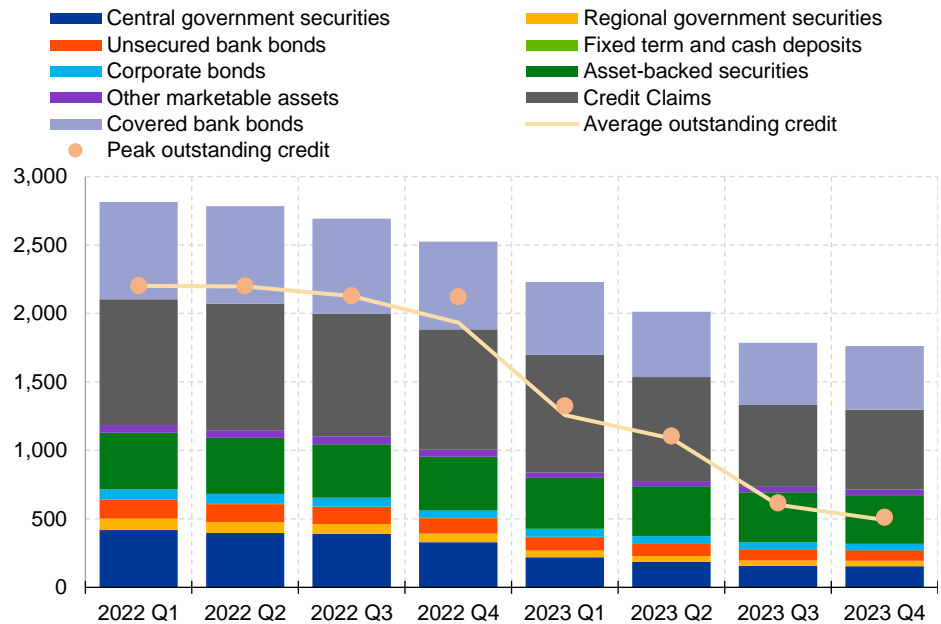


Source: ECB.

Notes: Asset values are nominal amounts. The chart shows averages of end-of-month data for each period.

b) Use of collateral and outstanding credit

(EUR billion)



Source: ECB and ECB calculations.

Note: This chart shows collateral values after haircut, as opposed to nominal amounts (in panel a).

Box C

Collateral release after TLTRO III repayments and phasing-out of collateral easing measures

On 28 June 2023, the largest remaining TLTRO III operation matured and freed up a substantial share of collateral mobilised with the Eurosystem. In the same week, some of the most prominent pandemic-related expansions of the collateral framework were reversed, reducing the value of available collateral. This box quantifies the relative strength of both factors and discusses how banks adjusted their collateral pools after the repayment of TLTRO III.4 and reversal of the pandemic collateral easing measures in June 2023.

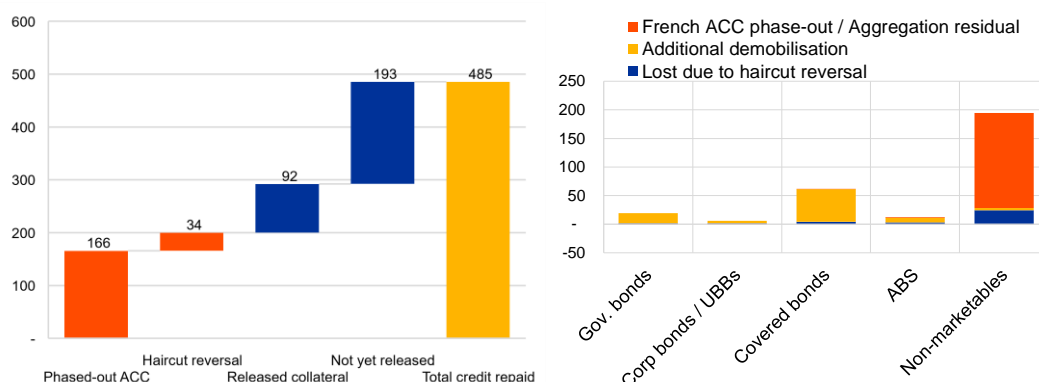
In the week following the TLTRO repayment in June 2023, mobilised collateral value fell by €292 billion to €1.82 trillion, corresponding to 60% of repaid credit. This was largely driven by the phasing-out of certain French ACCs (Chart C.1, left panel). The phasing-out of certain ACCs in France alone accounted for 57% of the drop in mobilised collateral value (€166 billion) at the end of June 2023.⁵⁸ Collateral values (after haircuts) were further reduced by the reversal of the remaining 10% haircut reduction, which was introduced during the pandemic (€34 billion: 11% of the total drop). The haircut reversal particularly affected non-marketable assets (€-24 billion), as the level of their haircuts is higher on average compared with marketable assets (Chart C.1, right panel). Overall, banks retained €193 billion of collateral, which corresponded to 40% of repaid credit. In the aftermath of the first TLTRO III repayment after the recalibration of the interest rate in November 2022, when almost €300 billion was repaid, banks retained 68% of the freed-up collateral in their pools. The lower collateral retention in June 2023 was mainly due to the collateral decline following the selective ACC phasing-outs and the haircut reduction, which mechanically reduced the amount of mobilised collateral without any active demobilisation.

Chart C.1

TLTRO III repayments in June 2023 and corresponding changes in Eurosystem collateral

Left panel: aggregate changes in collateral by source; right panel: breakdown by asset class

(EUR billion)



Notes: Changes compare the week before and after the settlement (22 vs 29 June 2023). Total credit repaid already includes the take-up in regular refinancing operations. The two red bars in the left-hand chart show the collateral "lost" due to the phasing-out of the pandemic haircut reduction and the French ACC framework. The aggregation residual in the right-hand chart arises from possible changes in the average haircut in each asset category unrelated to the phasing-out of the 10% haircut reduction between the two dates, but it is negligible.

⁵⁸ Banque de France decided to phase out the eligibility of pools of residential mortgages as part of its ACC framework, which accounted for more than 70% of French ACCs at the end of 2022.

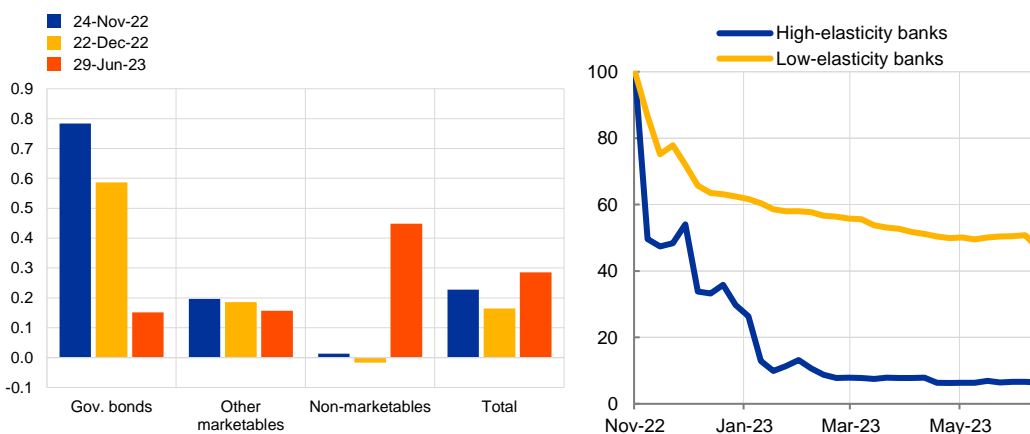
In terms of collateral breakdown, banks mainly demobilised covered bonds (€57 billion), while release of government bonds was more subdued than after the early repayments at the end of 2022. Banks actively demobilised €92 billion of collateral in the first week after the repayment in June 2023, most of which was attributable to covered bonds (62% of actively demobilised assets). However, release of government bonds (19% of actively demobilised collateral) was far more sluggish than after the November 2022 repayments, when government bonds had made up half of the released collateral following the recalibration of the TLTRO III conditions. This is illustrated by the sizable drop in the elasticity of government bond mobilisation: while in November, banks had released 0.78% of government bonds for each percent of credit repaid, this elasticity dropped to 0.15% (see Chart C.2, left panel).

Chart C.2

Elasticity of collateral after haircuts to change in credit outstanding (by repayment date)

Left panel: elasticity by asset class; right panel: mobilised government bonds depending on banks' elasticity with respect to repayments

(Left panel: elasticities; right panel: November 2022 = 100)



Notes: Changes in the left panel compare the week before and after the settlement (22 vs 29 June 2023). Elasticities refer to the percentage change of mobilised collateral to a 1% change in credit outstanding, i.e. the degree of demobilisation of collateral compared with the change in credit outstanding. The large increase in elasticity for non-marketables is due to the phasing-out of French ACCs. The right panel shows the mobilisation of central government bonds by high and low-elasticity banks since November 2022, indexed to 100 in the week before the first early repayment after the repricing in November 2022. Banks are defined as low (high) elasticity if their elasticity of government bond demobilisation with respect to credit outstanding was less (more) than 1 after the November repayment.

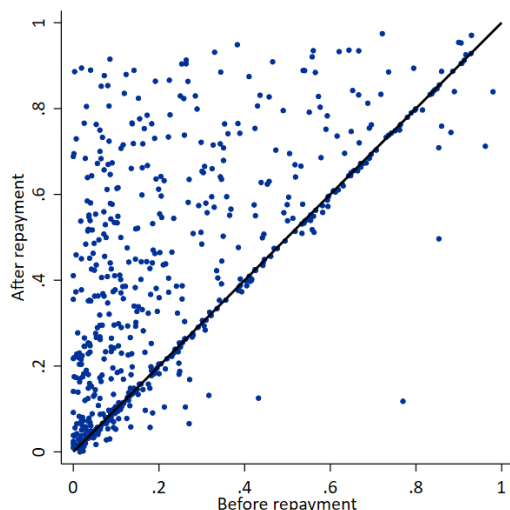
The subdued release of government bonds reflects the fact that those banks that were willing and able to demobilise their government bonds had already done so after the early repayments in 2022. Government bonds in the collateral pool have a higher opportunity cost than other eligible assets, as they can be used in repo transactions at favourable rates. Banks had therefore already demobilised a large share of their government bonds in the weeks after the early repayment in November, leaving little scope for a further release. However, this pattern differed largely across banks: banks that demobilised more than 1% of their government bonds for each percent of credit they repaid in November (“high-elasticity banks”) subsequently released almost all (93%) of their government bonds before the June 2023 repayment (see Chart C.2, right panel). In contrast, “low-elasticity banks” released only half of their government bonds up until June and released only a small share of these bonds following the repayment. Since high-elasticity banks had released most of their government bonds before the repayment, most remaining government bonds were with low-elasticity banks. This combination resulted in the low aggregate release of those bonds in June 2023.

Overall, the collateral freed up from the repayments more than offset the collateral value decline due to the phasing-out of certain French ACCs and the haircut reversal, even for the most affected banks. Chart C.3 shows the over-collateralisation across banks before and after the TLTRO III repayments in June. Most banks experienced a considerable increase in their collateral buffers due to the repayments (banks to the top-left of the 45-degree line), while only a few banks experienced a drop. However, even the banks that were most affected by the phasing-out of the French ACCs and the 10% haircut reversal – relative to their collateral pools – were able to fully offset the negative collateral impact with their TLTRO repayments. Most of these banks managed to maintain or even increase their collateral buffers without mobilising any additional collateral, and in some cases even demobilising additional assets, which indicates that they were not visibly collateral-constrained.

Chart C.3

Over-collateralisation of banks before and after repayment

(percentages)



Notes: Chart shows over-collateralisation rates before (horizontal axis) and after (vertical axis) the June repayment. Dots below the 45-degree line indicate banks whose over-collateralisation declined following the repayment and the ACC phasing-out and haircut reversal.

Box D

Climate change considerations for monetary policy implementation

In line with its commitment to include climate change considerations in its monetary policy strategy and operations, as presented in the climate action plan of 8 July 2021⁵⁹ and updated in July 2022⁶⁰ and in January 2024⁶¹, the Eurosystem took further steps in the areas of disclosure, collateral framework, risk assessment and corporate sector asset purchases during 2022-23.

In 2022, the Eurosystem announced that it would introduce climate-related disclosure requirements for collateral in Eurosystem credit operations, by way of compliance with the Corporate Sustainability Reporting Directive (CSRD)⁶², for marketable assets and credit claims from companies and debtors that are subject to this directive. The CSRD entered into force in January 2023 and the transposition deadline was 6 July 2024. Companies that fall within its scope will be required to report in a phased approach. In line with the staggered implementation of the CSRD, large companies subject to the Non-Financial Reporting Directive (NFRD)⁶³ will be the first to comply with the new requirements in their reports for the 2024 financial year, to be published in 2025. They will be followed by companies not subject to the NFRD, with their reports for the 2025 financial year published in 2026, and listed small and medium-sized enterprises (SMEs), with their reports for the 2026 financial year published in 2027. The new eligibility criteria are expected to apply as of 2026. In addition, the Eurosystem supports better and harmonised climate-related disclosures for structured products, such as covered bonds and asset-backed securities. This has been communicated in a joint statement by the European Supervisory Authorities and the ECB.⁶⁴

In 2022, the Eurosystem announced its intention to implement collateral pool concentration limits for assets issued by entities with a high carbon footprint before the end of 2024 provided that the necessary technical preconditions were in place. In July 2024,⁶⁵ the Governing Council decided not to proceed with the implementation of these limits, given that the said technical preconditions had not been fulfilled. It also mandated the development of alternative approaches to further integrate climate change considerations in the Eurosystem collateral framework. The Governing Council expects to report on the status of the work on alternative approaches in due course.

In the spectrum of the risk control framework, the Eurosystem decided to integrate climate change risk considerations into the reviews of its theoretical valuation methodologies and haircuts on a regular basis. The outcome of the first analysis showed that the current haircut calibration offers appropriate protection against climate-related financial risks. The Eurosystem will regularly review the framework and make adjustments, if warranted.

The Eurosystem also agreed to further enhance its risk assessment tools and capabilities to better include climate-related risks. On that front, the ECB has urged rating agencies to be more

⁵⁹ See corresponding [press release](#).

⁶⁰ See corresponding [press release](#).

⁶¹ See corresponding [press release](#).

⁶² Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting (OJ L 322, 16.12.2022, p. 15–80)

⁶³ Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups (OJ L 330, 15.11.2014, p. 1–9)

⁶⁴ See [Joint ESAs-ECB Statement on disclosure on climate change for structured finance products \(2023\)](#).

⁶⁵ See corresponding [Governing Council decision](#).

transparent about how climate risks are integrated into their credit assessments and more ambitious in their disclosure requirements on climate risks. The Eurosystem has also set common minimum standards for incorporating climate-related risks into the credit assessments (ratings) produced by the in-house credit assessment systems (ICASs) operated by NCBs. Currently, eight NCBs have developed an ICAS for credit quality assessment of credit claims granted to NFCs.⁶⁶ Assessment of climate change risks will be part of the regular rating process and will be conducted in order of priority, following the principle of proportionality: large corporations from high-polluting sectors, SMEs from high-polluting sectors for which firm-level data are available, other large corporations, and other SMEs for which firm-level data are available. All ICASs must abide by the agreed standards by the end of 2024.

The Eurosystem has also announced its aim to gradually decarbonise its corporate portfolios held for monetary policy purposes on path aligned with the goals of the Paris Agreement. It will achieve this by tilting purchases, in primary and secondary markets, towards issuers with a better climate performance as measured by a climate score calculated for each issuer. The neutral benchmark that guides the purchases is tilted so that issuers with a higher climate score have an increased benchmark weighting, while issuers with a low climate score have a lower weighting. Maturity limits are also imposed for issuers with lower climate scores. Finally, the tilting framework incentivises funding of the green transition by rewarding purchases of green bonds. The tilting has been applied to all corporate bond purchases settled as of October 2022. In February 2023, the ECB decided to introduce stronger tilting during the partial reinvestment phase of the APP. As of July 2023, reinvestments under the APP were discontinued. During the reinvestment phase of the PEPP – set to be discontinued at the end of 2024 – bond purchases will continue to be tilted towards issuers with a better climate performance.

In March 2023, the ECB published its first climate-related financial disclosure report⁶⁷ for the corporate sector portfolios held for monetary policy purposes (APP and PEPP). The report shows that these portfolios are on a decarbonisation path. Issuers' carbon intensities have gradually declined, reflecting their efforts to reduce their carbon footprints, and improving the climate-related metrics of the Eurosystem's corporate portfolios. In addition, the tilting framework has significantly reduced the carbon intensity of reinvestments. Disclosures for the corporate bond portfolios will be available every year and additional monetary policy portfolios will gradually be included in future disclosures.

⁶⁶ A ninth ICAS is expected for credit quality assessment of mortgage-backed promissory notes issued by credit institutions.

⁶⁷ See European Central Bank (2023).

6 Minimum reserve requirements (MRRs)

MRRs are one of the monetary policy implementation tools and are essentially reserve balances that credit institutions are required to hold with their respective NCB on average over a maintenance period. These reserve balances are determined on the basis of certain liabilities that credit institutions report prior to the start of the maintenance period and constitute the reserve base. The MRRs of each credit institution are determined by applying the reserve coefficient, currently set at 1%, on certain short-term liabilities of the reserve base.⁶⁸ Initially, the Eurosystem's minimum reserve system was set to create or enlarge the structural liquidity deficit of the euro area banking system and help steer money market interest rates in the corridor system. However, after the global financial crisis, non-standard monetary policy measures led to an increase in liquidity and there was no longer a structural liquidity deficit. As a result, the role of the MRRs has become less relevant. Nonetheless, they provided a basis for calculating the exempt tier of excess liquidity holdings for the TTS from September 2019, before the TTS was formally suspended from September 2022 onwards.⁶⁹

Traditionally, MRRs have been remunerated at the MRO rate, but two adjustments took place during the review period. First, in October 2022 the Governing Council decided to decrease MRR remuneration to the DFR (as of 21 December 2022), with the aim of aligning MRR remuneration with the rates at which funds (in excess of minimum reserves) can be invested in money market instruments, and the rates at which banks borrow funds in the money market to fulfil those minimum reserves.⁷⁰ A further adjustment to MRR remuneration was announced in July 2023, setting it to zero (as of 20 September 2023). The rationale behind this was to preserve the effectiveness of the ECB's monetary policy transmission, while improving the efficiency of monetary policy by reducing the overall amount of interest that needs to be paid on reserves in order to implement the appropriate stance.⁷¹

During the review period, the MRRs increased from €153.9 billion in January 2022 to €162.4 billion in December 2023 (5.5%).⁷² The effective date of the first remuneration adjustment marked a turning point in this upward trend. From January 2022 until December 2022 the aggregate MRRs rose by 9.4% to their peak value (€168.5 billion), from where they gradually declined (Chart 20). The aforementioned

⁶⁸ See ["How to calculate the minimum reserve requirements"](#).

⁶⁹ See ["Two-tier system for remunerating excess reserve holdings"](#). The Eurosystem introduced the TTS in September 2019, with the aim of supporting the bank-based transmission of monetary policy, while preserving the positive contribution of negative rates to the accommodative monetary policy stance and the continued sustained convergence of inflation to the ECB's aim. Following the Governing Council decision on 8 September 2022 to raise the DFR to above zero, it is no longer necessary to exempt part of credit institutions' excess reserves. The Governing Council therefore decided, on the same date, to formally suspend the TTS by setting the multiplier – the multiple of the reserve requirements exempted from a negative DFR – to zero.

⁷⁰ See ["ECB adjusts remuneration of minimum reserves" \(2022\)](#)

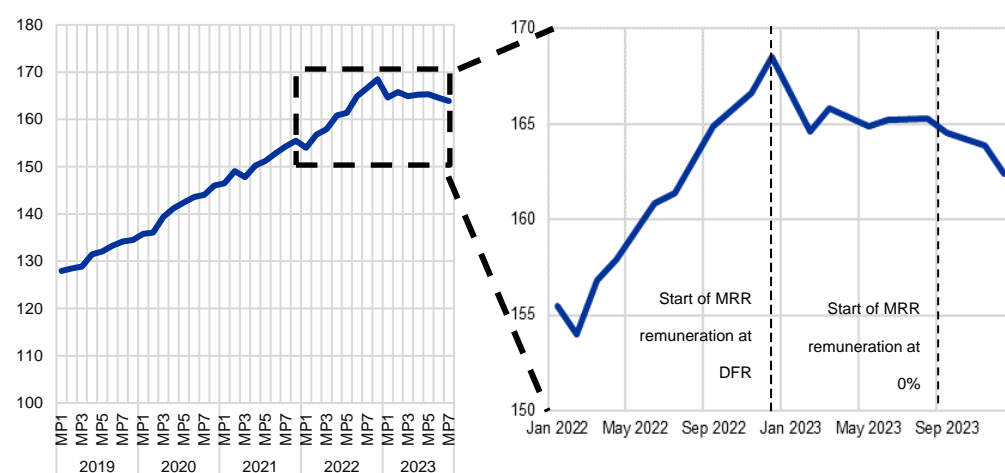
⁷¹ See ["ECB adjusts remuneration of minimum reserves" \(2023\)](#)

⁷² Based on data from MP8-2023 (eight reserve maintenance period of 2023).

fluctuations in the MRRs reflect fluctuations in banks' liabilities, on the basis of which the reserve base is determined. During the review period, the share of the MRRs compared with total excess liquidity increased by 1.1 percentage points to 4.4%, driven by a reduction in excess liquidity amid the decline in the central bank balance sheet.

Chart 20
Developments in MRRs by maintenance period

(EUR billion)



Source: ECB.

While most of the decline in the MRRs compared with their long-term trend period was driven by the extraordinary slowdown in deposit growth⁷³, it could also be partially due to the change in MRR remuneration. Since MRRs are no longer remunerated at a rate comparable to (or above) money market rates, holding MRRs now implies a cost to banks. The latest recalibration of MRR remuneration introduced a marginal cost of 4 basis points on banks' liabilities subject to reserve requirements, to which the positive reserve coefficient applies (i.e. equivalent to 1% (the reserve coefficient) multiplied by the DFR, at 400 basis points in December 2023), and persists throughout each maintenance period. Banks therefore have an incentive to reduce their reserve base, shifting away from liabilities that are subject to reserve requirements as far as possible. Alternatively, banks could absorb the cost or pass it on to short-term liabilities on reporting dates or cumulatively during the maintenance period.

At the same time, key ECB interest rates moved towards positive territory (see Chapter 2). Reserve holdings in banks' current accounts in excess of MRRs are remunerated at 0% or the DFR, whichever is lower.⁷⁴ With the DFR in positive territory, it has therefore become unattractive for banks to hold more reserves on their current accounts than needed for their MRRs: if they fulfil the necessary

⁷³ See the data on "Monetary developments in the euro area", for example from [December 2023](#).

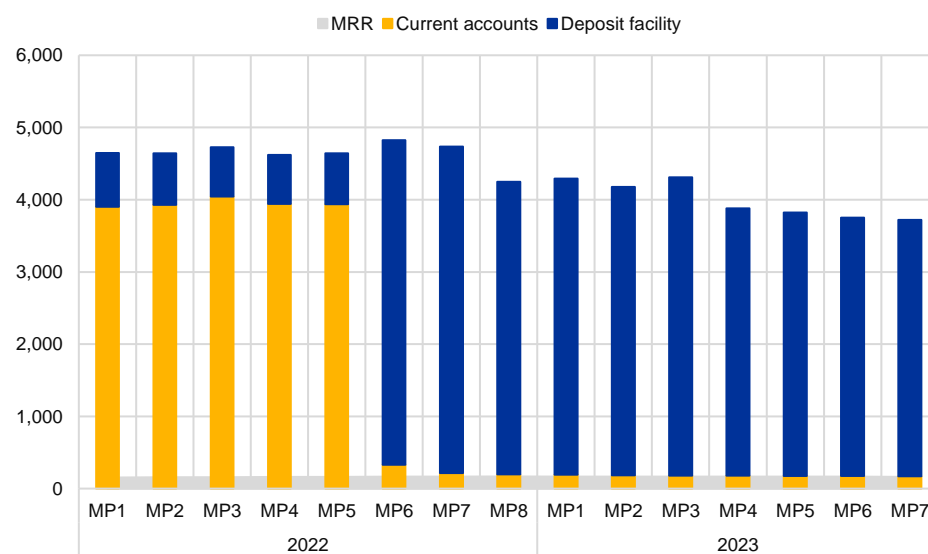
⁷⁴ Decision (EU) 2019/1743 of the European Central Bank of 15 October 2019 on the remuneration of holdings of excess reserves and of certain deposits (OJ L 267, 21.10.2019, p. 12–14).

counterparty eligibility criteria (Chapter 7) they could earn the positive DFR when transferring the money from the current account to the DF. As a result, banks redistributed their excess liquidity holdings from the current account to the DF. Before this point, MRRs represented around 4% of the total amount deposited by credit institutions in current accounts. However, their share increased to 50% just after the increase, and currently stands at 95% (Chart 21), as excess holdings were transferred to the DF and the current account holdings therefore mechanically declined. This redistribution of reserves happened at a rapid pace, at the start of the sixth maintenance period of 2022 (when the DFR turned positive), so that banks could receive the increasing DFR on their excess reserves. After the introduction of the TTS, banks acted in a similar fashion and pace but in the opposite direction, moving excess reserves to current accounts, to be able to benefit from the exempt tier.⁷⁵

Chart 21

Redistribution of balances in current accounts and deposit facility amid positive DFR

Current account (including minimum reserves) and DF by maintenance period
(EUR billion)



Source: ECB.

⁷⁵ See Corsi and Mudde (2022).

7 Counterparty framework

The counterparty framework provides criteria on the basis of which credit institutions, mainly banks, are granted access to Eurosystem MPOs.⁷⁶ The framework is designed to ensure that a broad range of counterparties are able to participate in MPOs, while protecting the Eurosystem from the risk of a counterparty defaulting.

7.1 Eligibility criteria and discretionary measures

Eligibility criteria for participation in Eurosystem MPOs did not change in the review period. To qualify as a counterparty, an institution needs to:

- (1) be subject to the Eurosystem's MRRs;
- (2) be supervised by competent authorities;
- (3) be financially sound;
- (4) fulfil the operational requirements of the local NCB to participate in MPOs.⁷⁷

The first requirement allows euro area credit institutions to have access to MPOs, fostering the transmission of monetary policy. The second and third requirements provide the Eurosystem with a first layer of risk protection (the second layer consisting of collateral; see Chapter 5). Financial soundness requires an assessment by the Eurosystem, which may take into account, as a minimum, prudential information on capital, leverage and liquidity ratios, as well as the methods used for in-kind recapitalisation when a credit institution is subject to it.⁷⁸ No major changes have been introduced since the last change of the counterparty framework in 2021.⁷⁹

7.2 Counterparty-related developments

During the reference period, the number of monetary policy eligible counterparties (MPEC) remained stable, reflecting the balance between two main factors. First, it reflects the overall decrease in the number of credit institutions overall, driven mainly by the continued consolidation of the European banking sector.

⁷⁶ Monetary policy eligible counterparties (MPECs) are defined as counterparties having access to either liquidity-providing operations and/or liquidity-absorbing operations, as well as standing facilities. Counterparties for outright purchases are not MPECs. MPECs are a subset of counterparties subject to MRRs, which decreased from 4,462 to 4,308 in the review period.

⁷⁷ Under Article 55 of the General Documentation, access to Eurosystem MPOs is granted by the relevant NCB to counterparties that fulfil eligibility criteria in line with decentralised monetary policy implementation in the euro area.

⁷⁸ See Article 55a of the General Documentation.

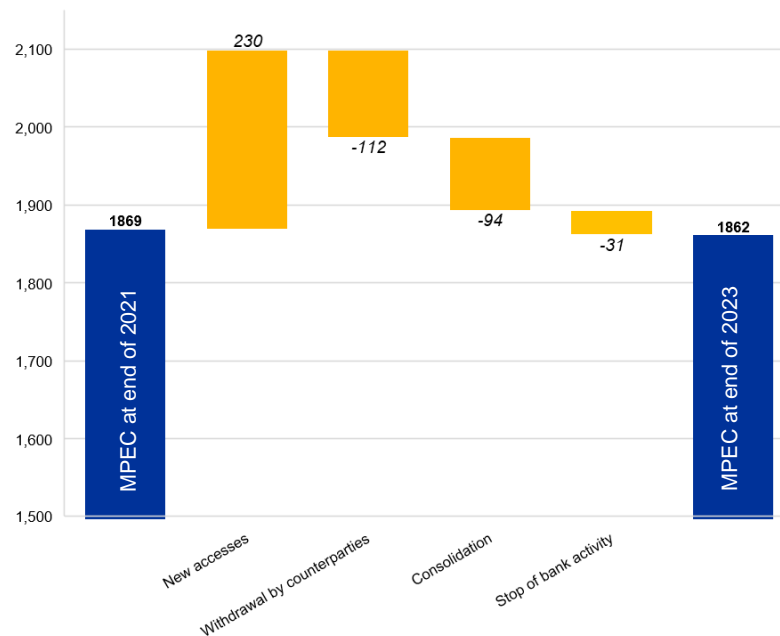
⁷⁹ The 2021 changes introduced a degree of automaticity in applying discretionary decisions by the NCBs relating to limitation, suspension and exclusion following a breach of the own funds requirements by a counterparty. The changes also aligned the rules for assessing financial soundness with the definitions under the Capital Requirements Regulation. See also Corsi and Mudde (2022).

Second, the return to positive interest rates in September 2022 increased the incentive for credit institutions to request access to the Eurosystem’s standing facilities. By the end of 2023, 1,862 of the 3,929 credit institutions in the euro area were MPECs, with a net reduction of seven counterparties compared with the end of 2021. However, despite the apparent stability in the number of MPECs, a significant number of credit institutions (237) lost their counterparty eligibility status during the period, and a similar number of institutions (230) that became eligible required access to MPOs for the first time (see Chart 22).

Chart 22
Developments in the MPEC universe in 2022-23

(Number of MPECs)

Drivers of net decrease in the number of MPECs



Source: ECB.

Notes: "New accesses" refers either to new credit institutions or credit institutions that demanded access to any Eurosystem facility in the review period. "Withdrawal by counterparties" refers to credit institutions that voluntarily withdrew from Eurosystem facilities. "Consolidation" refers to the net of merger and acquisition activity in terms of legal entities having access to Eurosystem facilities. "Stop of bank activity" refers to bank licence withdrawals, bank closures or liquidation.

The main drivers behind credit institutions losing access to MPOs were voluntary withdrawal, followed by corporate consolidation activities and the cessation of banking activity, reflecting a structural progressive consolidation of the banking sector in Europe.

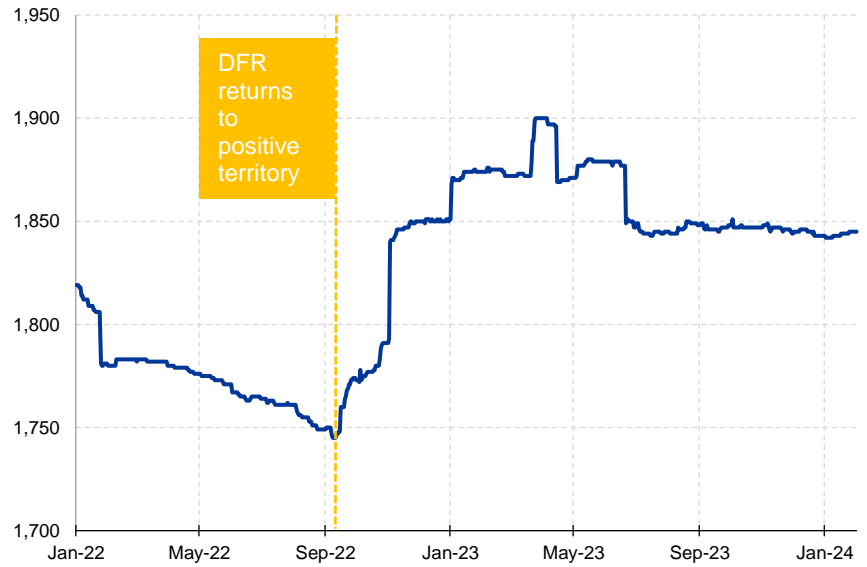
At the same time, there was a marked increase in credit institutions’ actual access to the Eurosystem’s DF over the reference period (as opposed to mere eligibility without accessing MPOs). The primary driver behind this increase was remuneration available on funds held by eligible counterparties in the DF, which returned to positive territory in September 2022. Chart 23 highlights the upward trend in credit

institutions requesting access to MPOs to take advantage of positive remuneration on the DF.

Chart 23

Upward trend in credit institutions with access to Eurosystem MPOs

(Number of MPECs)



Source: ECB.

Note: The yellow line represents the moment when the DFR returned to positive territory

References

- Albertazzi, U., Barbiero, F., Marques-Ibanez, D., Popov, A., Rodriguez D'Acri, C. and Vlassopoulos, T. (2020), "[Monetary policy and bank stability: the analytical toolbox reviewed](#)", *Working Paper Series*, No 2377, ECB, Frankfurt am Main, February (revised June 2021).
- Alvarez, I. et al. (2017), "[The use of the Eurosystem's monetary policy instruments and operational framework since 2012](#)", *Occasional Paper Series*, No 188, ECB, Frankfurt am Main, May.
- Altavilla, C., Carboni, G. and Motto, R. (2021), "[Asset Purchase Programs and Financial Markets: Lessons from the Euro Area](#)", *International Journal of Central Banking*, Vol. 17, No. 70, pp. 1-48.
- Andrade, P., Breckenfelder, J., de Fiore, F., Karadi, P. and Tristani, O. (2016), "[The ECB's asset purchase programme: an early assessment](#)", *Working Paper Series*, No. 1956, ECB, Frankfurt am Main.
- Bakker, C., Bortolussi, L., Büssing-Lörcks, M., Fudulache, A.-E., Gomes, D., Pavlova, I. and Sauer, S. (2022), "Gradual phasing-out of pandemic collateral easing measures", *Economic Bulletin*, Issue 3, ECB, Frankfurt am Main.
- Barbiero, F., Boucinha, M., and Burlon, L. (2021), "[TLTRO III and bank lending conditions](#)", *Economic Bulletin*, Issue 6, ECB, Frankfurt am Main.
- Bauer, M. D. and Rudebusch, G. D. (2014), "[The signaling channel for Federal Reserve bond purchases](#)", *International Journal of Central Banking*, Vol. 10, No. 3, pp. 233-289.
- Bindseil, U., Corsi, M., Sahel, B. and Visser, A. (2017), "[The Eurosystem collateral framework explained](#)", *Occasional Paper Series*, No 189, ECB, Frankfurt am Main, May.
- Bock, A. et al. (2018), "[The use of the Eurosystem's monetary policy instruments and its monetary policy implementation framework Q2 2016 – Q4 2017](#)", *Occasional Paper Series*, No 209, ECB, Frankfurt am Main, April.
- Böninghausen, B., Fernández Brennan, L., McCabe, L. and Schumacher, J. (2022), "[The pandemic emergency purchase programme – an initial review](#)", *Economic Bulletin*, Issue 8, ECB, Frankfurt am Main.
- Corsi, M. and Mudde, Y. (2022), "[The use of the Eurosystem's monetary policy instruments and its monetary policy implementation framework in 2020 and 2021](#)", *Occasional Paper Series*, No 304, ECB, Frankfurt am Main, September.
- De Santis, R. and Holm-Hadulla, F. (2020), "[Flow Effects of Central Bank Asset Purchases on Sovereign Bond Prices: Evidence from a Natural Experiment](#)", *Journal of Money, Credit and Banking*, Vol. 52, No. 6, pp. 1467-1491.

- Eser, F., Carmona Amaro, Iacobelli, S. and Rubens, M. (2012), “[The use of the Eurosystem’s monetary policy instruments and operational framework since 2009](#)”, *Occasional Paper Series*, No 135, ECB, Frankfurt am Main, August.
- Eser, F., Lemke, G. Nyholm, K., Radde, S. and Vladu, A. (2023), “[Tracing the Impact of the ECB’s Asset Purchase Program on the Yield curve](#)”, *International Journal of Central Banking*, Vol. 19, No. 3, pp. 359-422.
- European Central Bank (2023), [Climate-related financial disclosures of the Eurosystem’s corporate sector holdings for monetary policy purposes](#), Frankfurt am Main.
- Ferrara, F.M., Hudepohl, T., Karl, P., Linzert, T., Nguyen, B. and Vaz Cruz, L. (2024), “[Who buys bonds now? How markets deal with a smaller Eurosystem balance sheet](#)”, *The ECB Blog*, ECB, Frankfurt am Main, March.
- Geiger, F. and Schupp, F. (2018), “[With a Little Help from My Friends: Survey-Based Derivation of Euro Area Short Rate Expectations at the Effective Lower Bound.](#)” Discussion Paper No. 27, Deutsche Bundesbank.
- Gomes, D. and PiloIU, A. (2024), “[Added Scope: Eurosystem accepts a fifth rating agency](#)”, *The ECB Blog*, ECB, Frankfurt am Main, February.
- Joslin, S., Singleton, K.J. and Zhu, H. (2011), “[A New Perspective on Gaussian Dynamic Term Structure Models](#)”, *The Review of Financial Studies*, Vol. 24, No 3, pp. 926-970.
- Kedan, D. and Veghazy, A.V. (2021), “[The implications of liquidity regulation for monetary policy implementation and the central bank balance sheet size: an empirical analysis of the euro area](#)”, *Working Paper Series*, No 2515, ECB, Frankfurt am Main, January.
- Lane, P.R. (2020), “[The market stabilisation role of the pandemic emergency purchase programme](#)”, *The ECB Blog*, ECB, Frankfurt am Main, June.
- Lane, P.R. (2022), “[Monetary policy in the euro area: the next phase: Remarks for high-level panel ‘High inflation and Other Challenges for Monetary Policy’](#)” at the Annual Meeting 2022 of the Central Bank Research Association (CEBRA), Barcelona, ECB, Frankfurt am Main, August.
- Mudde, Y., Samarina, A., and Vermeulen, R. (2024), “[Spillover Effects of Sovereign Bond Purchases in the Euro Area](#)”, *International Journal of Central Banking*, Vol. 20, No 2, pp. 344-389.
- Schnabel, I. (2024), “[The benefits and costs of asset purchases](#)”, *Speech at the 2024 BOJ-IMES Conference on “Price Dynamics and Monetary Policy Challenges: Lessons Learned and Going Forward”*, Tokyo, May.
- Sylvestre, J., and Coutinho, C. (2020), “[The use of the Eurosystem’s monetary policy instruments and its monetary policy implementation framework between the first](#)

quarter of 2018 and the fourth quarter of 2019”, *Occasional Paper Series*, No 245, ECB, Frankfurt am Main, June.

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