



EUROPEAN CENTRAL BANK
EUROSYSTEM

€STR Annual Methodology Review

December 2023



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1 Introduction

The European Central Bank (ECB) launched the [euro short-term rate \(€STR\)](#) on 2 October 2019. The €STR reflects the wholesale euro unsecured overnight borrowing costs of banks located in the euro area. The rate is based entirely on [daily confidential statistical information relating to money market transactions](#) collected in compliance with the Money Market Statistical Reporting (MMSR) Regulation¹.

During the review period (1 October 2022 to 30 September 2023), there were two main developments that had a bearing on the importance and continued robustness of the €STR. First, a robust and representative benchmark was key for market participants in the context of rapid policy rate changes. The strong pass-through of policy rate changes to the benchmark shows that this was the case.

Second, with the upcoming expansion of the MMSR reporting population, which was announced in April 2023², €STR users can expect an improved representativeness of the rate, as more banks and new countries will be added to the current ones. While the new MMSR reporting banks will start reporting on 1 July 2024, the new data are planned to be integrated into the €STR calculation on 1 July 2025, once the ECB has ascertained the quality of the data and assessed the impact that integrating these new participants into the MMSR data collection will have on the rate. The public will be kept informed of the next steps and ultimately of the results of the administrator's overall assessment.

The €STR Guideline³ regulates the production of the €STR and establishes the ECB's responsibility as rate administrator. Under Article 15 of the Guideline, the administrator is required to review at least annually whether changes in the underlying market for the €STR require there to be changes made to the €STR methodology. This report therefore (i) reviews the performance of the rate and the developments in the underlying markets, and (ii) assesses whether any changes in the methodology are required so the rate better captures the underlying economic reality, namely the overnight wholesale unsecured borrowing costs of euro area banks. The assessment is an important review of the robustness of the methodological choices made in 2018, when market conditions were different.

The ability of the €STR methodology to correctly measure the defined underlying economic reality is first assessed against the three main criteria set out below.

- Rate accuracy: does the rate correctly reflect the underlying market dynamics?

1 Regulation (EU) No 1333/2014 of the European Central Bank of 26 November 2014 concerning statistics on the money markets (ECB/2014/48) (OJ L 359, 16.12.2014, p. 97)

2 See [ECB press release](#), 21 April 2023.

3 Guideline (EU) 2019/1265 of the European Central Bank of 10 July 2019 on the euro short-term rate (€STR) (ECB 2019/19) (OJ L 199, 26.7.2019, p. 8).

- Data sufficiency: is the rate built on a sufficient volume of data?
- Rate representativeness: is the rate unbiased?

This initial assessment of the methodology is then complemented by a gap analysis using MMSR data. This is to ensure that the defined scope is still adequate for measuring the underlying interest rate.

Lastly, the calibration of key parameters in the methodology is reviewed, specifically the 25% trimming level and the data sufficiency thresholds.

The report covers the period from the beginning of October 2022 to the end of September 2023.

The report is structured as follows: Section 2 reviews how the methodology performed in the reference period, analysing €STR volatility and trends in the underlying volume of transactions; Section 3 reviews the adequacy of the scope of the €STR and investigates market developments in sectors and maturities outside the current scope; Section 4 reviews the core parameters of the methodology; Section 5 concludes with a final assessment.

2 Methodology

This section looks at the development of the €STR's main metrics to assess whether the methodology proved able to deliver an adequate measure of the underlying economic reality.

2.1 Assessment of rate accuracy

During the above-mentioned review period, the €STR reflected the respective market dynamics well.

First, the €STR showed a full and immediate pass-through of the ECB policy rate changes. During the period under review, the ECB raised its three key interest rates by a total of 325 bps. Accordingly, the €STR increased from 0.66% at the beginning of October 2022 to 3.90% on 20 September 2023, when the last rate hike took effect.

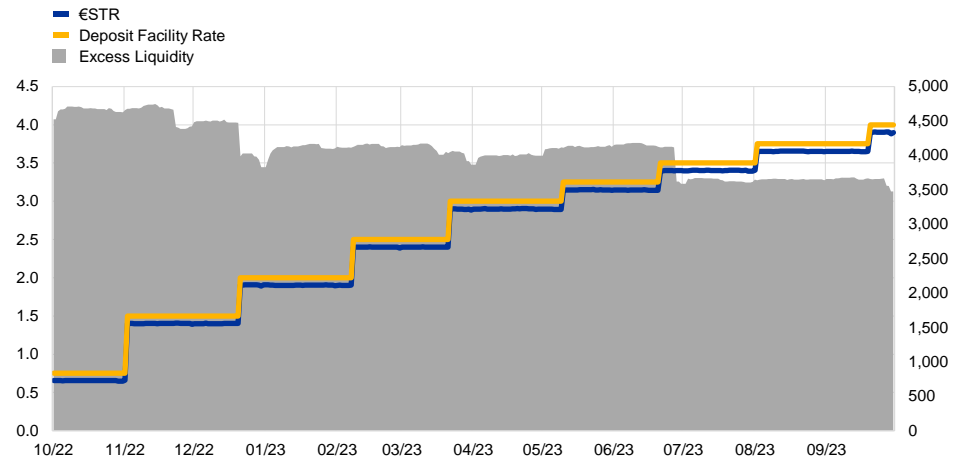
Second, given the high level of excess liquidity in the banking system, the €STR maintained a stable negative spread against the ECB's deposit facility rate (DFR). The high level of excess liquidity continued to provide an opportunity for reporting banks to apply rates below the DFR to overnight deposits from other financial institutions, especially those that do not have access to the deposit facility. As outlined in the two public consultations that supported the development of the €STR methodology,⁴ unsecured money market activity has largely shifted away from the interbank market and now encompasses transactions with a large array of other financial institutions, including money market funds (MMFs) and insurance corporations and pension funds (ICPFs). These firms do not have access to the Eurosystem deposit facility, and commercial banks therefore routinely offer them rates below the DFR, thereby covering the associated transaction and regulatory costs.

Third, the €STR was reflective of market dynamics on specific calendar days, for instance quarter-ends, when banks are more sensitive to the size of their balance sheet and tend to limit exposures, including by lowering their rates (Chart 1).

⁴ See "First ECB public consultation on developing a euro unsecured overnight interest rate", ECB, Frankfurt am Main, November 2017, and "Second public consultation on the publication by the ECB of an unsecured overnight rate", ECB, Frankfurt am Main, March 2018.

Chart 1**The €STR and the policy environment since 1 October 2022**

(left-hand scale: percentage points; right-hand scale: EUR billions)



Source: ECB calculations.

Box**The pass-through of the ECB's interest rate hikes to the €STR**

During the period under review, the ECB increased interest rates eight times, by a total of 325 basis points, which is an unprecedented pace. Overall, these rate hikes were well transmitted to the €STR, which rose from 0.662% on 14 September 2022 to 3.901% on 20 September 2023 (the day the last ECB rate hike entered into force), a total of 324.4 basis points. This implies a pass-through ratio of 99.8% (Table 1).

Table 1**Cumulative DFR and €STR changes since 30 September 2022**

(percentage points)

Maintenance period start date	DFR	DFR change	€STR	€STR change
14/09/2022	0.75	-	0.662	-
02/11/2022	1.5	0.75	1.403	0.743
21/12/2022	2	0.5	1.902	0.5
08/02/2023	2.5	0.5	2.401	0.5
22/03/2023	3	0.5	2.898	0.498
10/05/2023	3.25	0.25	3.145	0.251
21/06/2023	3.5	0.25	3.395	0.251
02/08/2023	3.75	0.25	3.655	0.25
20/09/2023	4	0.25	3.901	0.251
TOTAL		3.25		3.244

Source: ECB calculations.

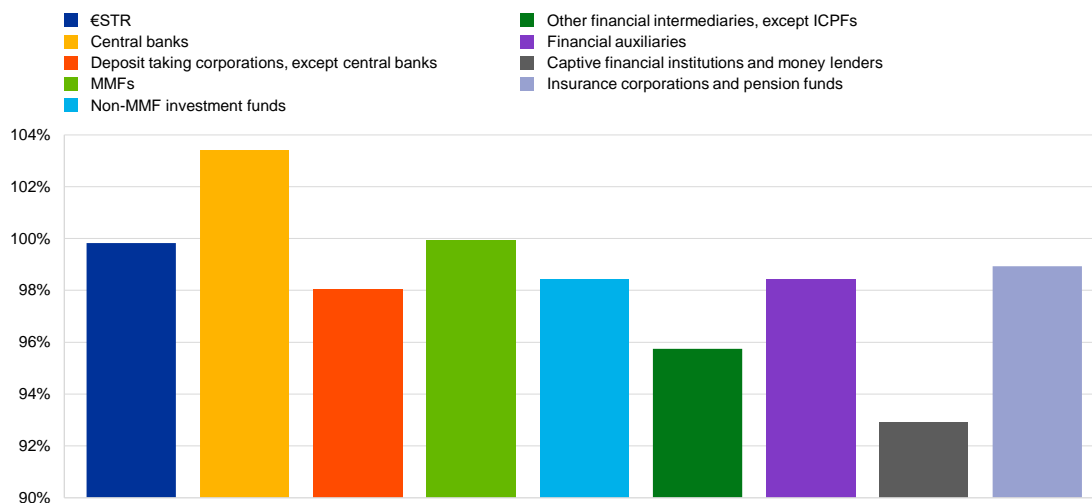
The pass-through of the various rate hikes was similarly well transmitted across the different sectors, even though some differences across types of counterparties were observed throughout the rate cycle (Chart A). For example, on average central banks benefitted from faster and larger adjustment of rates, reflecting not only long-standing business relationships but also significant

volumes of business. However, this was not the case for captive financials and other financial institutions, which generate less regular volumes.

Chart A

Pass-through of interest rate hikes in 2022-2023 across counterparty sectors

(percentage change in rate with respect to change in DFR)



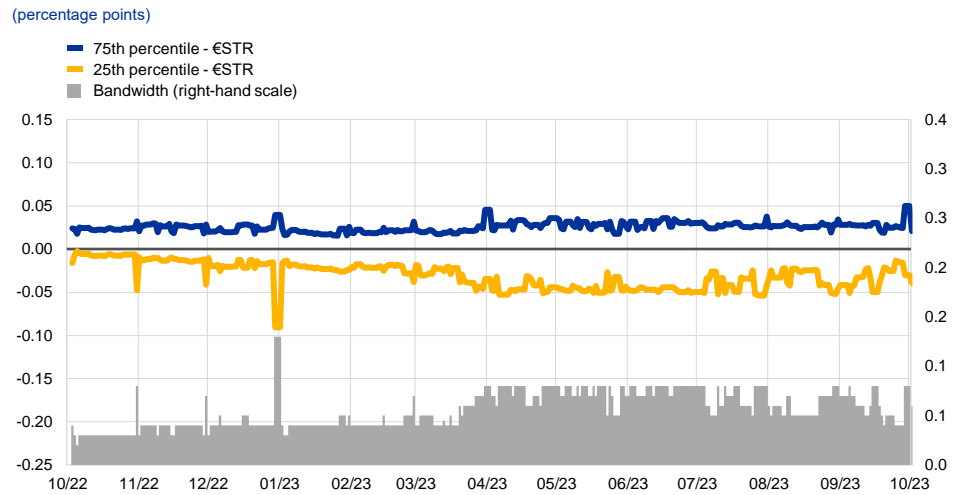
Source: ECB calculations.

Note: The pass-through rate is calculated by taking the average of the differences in rates on the last day of a maintenance period and the first day of a subsequent maintenance period with respect to the changes in the DFR (stated as percentages) over a period of positive interest rates.

Rate dispersion, measured as the difference between the rates at the 25th and 75th percentiles (i.e. the interquartile range), almost doubled compared with the previous review period, hovering between 5 and 8 basis points. Reporting banks were able to maintain a wider price range. Indeed, the shift to positive rates brought new counterparties and generally higher interest from financial institutions to actively manage their liquidity reserves by depositing them overnight with the reporting banks (Chart 2). These new entrants appear generally less price-sensitive while reporting banks continue to attach limited regulatory value to these overnight funds.

Chart 2

Spread between the €STR and the rates at the 25th and 75th percentiles



Source: ECB calculations.

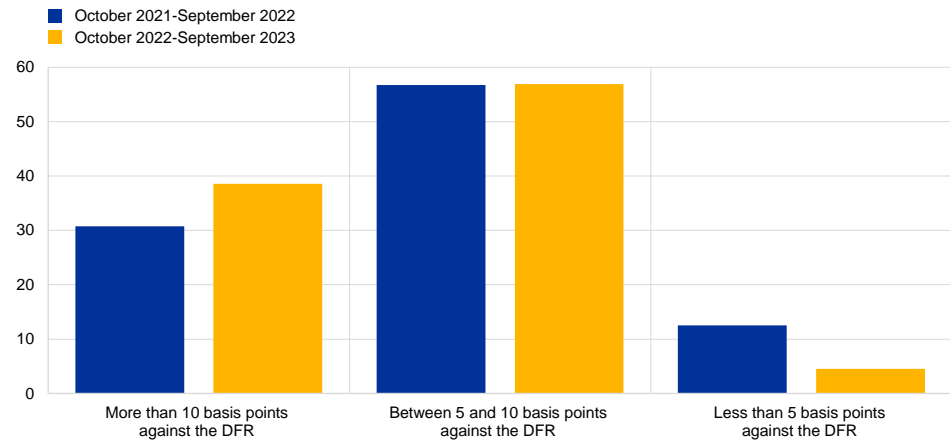
The distribution of the rate on eligible transactions changed in 2023, as the cluster of liquidity consisting of lower-priced transactions, particularly those priced at a negative spread of more than 10 basis points against the DFR, continued to increase in weight (Chart 3). At the same time, the share of transactions priced closer to the DFR shrank. Despite the steady decline in excess liquidity, which remained ample even so, banks were able to charge lower rates to depositors more frequently than in the previous year. This is another indicator that the persistence of high-excess liquidity is having an enduring impact on pricing behaviour.

In terms of day-to-day volatility, the €STR average absolute daily fluctuation hovered around the 0.2 basis point mark, similar to the previous three years of the €STR (the days on which the new ECB policy rates took effect for the first time were excluded). On average, volatility at quarter-ends was also stable at around 1.2 basis points during the period under review, unchanged from the previous year.

Chart 3

Volume share and price distribution in 2022-23

(percentage of total volume)



Source: ECB calculations.

In the year under review, and against a backdrop of ECB policy rate hikes, the €STR was fully consistent with general market trends. The distribution of the underlying transactions changed somewhat in 2023, with the weight of transactions at lower rates increasing compared with the previous year. However, volatility remained contained and the rate reflected the impact of the factors affecting day-to-day money market liquidity and trading patterns, such as quarter-ends.

2.2 Assessment of data sufficiency

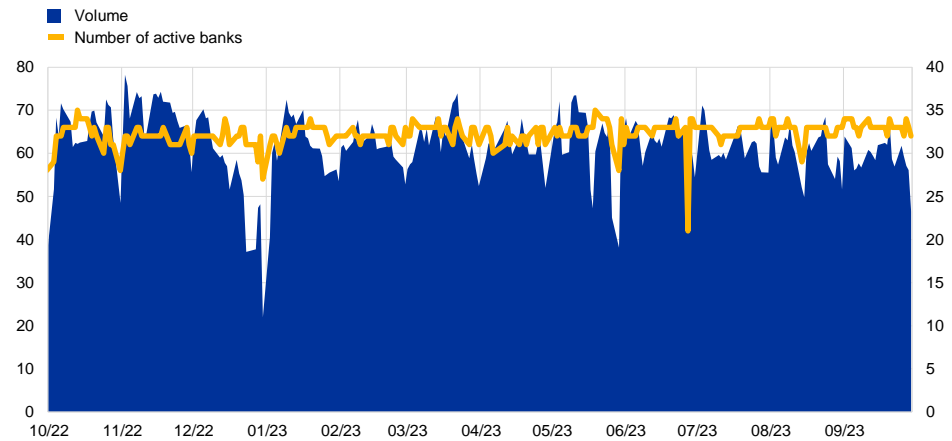
The underlying transaction volumes providing the basis for calculating the €STR continued increasing during the period under review, reaching an average of €62 billion. This compares with an average of €52 billion in the previous review period and €45 billion and €38 billion in the second and first years of the €STR, respectively. In the year under review, the underlying volumes oscillated between a low of around €22 billion over the 2022 year-end and a high of €78 billion, which was reached on 2 November 2022 (Chart 4). The increase of transaction volumes over the review period was mainly the result of renewed interest by a number of financial institutions to more actively manage their euro liquidity in the context of positive interest rates.

Like in previous years, seasonal fluctuations had an impact on the €STR eligible volume, with activity being somewhat lower during the holiday periods. For example, during national holidays and the Christmas period, many market participants entered into transactions with longer terms to cross over the holiday period. The €STR eligible volume was also lower during quarter-ends, i.e. regulatory reporting dates, as market participants generally refrained from entering into new transactions and expanding their balance sheets.

Chart 4

€STR volume and number of active banks

(left-hand scale: volume in EUR billions; right-hand scale: number of active banks)



Source: ECB calculations.

The level of participation increased somewhat, with an average of 32 banks reporting eligible overnight transactions every day, compared with around 30 banks in the previous review period. Participation dropped around holidays, in particular during the Christmas and New Year period, Ascension Day and Whit Monday.

€STR volumes increased further, averaging €62 billion in the fourth year of rate production. This indicated a sufficient level of market liquidity underpinning the rate and therefore provided a solid basis for the day-to-day rate calculation.

2.3 Assessment of rate representativeness

During the period under review, concentration metrics relating to reporting banks and the sectors of the counterparties improved.

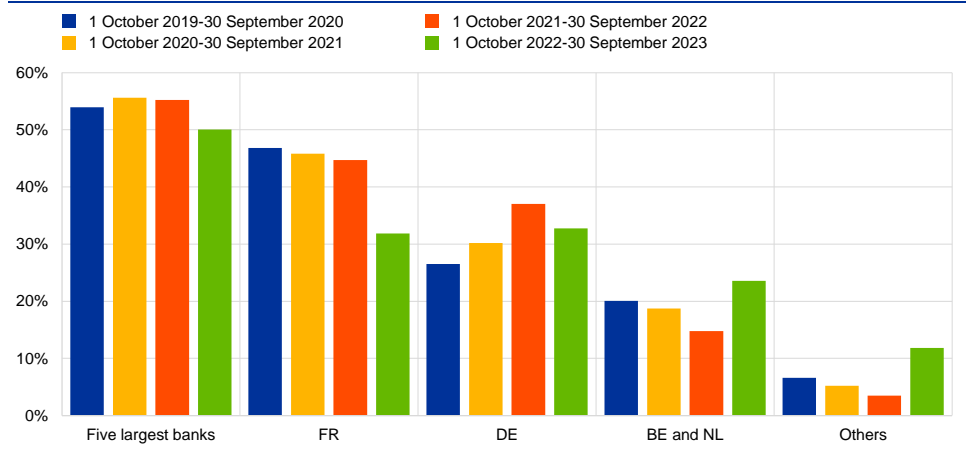
The volume share of the five largest banks decreased on average to 50%, compared with 55%, 56% and 54% in the third, second and first years of €STR production, respectively. Concentration remained well below the 60% mark observed in the initial calibration of the methodology and well under the threshold of 75%, which would trigger a contingency computation.

The combined share of volume reported by banks located in Germany and France declined to 65% in the period under review, compared with 82%, 76% and 72% in the third, second and first years of production, respectively. The activity of Dutch and Belgian reporting agents recovered, reaching 24% in the fourth year of publication. This followed a steady declining trend after the inception of the rate in 2019, with the share of these banks standing at 20%, 19% and 15% in the first, second and third

years of the €STR, respectively. In addition, other countries were significantly more active during the review period (Chart 5).

Chart 5

Volume share of reporting banks by size and location



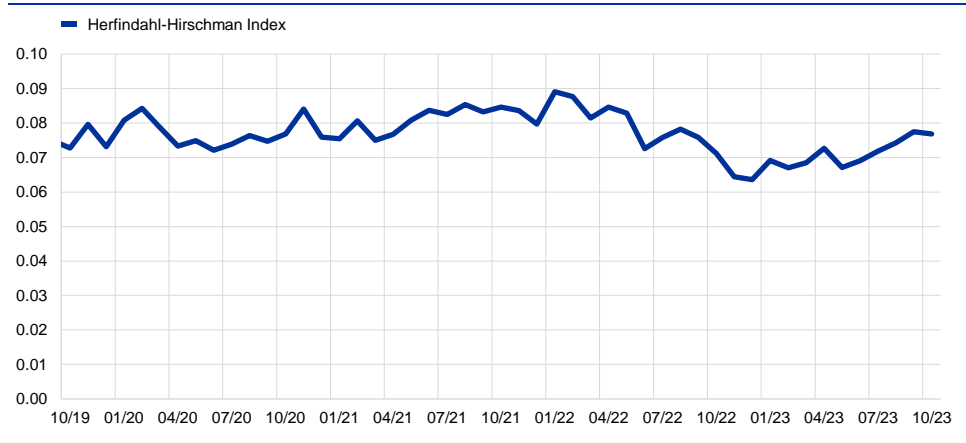
Source: ECB calculations.

Note: The share of the five largest banks is computed considering the volume of the top five banks on each business day of the review period.

Overall, 14 different banks featured among the five largest reporting institutions in terms of volume contribution during the period under review. In comparison, 13, eleven and 16 banks were observed during the third, second and the first years of €STR production, respectively. The Herfindahl-Hirschman Index, which was computed on the volume share of reporting agents since 2019, shows that the concentration of activity declined around summer and autumn 2022, before stabilising at around 0.07 by the end of the review period (Chart 6).

Chart 6

Reporting agent participation indicator



Source: ECB calculations.

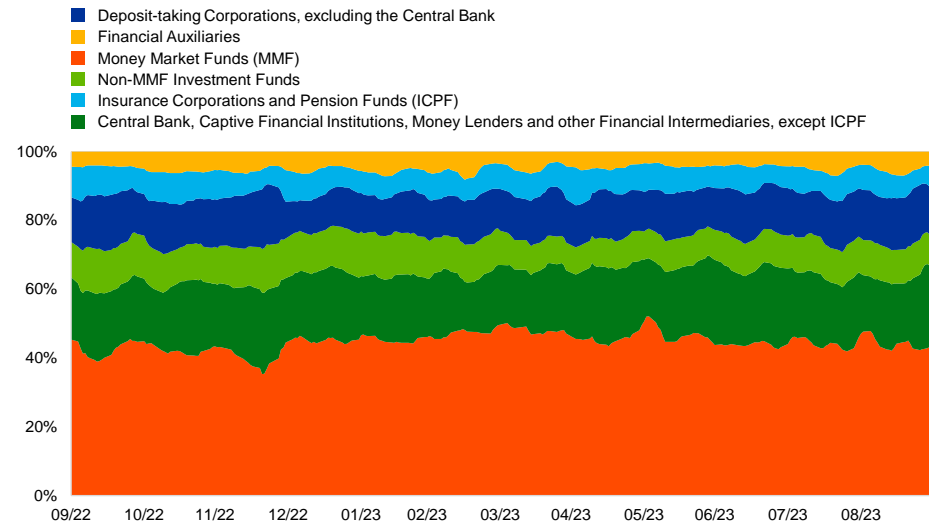
Notes: The index is used to measure the concentration of activity (volume) among reporting agents. An increase in the index indicates a higher concentration of activity within fewer banks, whereas a decrease indicates the opposite.

The distribution of activity by counterparty sector was broadly unchanged. MMFs remained by far the biggest counterparties to reporting agents, generating 45% of

daily activity as funds continued to hold significant cash buffers overnight with large banks (Chart 7). Interbank activity remained limited at around 13%.

Chart 7

Breakdown of volumes by counterparty sector since October 2022: five-day moving average



Source: ECB calculations.

Note: All borrowing transactions with a volume above €1 million (all rate types, all instrument types and all counterparty sectors are included).

Large French and German banks' combined share of the transaction volume underpinning the €STR decreased, giving way to banks from other jurisdictions. This resulted in a more diverse set of reporting banks actively involved in the overnight market, thus improving the representativeness of the benchmark. The composition of the counterparties remained largely unchanged.

3 Scope

This section aims to identify whether market liquidity in unsecured overnight trades conducted with financial firms using deposit instruments moved to sectors or maturities other than those currently eligible for inclusion in the €STR. If such gaps in coverage were to emerge, the ability of the €STR to adequately measure the underlying interest rate could be at risk and a reassessment of the scope might be necessary. For this analysis, a wider dataset than the one underpinning the €STR is required, so MMSR data are used.

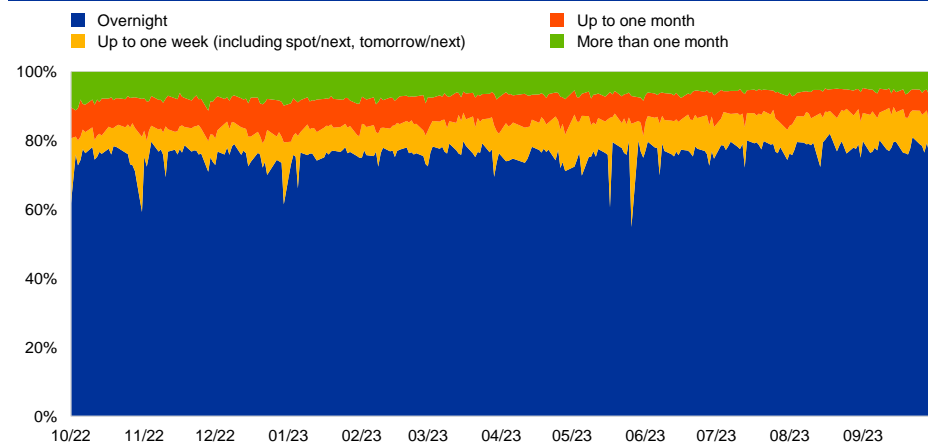
3.1 Maturity analysis

During the period under review, the share of liquidity in the overnight segment (as opposed to other maturities) increased further to 76%, up from 68% in the previous review period (Chart 8).

In absolute terms, the volume of overnight borrowing in the MMSR data averaged €145 billion in the review period, markedly higher than the average of €89 billion in the previous review period. This largely reflects the increased appetite for more active liquidity management against the backdrop of the return to positive interest rates. The maturities longer than one week declined somewhat in nominal terms: throughout the year, in the context of rapid interest rate increases, the overnight segment was the maturity of choice for keeping the upside potential for investors.

Chart 8

Breakdown of volumes by maturity since 1 October 2022



Source: MMSR data.

Note: All borrowing transactions with a volume above €1 million (all rate types, all instrument types and all counterparty sectors are included).

Overnight borrowing continues to represent by far the highest concentration of liquidity in the unsecured segment. This ensures that the rate is robustly based on a wide pool of daily transactions.

3.2 Sectoral analysis

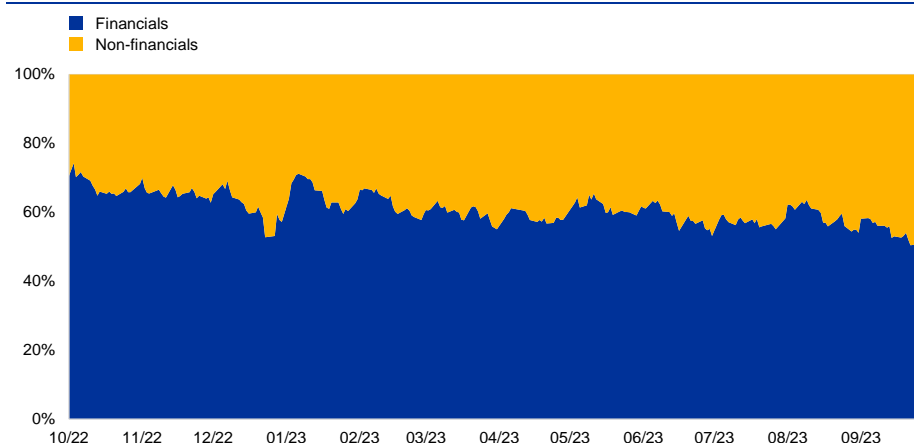
In terms of broad counterparty sectors, the share of non-financial firms rather than financial companies acting as counterparties reached 39% on average during the period under review, up from around 23% in the previous review period (Chart 9). This increase can be largely attributed to the fact that, with the return of positive rates, many large corporates started to look for better yielding options to manage their liquidity. In absolute terms, overnight deposits increased for both non-financial and financial counterparties, but at a slower pace for the former.

In addition, the financial sector remains the dominant counterparty sector. Hence, data sufficiency based on the eligible scope in terms of broad counterparty sector (i.e. financials) are not compromised by this development. There was a clear change in pricing dynamics whereby, in the light of the higher inflow of deposits from non-financials, banks were increasingly slow in adjusting their rates on these deposits during the rate hike cycle. As a result, the spread between the rate on deposits of financials against the rate on deposits of non-financials turned positive (Chart 10), i.e. banks started remunerating corporates less favourably than other financial institutions. This is in stark contrast to the previous environment of stable negative policy rates, when banks used to pay up to receive deposits from corporates as opposed to financials, also reflecting the cross-selling of products.

In a rapid rate hike cycle banks are slower in adjusting the pricing on deposits of corporates as the latter may have lower capacity than financial institutions to arbitrage between banks for better return. In both regimes, however, there seems to be a clear differentiation of pricing that justifies the original scope of the €STR, which excludes transactions with corporates.

Chart 9

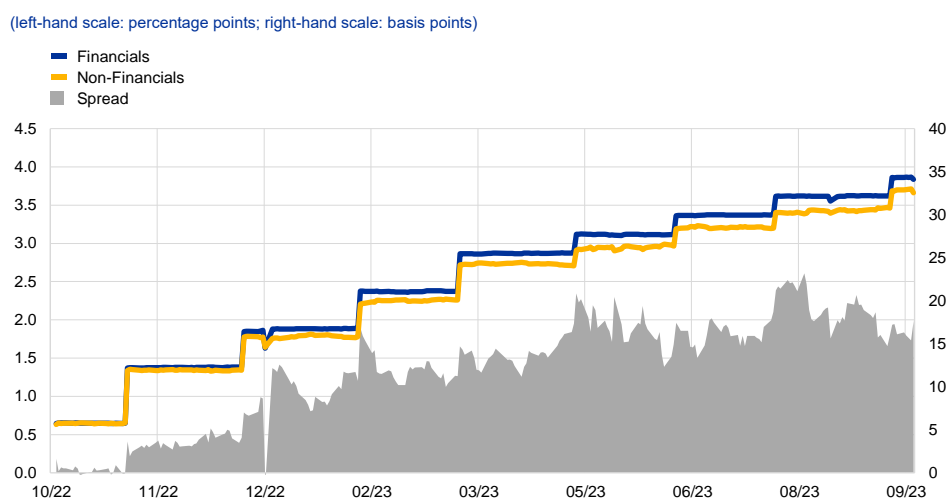
Breakdown of volumes by broad counterparty sector since 1 October 2022



Source: MMSR data.
Note: Overnight borrowing transactions with a volume above €1 million (all instrument types, rate types and counterparty sectors are included).

Chart 10

Rates and spread by broad counterparty sector since 1 October 2022



Source: MMSR data.
Market liquidity remains largely within the broad counterparty sector eligible for inclusion in the scope of the €STR.

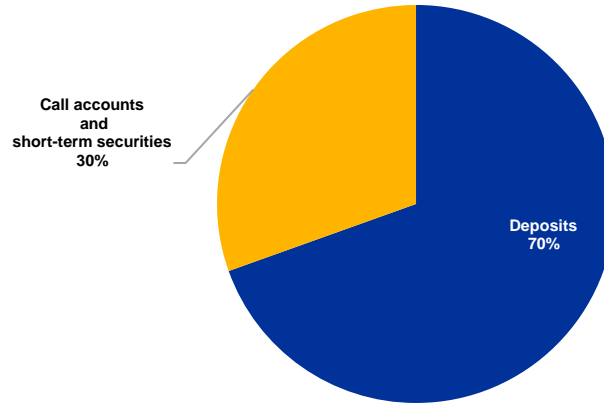
3.3 Instrument analysis

The share of deposits in this review period declined compared with the previous period, down from 77% to 70% of all unsecured overnight transactions recorded in the MMSR data. The remaining instruments mainly consist of call accounts (Chart 11), generally used by some cooperative banking networks to place cash surpluses from their retail customers with their central institution reporting under the MMSR. Corporate and institutional clients favour deposits, as their day-to-day cash positions and limits require more flexibility than call accounts usually permit. After the ECB started to raise its policy rates in July 2022, both deposits and call account volumes

started increasing, while call accounts increased in share. This happened after some clients started to re-engage in more active liquidity management in a positive rate environment.

Chart 11

Breakdown of volumes by instrument type since 1 October 2022



Source: MMSR data.

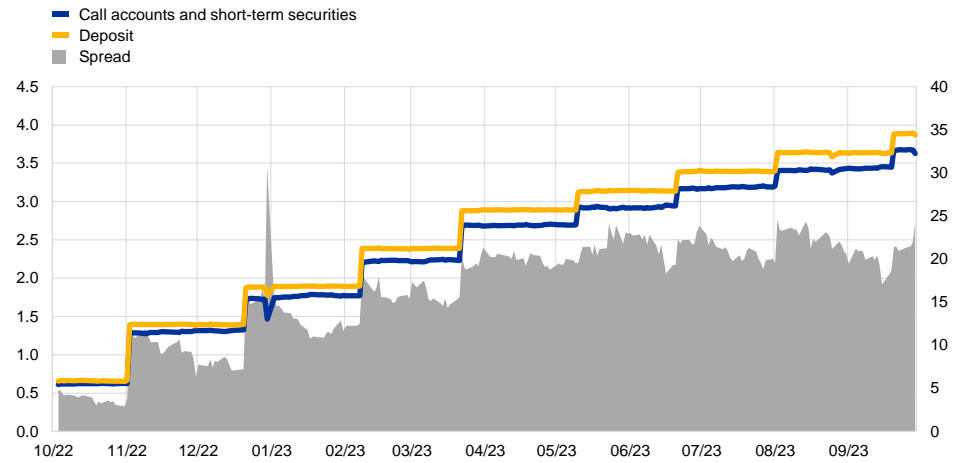
Notes: Overnight borrowing transactions with a volume above €1 million (all instrument types, rate types and counterparty sectors are included). Short-term securities include commercial paper, certificates of deposit and other securities.

The pricing of call accounts remains distinct from that of deposits. Since the ECB started its policy rate hikes in July 2022, deposits have become better remunerated than call accounts, reversing the trend observed since the launch of the €STR, whereby call accounts offered more favourable remuneration (Chart 12). Several factors can explain this development. First, call account remuneration tends to be “stickier”, which means it adjusts more slowly than deposit remuneration to new market conditions. This is because prices for call accounts are not renegotiated as often as those for deposits. Second, market feedback indicates significant increases in call account activity coming from a number of previously dormant accounts (especially in cooperative networks and notably among local authorities), which are priced at different terms than deposits.

Chart 12

Interest rate by instrument type since 1 October 2021

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



Source: MMSR data.

Notes: Overnight borrowing transactions with a volume above €1 million (all instrument types, rate types and counterparty sectors are included). Short-term securities include commercial paper, certificates of deposit and other securities.

Liquidity with instruments that fall within the scope of the €STR increased, supporting the robustness of the rate. Deposits remain by far the most liquid instrument. The pricing behaviour of call accounts and deposits with non-financial corporates justifies the decision for them to remain out of the €STR calculation scope.

3.4 General assessment of scope

The €STR scope remains appropriate. In particular:

- liquidity remains abundant in the overnight segment;
- liquidity remains concentrated among the counterparties and instruments initially identified as being the most active and appropriate;
- pricing dynamics and behaviours continue to justify the exclusion of instruments other than deposits.

4 Parameter calibration

In addition to the scope assessment, a review of the calculation parameters is also required. This review covers (i) the 25% trimming level applied in the daily calculation of the €STR, and (ii) the data sufficiency thresholds (contingency thresholds), which determine whether the standard or contingency method for calculation is applied.

4.1 Testing the 25% trimming level

Trimming is one of the key features of the methodology. It is a way of limiting volatility stemming from idiosyncratic factors. At the time the methodology was devised, a symmetric trimming of 25% was deemed appropriate.

The impact of the trimming level on volatility was retested using €STR data for the 12 months starting from 1 October 2022. The level shifts resulting from the ECB policy rate changes were filtered out, as otherwise volatility levels would have been artificially high. Compared with the findings for the previous years, the data continue to suggest that the trimming at 25% achieves an acceptable level of volatility in the rate at around 0.2 basis points, even if this level is also achieved over a relatively broad range of trimming levels. This is consistent with the very stable price for overnight liquidity in the centre of the distribution (calculated taking 50% of transactions) in an environment of considerable excess liquidity. Contrary to the previous year, a trimming level of 35% and above would result in a further decline in volatility. As a result of the higher liquidity in the overnight tenor, the centre of the pricing distribution became more homogeneous, preventing the appearance of clusters of pricing around the centre. This largely explains the decline in volatility at higher trimming levels.

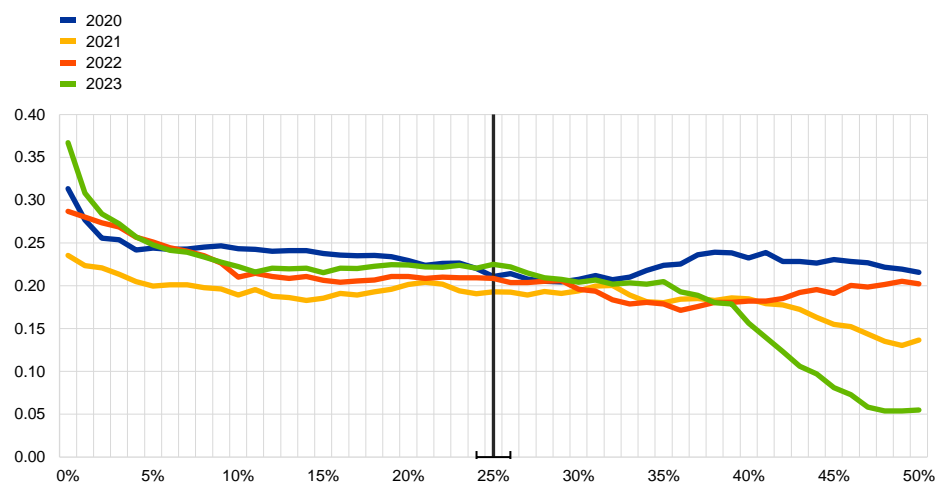
At the lowest trimming level of 0%, where no transactions are filtered out, the rate is calculated as a weighted average. If this calculation methodology was used in the €STR, the benchmark volatility in the past year would have been around twice as high as in 2021, in a context of rapidly changing positive rates.

The trimming level will continue to be monitored closely in the context of the annual methodology reviews. In the current market, which is marked by very high levels of excess liquidity, the current symmetric trimming of 25% appears adequate as it continues to take out any outliers that might be of idiosyncratic nature, while avoiding an artificial suppression of market volatility (Chart 13).

Chart 13

Rate volatility according to trimming levels

(day-to-day volatility rate relative to the trimming level; x-axis: trimming level in percentage points; y-axis: average absolute day-to-day changes in basis points).



Sources: MMSR data and ECB calculations.

Notes: The black bar indicates the actual trimming level (25%), which coincides with the trimming level associated with the minimum average absolute day-to-day changes for 2021. The 2020 period covers 1 October 2019 to 30 September 2020. The 2021 period covers 1 October 2020 to 30 September 2021. The 2022 period covers 1 October 2021 to 30 September 2022. The 2023 period covers 1 October 2022 to 30 September 2023.

The 25% trimming level remains adequate.

4.2 Testing the contingency thresholds

The contingency policy aims to ensure the continuity of €STR publication when (a) there are not enough banks sending data (i.e. fewer than 20), or (b) the share of the largest contributors goes beyond certain levels (five banks represent 75% or more of turnover). These safeguards protect the rate from the risk of bias in the event of insufficient data, while being agnostic as to the source of data insufficiency and/or excessive concentration. Data insufficiency can be caused either by a genuine lack of market activity or by technical incidents preventing a sufficient data feed.

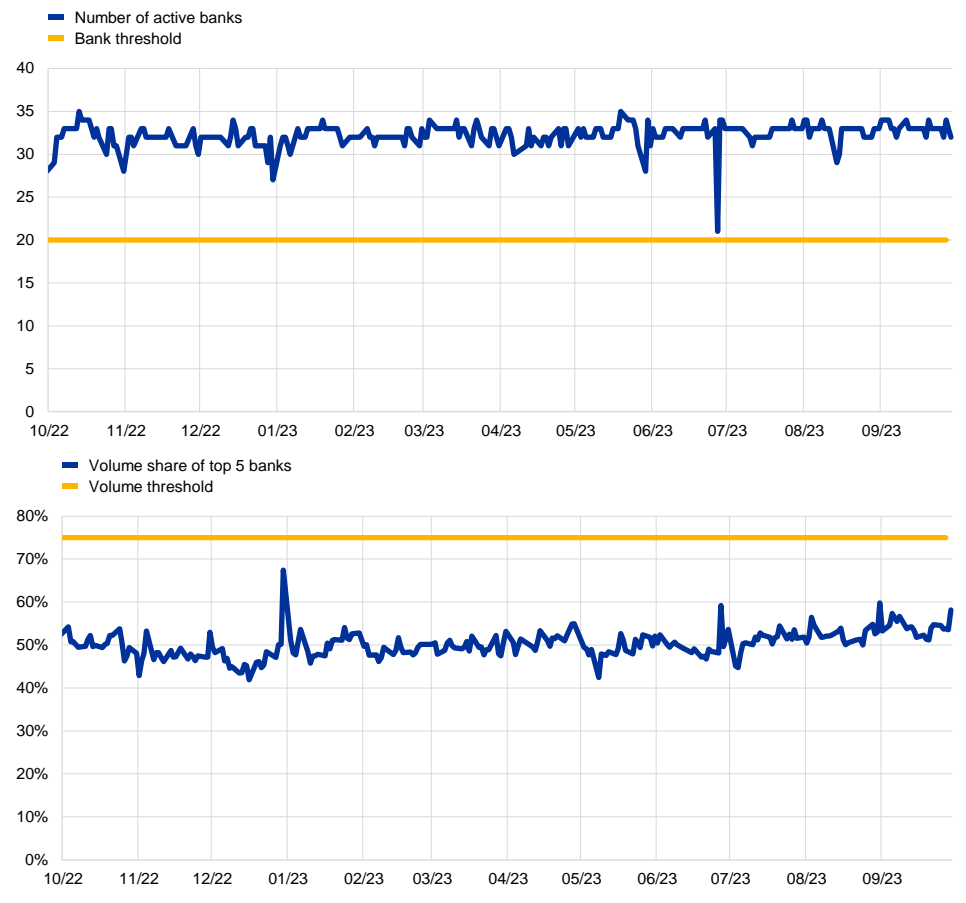
In the past year, the number of active banks has risen slightly, from the previous year's average of 30 to 31. On 30 December 2022 only 27 banks reported transactions, and on 27 June 2023 this number dropped to 21, still above the contingency threshold (Chart 14, upper panel).

In May and June 2023, bank holidays in some countries had only a limited impact on participation.

The concentration metrics for the five largest banks remained significantly below the 75% threshold and hovered around 50%, which indicates that the higher level of

activity was correlated with a lower level of concentration compared with the year before (Chart 14, lower panel).

Chart 14
Contingency monitoring



Source: ECB.

Table 2
Activity metrics

Measure	1 October 2021-30 September 2022	1 October 2022-30 September 2023
Average number of banks	30	32
Lowest number of banks	17	21
Average number of countries	8	9
Lowest number of countries	5	5
Average number of transactions	532	683
Lowest number of transactions	104	261
Average daily volume (EUR billions)	52.3	62.1
Lowest daily volume (EUR billions)	13.6	21.9

Source: MMSR data.

Overall, the metrics show the robustness of the market activity on which the accurate measurement of the underlying interest is built. In the review period, the higher number of transactions and increased volumes, along with a reduced concentration,

clearly formed the base for a robust rate. Therefore, changes in the contingency parameters do not seem warranted (Table 2).

Contingency parameters continue to provide adequate safeguards against scenarios in which there is insufficient data to calculate the €STR. They are adequate in the current market circumstances, where shifts in market participation are to be expected, especially around holidays and reporting dates. Therefore, they will be left unchanged and continue to be monitored.

5 Overall assessment

The assessment presented in this report demonstrates that the €STR continues to provide an accurate reflection of short-term wholesale unsecured bank borrowing costs. The rate is consistently backed by sufficient market activity, which ensures that it remains a representative and unbiased measure of the very short-term borrowing costs of the reporting banks. Given that it captured all relevant market liquidity in money market statistical reporting in the year under review, the scope remains adequate for calculating the rate. The contingency thresholds remain commensurate to the daily changes in market participation and have proven to be an adequate safeguard for representative and unbiased rate calculation. Lastly, the level of trimming applied in the calculation contributes to the desired reduction in volatility by helping to prevent idiosyncratic factors from affecting the rate level.

These findings enable the administrator to conclude that changes to the €STR methodology are not warranted.

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For specific terminology please refer to the [ECB glossary](#) (available in English only).

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