



EUROPEAN CENTRAL BANK

EUROSYSTEM

€STR Annual Methodology Review

January 2022



Contents

1	Introduction	2
2	Methodology	4
	2.1 Assessment of rate accuracy	4
	2.2 Assessment of data sufficiency	8
	2.3 Assessment of rate representativeness	9
3	Scope	12
	3.1 Maturity analysis	12
	3.2 Sectoral analysis	13
	3.3 Instrument analysis	13
	3.4 General assessment of scope	15
4	Parameter calibration	16
	4.1 Testing the 25% trimming level	16
	4.2 Testing the contingency thresholds	18
5	Overall assessment	20

1 Introduction

The euro short-term rate (€STR) was launched by the ECB on 2 October 2019.¹ The rate measures the wholesale euro unsecured overnight borrowing costs of banks located in the euro area. The €STR is based entirely on daily confidential statistical information relating to money market transactions collected in compliance with the Money Market Statistical Reporting (MMSR) Regulation.²

The €STR is of increasing relevance as markets transition towards wider use of risk-free rates that are robust and reliable. The private sector-led working group on euro risk-free rates³ recommended the €STR as the replacement for EONIA, the previously widely used overnight benchmark discontinued on 3 January 2022. The working group also recommended €STR-based rates in fallback provisions for EURIBOR-linked contracts aimed at helping users comply with obligations in the EU Benchmarks Regulation⁴ to preserve continuity in the event of a discontinuation of EURIBOR. To support the wider use of the €STR in all types of contracts, and also as a fallback rate in EURIBOR contracts, the ECB started publishing compounded €STR rates for standard maturities together with a daily index value from 15 April 2021. The European Commission designated the €STR as the statutory replacement rate for EONIA on 21 October 2021.⁵

Production of the €STR is regulated by the €STR Guideline,⁶ which establishes the ECB's responsibility as rate administrator. Article 15 of this requires the administrator to review at least annually whether changes in the underlying market for the euro short-term rate require changes to the euro short-term rate and the euro short-term rate methodology. This report therefore (i) reviews the performance of the rate and developments in the underlying markets, and (ii) assesses whether any changes in the methodology are required so the rate better captures underlying economic reality, i.e. the overnight wholesale unsecured borrowing costs of euro area banks. The assessment is an important check on the robustness of 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 three main criteria:

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

¹ See the [€STR page](#) on the ECB's website.

² See the [money market statistical reporting page](#) on the ECB's website.

³ See [the working group on euro risk-free rates](#) on the ESMA's website.

⁴ See Regulation (EU) 2016/1011 of the European parliament and of the Council of 8 June 2016 on indices used as benchmarks in financial instruments and financial contracts or to measure the performance of investment funds and amending Directives 2008/48/EC and 2014/17/EU and Regulation (EU) No 596/2014 (Text with EEA relevance) (OJ L 171, 29.6.2019, p.1).

⁵ See Commission Implementing Regulation (EU) 2021/1848 of 21 October 2021 on the designation of a replacement for the benchmark Euro overnight index average (Text with EEA relevance) (C/2021/7487) (OJ L 374, 22.10.2021, p. 6).

⁶ See 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, to ensure that the defined scope is still adequate to measure the underlying interest rate.

Finally, given the importance of continuity for users, 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 October 2020 to the end of September 2021.

The report is structured as follows: Section 2 reviews how the methodology performed in the past year, analysing €STR rate volatility and trends in underlying volume; Section 3 reviews the adequacy of the scope of the €STR and looks into market developments beyond 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 how the €STR's main metrics have behaved to assess whether the methodology proved able to deliver an adequate measure of the underlying economic reality.

2.1 Assessment of rate accuracy

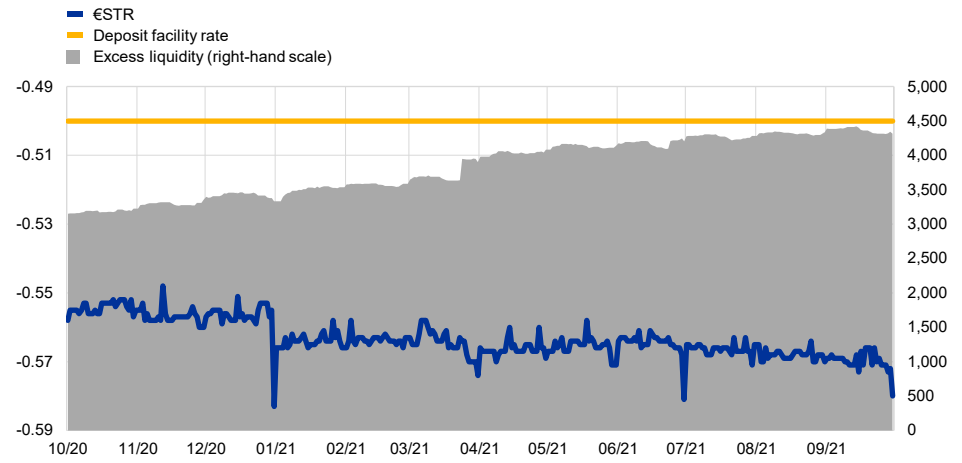
During the review period (from October 2020 until the end of September 2021), the €STR remained within a relatively tight range between -54.8 basis points (bps) and -58.4 bps, while it followed a mild downward trend (Chart 1). This pattern reflects unchanged policy rates, coupled with increasing amounts of excess liquidity in the banking system. The latter was the result of the continuing asset purchase programmes of the ECB and the additional liquidity provided under the targeted longer-term refinancing operations (TLTROs). The increasing excess liquidity contributed to the mild decline in the €STR, as banks were able to lower the negative rates they apply to overnight deposits from other financial institutions, especially those that do not have access to the deposit facility provided by the Eurosystem. As outlined in the two public consultations that supported the development of the €STR methodology,⁷ unsecured money market activity has to a large extent shifted away from the interbank market and now encompasses transactions with a large array of other financial institutions, including money market funds, pension funds and insurance companies. These firms do not have access to the Eurosystem deposit facility and commercial banks therefore routinely offer them rates below the deposit facility rate to cover transaction and regulatory costs.

⁷ See [First ECB public consultation on developing a euro unsecured overnight interest rate](#) and [Second public consultation on the publication by the ECB of an unsecured overnight rate](#).

Chart 1

The €STR rate and the policy environment since 1 October 2020

(left-hand scale: %, right-hand scale: EUR billions)

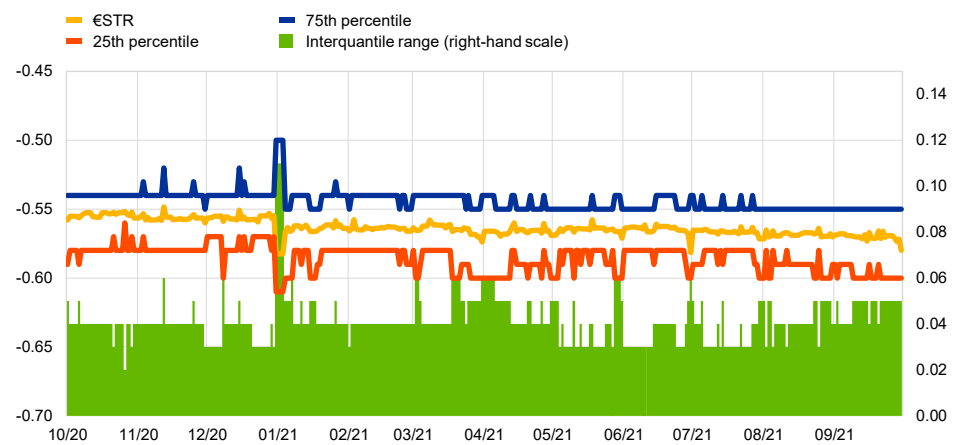


Source: ECB calculations.

Chart 2

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

(in %)

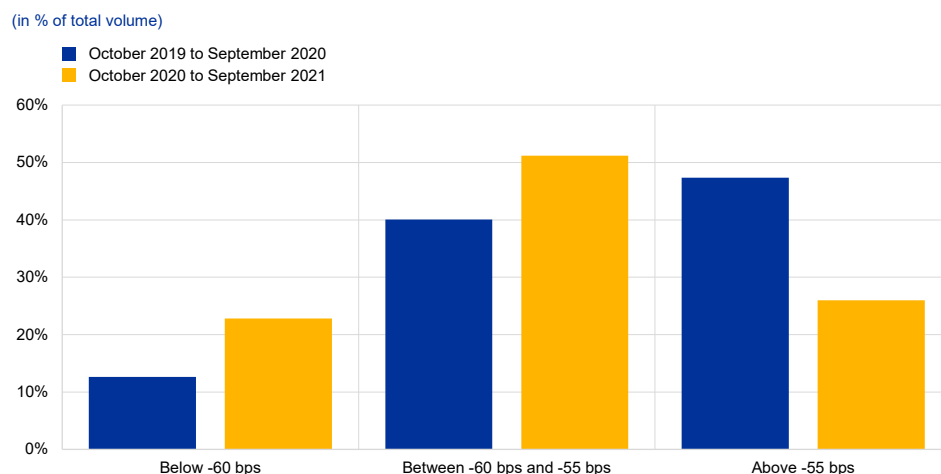


Source: ECB calculations.

cluster of liquidity consisting of lower-priced transactions appeared (see Chart 3). In a context of growing excess liquidity, banks charged lower rates to depositors more frequently than last year.

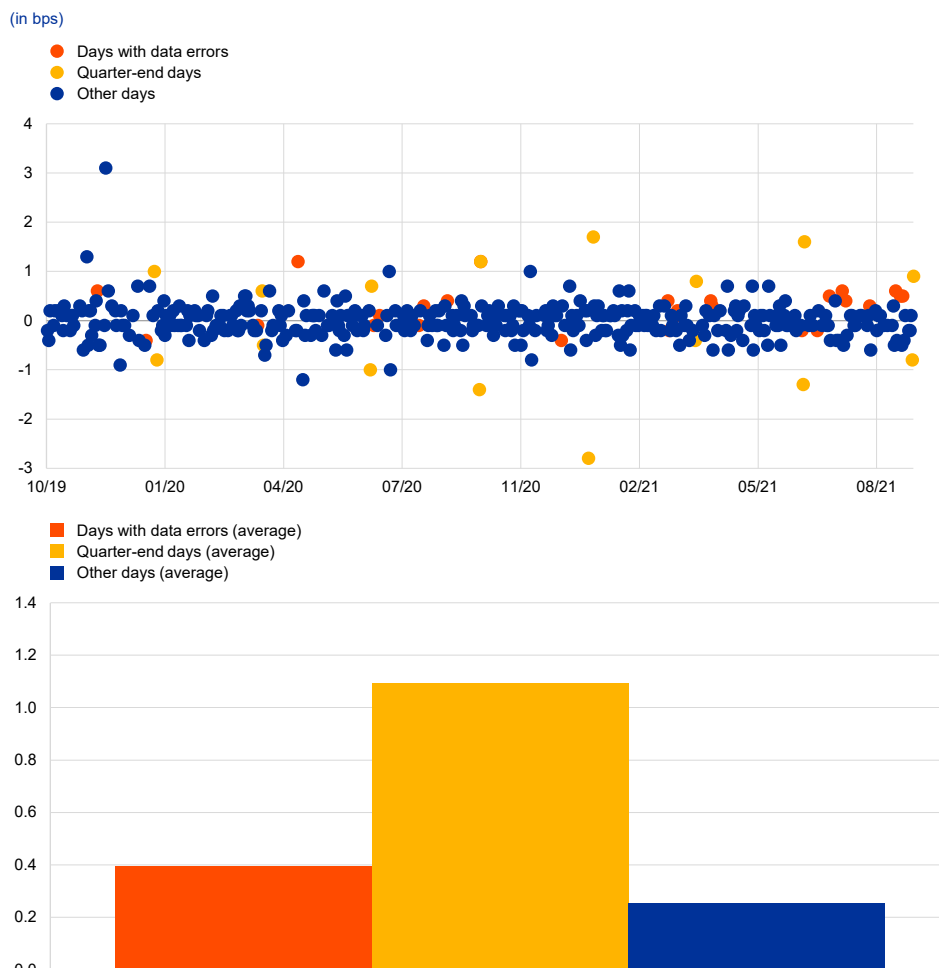
Chart 3

Volume share and price distribution in 2020-2021



The emergence of an additional significant liquidity pool at deeply negative rates at dates other than reporting dates (month-end, quarter-end) is another indicator that the persistence of large excess liquidity is having a structural impact on pricing behaviour, as a larger fraction of reporting agents now only accept deposits at rates that are routinely at levels of -60 bps and below. This is also relevant for the assessment of the trimming applied, which is reviewed in Section 4.1.

In terms of day-to-day volatility, the €STR maintained an average absolute daily deviation of around 0.2 bps over the past year (unchanged from the first year it was produced). On average, volatility at quarter-ends was around 1.3 bps during the review period, compared to 0.9 bps in the first year of the benchmark (Chart 4). Compared to other euro one-day benchmark rates, such as the GC Pooling overnight rate and the repo funds rate, the volatility of the €STR was more contained; repo rates exhibited much stronger volatility around quarter-ends than the €STR, in view of their collateral component.

Chart 4**Published daily rate change on normal dates, on reporting dates and on dates with reporting errors**

The ECB periodically publishes summary information on errors larger than 0.1 bps that were detected after the standard publication and did not meet the republication criteria⁸. There were nine such errors in the first year of the €STR and 17 in the second. Despite the higher number of errors in the later period, these did not have any visible impact on volatility and day-to-day deviations remained on average within the ranges seen on normal days. This is largely the result of the limited impact such production errors had on the accuracy of the rate and confirms (i) the methodology is sufficiently robust to cope with such events, and (ii) underlying market liquidity is sufficiently high for single reporting issues to be unlikely to have any material impact on the rate.

⁸ See the [page on €STR transparency on errors](#) on the ECB website.

The €STR in the past year was consistent with general market trends in the context of the accommodative monetary policy of the ECB. The distribution of the underlying transactions changed somewhat in 2021, with transactions at lower rates appearing as a second cluster of liquidity. Volatility remained contained. The rate reflected the impact of factors affecting day-to-day money market liquidity and trading patterns, such as quarter-ends.

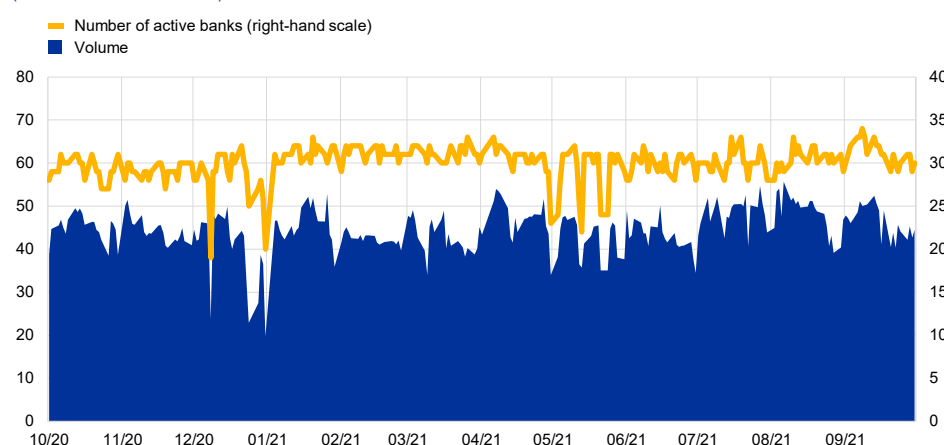
2.2 Assessment of data sufficiency

The underlying volumes underpinning the €STR computation stabilised during the review period around an average of €45 billion, having increased from some €30 billion in 2018 to more than €45 billion in the aftermath of the coronavirus (COVID-19) market stress in spring 2020 (Chart 5). As discussed in the following section, the reporting banks were accepting deposits from a wide range of financial institutions, of which money market funds accounted for the highest share. Money market funds also contributed to the visible increase in overnight activity in the aftermath of the COVID-19 market stress and have maintained significant amounts of deposits with reporting banks since 2020.

Chart 5

€STR volume and number of active banks

(left-hand scale: EUR billions)



While volumes remained stable on most of the days, ranging between €40 billion and €50 billion, there were a few days when much lower volumes were registered. As expected, unsecured money market activity was more subdued during the holiday period, for example during the Christmas period in 2020. On 31 December a record low volume of just under €20 billion was registered, as market participants were closing their books.

The level of participation remained steady overall, with around 30 banks reporting eligible overnight transactions every day. Participation visibly dropped around holidays – the Christmas period, New Year, Labour Day, Ascension Day and Whit Monday. On only one occasion, on 8 December 2020, the level of participation dropped below 20, i.e. the data sufficiency threshold, which resulted in the €STR being computed and published under the contingency procedure. The lower activity on that day was the result of a technical incident that prevented the transmission of eligible data for timely rate computation and was hence not related to market illiquidity.

€STR volumes steadied around €45 billion in the second year of rate production, indicating sufficient level of market liquidity underpinning the rate and therefore providing a solid basis for the day-to-day rate computation. Contingency computation had to be triggered only once, resulting from a technical issue rather than market illiquidity.

2.3 Assessment of rate representativeness

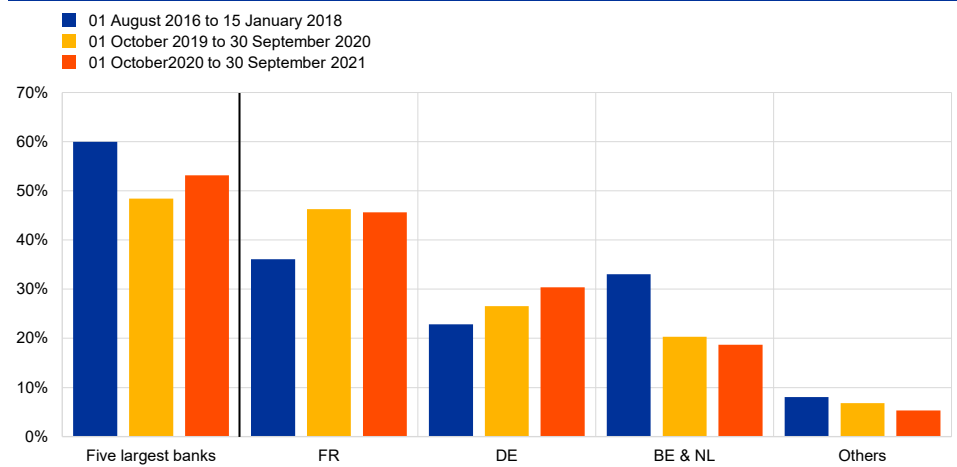
During the review period the €STR saw a deterioration in concentration measures referring to the reporting banks, their location, and the sector of the counterparties involved.

The volume share of the five largest banks increased slightly to 56% on average, as compared to 54% in the first year of €STR production. However, concentration remained below the 59% mark observed in the initial calibration of the methodology.

The share of volume reported by banks located in Germany and France rose to a combined level of 76% in the review period, compared to 72% in the first year of production and 58% in the pre-production analysis. Dutch reporting agents saw the most pronounced decline, from 17% in the pre-production period to 8% in the first year of the €STR and 5% in the second (Chart 6).

Chart 6

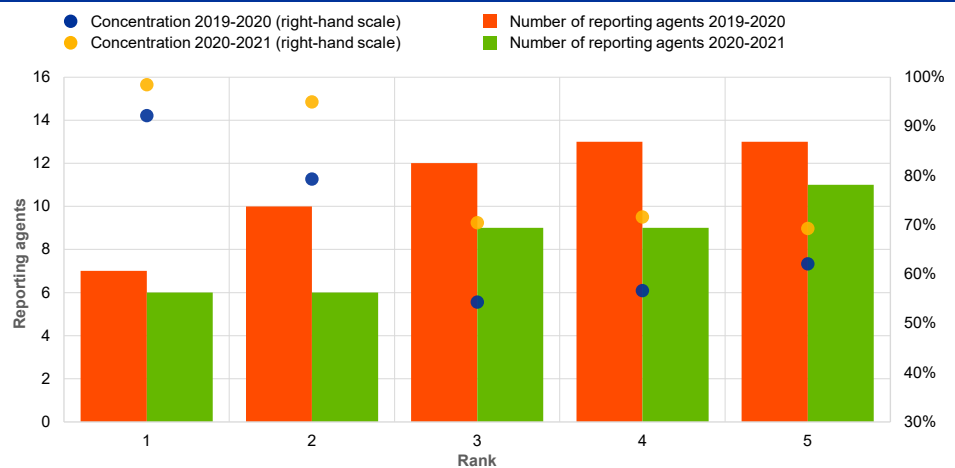
Volume share of reporting banks by size and location



Eleven banks featured among the largest five reporting institutions in terms of volume contribution during the review period. That is a notable decline from the 16 observed during the first year of €STR production. Similarly, a lower number of banks made it to each of the five highest ranks (Chart 7). Moreover, the turnover of institutions within each rank remained low. For example, the top three institutions that made it to rank one remained there in 98% of days. That compares to 92% in the first year of the €STR.

Chart 7

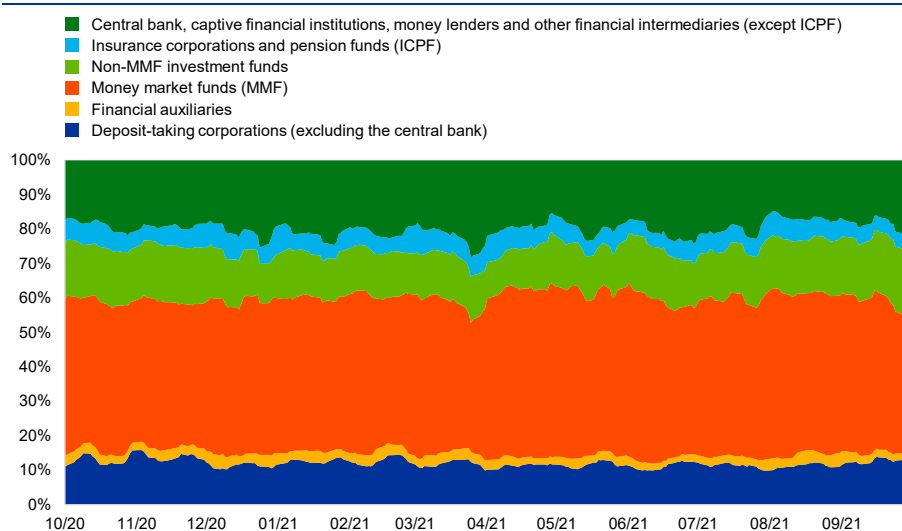
Participation indicator of reporting agents



The distribution of activity by counterparty sector was unchanged. Money market funds remained by far the biggest counterparts to reporting agents, generating some 45% of daily activity. Funds continued to hold significant cash buffers overnight with large banks for diversification due to the persistent uncertainty linked to the COVID-19 situation and limited investment opportunities in longer maturities (Chart 8). Interbank activity remained limited at around 10%.

Chart 8

Volume breakdown by counterparty sector since October 2019: five-day moving average



The volume share held by large French and German banks in the €STR increased further, as they continued to gain a substantial portion of the activity generated by money market funds. Despite the higher concentration, there is still sufficient diversity of both reporting banks and counterparties for the benchmark to be representative. However, the changes in concentration measures will need to be closely monitored in future.

3 Scope

This section aims to identify whether unsecured market liquidity in overnight trades conducted with financial firms using deposit instruments may have moved to sectors or maturities other than those currently eligible for 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 re-assessment of the scope might be necessary. For this analysis, a wider dataset than the one underpinning the €STR is required, and thus MMSR data is used.

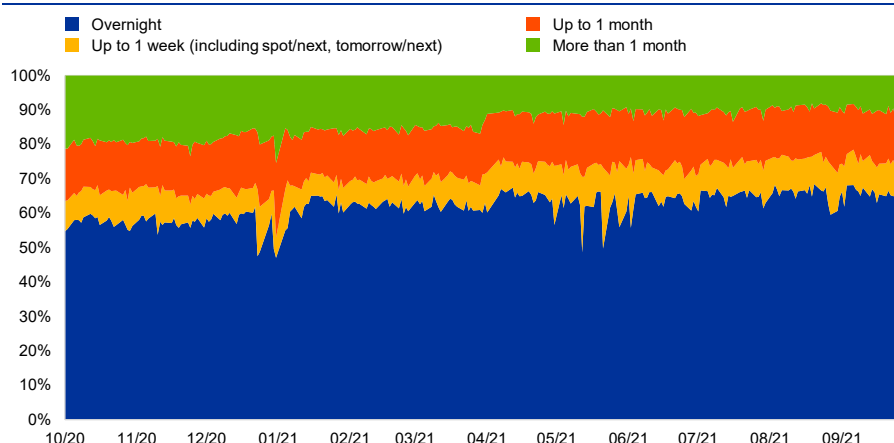
3.1 Maturity analysis

The share of liquidity in the overnight segment increased from 55% to 65% during the review period. The figure remained relatively stable at around 55% up to spring 2021, and then rose gradually as a consequence of the decline in activity in longer maturities, particularly those longer than one month (Chart 9).

In absolute volume terms, overnight borrowing hovered around €80 billion throughout the year. This reflects the ongoing COVID-19 crisis, with money market funds in particular continuing to hold large overnight liquidity buffers in case investors demand repayment. The volume of borrowing at longer maturities declined as banks, in particular, had ample access to longer-term liquidity from the ECB's TLTROs.

Chart 9

Percentage of volumes by maturity since 1 October 2020



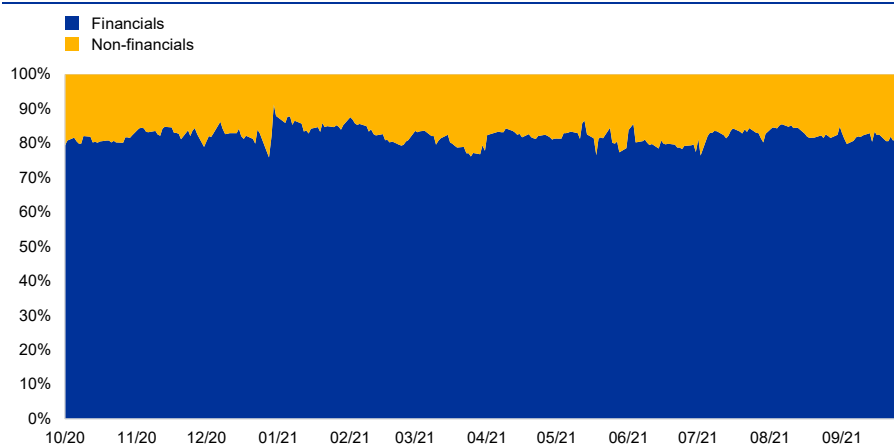
Overnight remains a maturity that represents a high concentration of liquidity in the unsecured segment. This ensures the rate is robustly based on a wide pool of daily transactions.

3.2 Sectoral analysis

In terms of counterparty sectors, no changes were observed. The respective shares of financial and non-financial firms as counterparties remained very stable during the past year: around 80% with the former and 20% with the latter (Chart 10). The price of liquidity received from non-financial counterparties continues to be more favourable than from financials, reflecting pricing dynamics influenced by commercial considerations such as cross-selling. This justifies the decision that transactions executed with these counterparties, where pricing conditions are materially influenced by parameters other than funding costs, remain out of scope of the €STR.

Chart 10

Percentage of volumes by broad counterparty sector since 1 October 2020



Market liquidity remains largely within the sectoral scope of counterparties eligible for inclusion in the €STR. The price differentiation between financials and non-financials which had initially justified exclusion of non-financials persists.

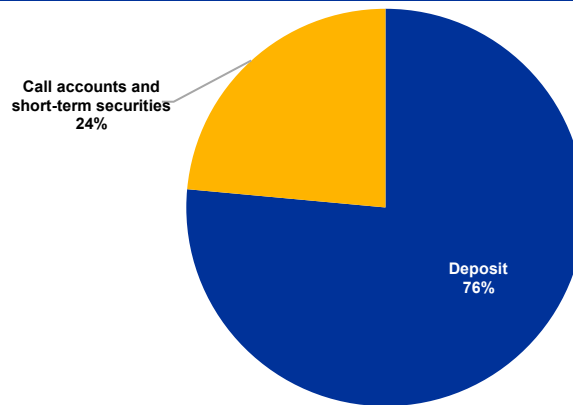
3.3 Instrument analysis

Compared to the first year of the €STR, the use of deposits increased from 74% to 76% of all unsecured overnight transactions recorded in the MMSR data, while the share of call accounts in overnight funding declined by similar proportions (Chart 11). Some cooperative banking networks, which generally use call accounts to place cash surpluses from their retail clients with their central institution reporting in MMSR, faced outflows that resulted in a reduction in call account volumes. Feedback indicates that retail clients increased their spending on discretionary items as the economy reopened from summer 2021, which partly explains the decline. Corporate and

institutional clients favour deposits, as their day-to-day cash positions and limits require more flexibility than call accounts usually permit.

Chart 11

Percentage of volumes by instrument since 1 October 2020



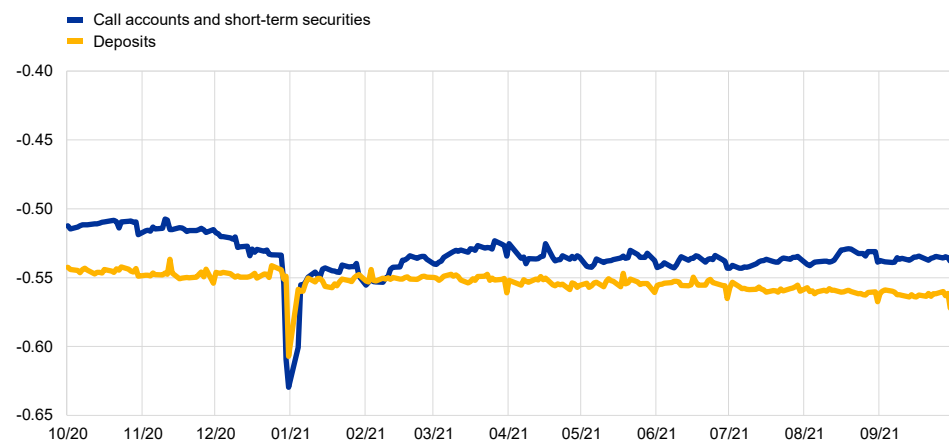
Source: MMSR data. Overnight borrowing transactions with volume above EUR 1 million (all instrument types, rate types and counterparty sectors considered). Short-term securities include commercial paper, certificates of deposit and other securities.

The pricing of call accounts remains quite distinct from that of deposits. After a period where the difference between the two tended to narrow, call accounts are again benefiting from more favourable remuneration than deposits by around 3 bps (Chart 12).

Chart 12

Price by instrument type since 1 October 2020

(percentage)



Source: MMSR data. Overnight borrowing transactions with volume above EUR 1 million (all instrument types, rate types and counterparty sectors considered). Short-term securities include commercial paper, certificates of deposit and other securities.

Liquidity remains with instruments that fall within the scope of the €STR. Deposits benefited from additional liquidity linked to a relatively recent shift away from call accounts in certain cooperative networks. This further supports the robustness of the €STR.

3.4 General assessment of scope

The €STR scope remains appropriate:

- Liquidity remains abundant in the overnight segment and even increased in relative terms;
- Liquidity remains predominantly focused in the counterparties and instruments initially identified as being the most active and appropriate;
- Pricing dynamics and behaviours remain stable and continue to justify the exclusion of non-financials and instruments other than deposits.

4 Parameter calibration

In addition to the scope assessment, the computation parameters need to be revisited as well. This review covers the 25% trimming level applied in the daily computation of the €STR and the data sufficiency thresholds (contingency thresholds) which determine whether the standard or contingency method for computation is applied.

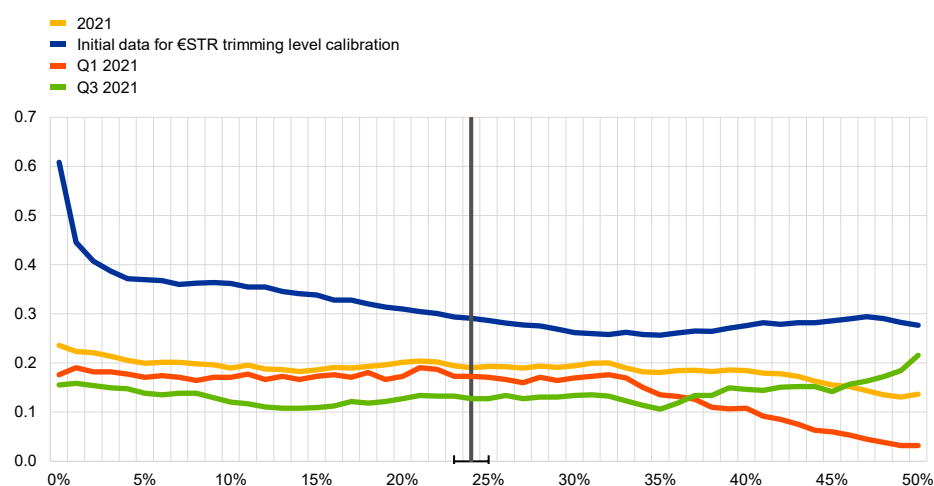
4.1 Testing the 25% trimming level

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 level of 25% was deemed appropriate.

The impact the trimming level has on volatility was re-tested using €STR data since 1 October 2020. Compared to the findings for the periods 2016-18 and 2019-20, the data continue to suggest that a trimming at 25% achieves an acceptable level of volatility in the rate. The lower level of volatility at this level (down 0.1 bps) suggests trimming had a greater impact than in previous years. 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 (Chart 13).

Chart 13
The trimming smile

(day-to-day rate volatility relative to the trimming level)



Source: MMSR Data, ECB calculations

Note: trimming level in percentages (x-axis); average absolute day-to-day changes in basis points (y-axis). The grey line indicates the suggested 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 Oct 2019 to 30 Sep 2020. The 2021 period covers 1 Oct 2020 to 30 Sep 2021. Initial data for the €STR trimming level calibration cover the period from 1 Aug 2016 to 15 Jan 2018.

The shape of the trimming smile remained flat on average in 2021, however there were substantial changes during the year. By comparison with Q1 2021, during Q3 2021 the daily rate volatility increases relatively quickly at trimming levels above 35%

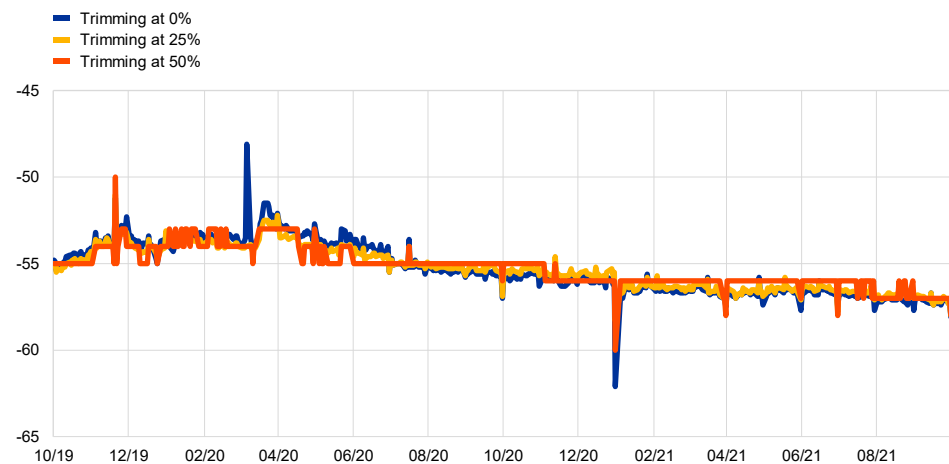
and reaches around 0.25 bps for a 50% trimming level. In other words, at a 50% trimming level (which amounts to a rate calculated based on a median), the increase in volatility suggests a less homogeneous distribution of volumes, as mentioned in Section 2. Since the start of 2021, the pricing of overnight liquidity has gradually split into two distinct pools. Therefore a higher trimming level would expose the rate to higher volatility, depending on the daily distribution of transactions between these distinct liquidity pools.

Consistently with this, we observe that the volatility of the €STR calculated with a 50% trimming level increases visibly from July 2021 onwards, while the rate would be slightly higher (by 0.2 bps on average) compared with the rate calculated with a 25% trimming level (Chart 14).

Chart 14

The €STR rate with 0%, 25% and 50% trimming levels since October 2020

(in bps)



Source: MMSR data.

Note: trimmed volume-weighted average rate of trades eligible for €STR.

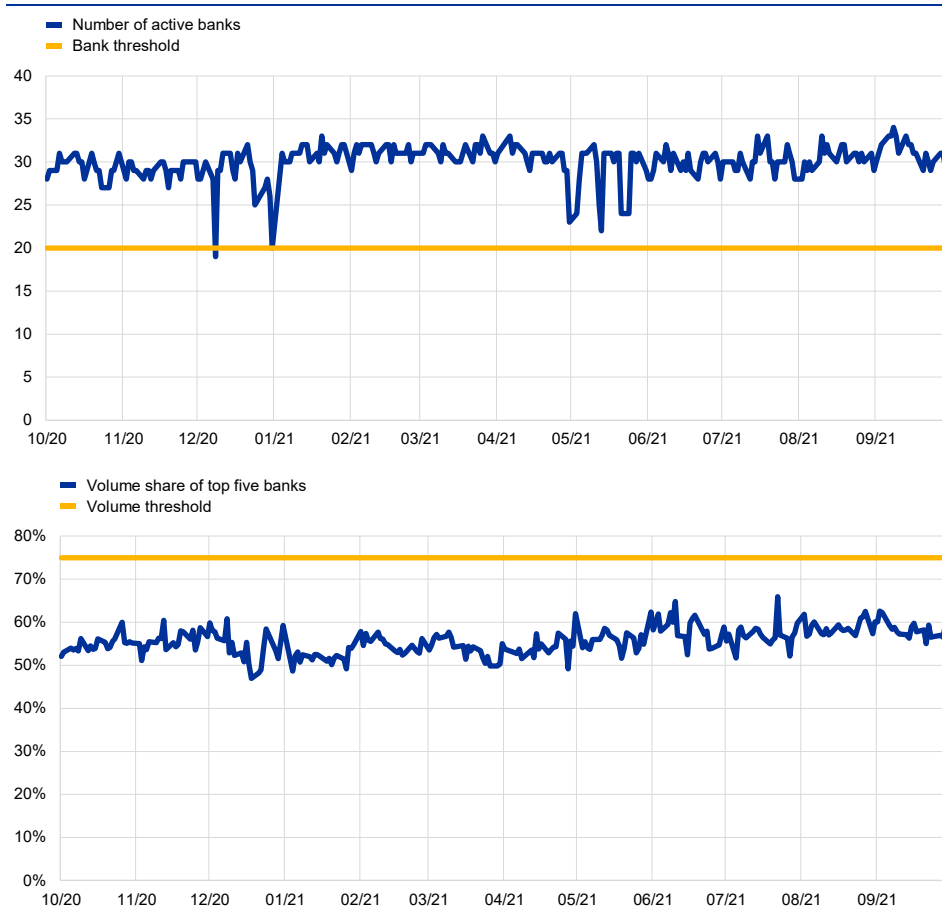
The 25% trimming level remains adequate, as it contains rate volatility.

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 (fewer than 20) or (b) when 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 remained fairly stable at around 30, with the exception of one contingent publication on 8 December 2020. At year-end 20 banks reported transactions, a figure still above the contingency threshold. In May and June, bank holidays in some countries had an impact on participation. However, the concentration metrics for the largest five banks remained stable at around 55% even on those dates (Chart 15).

Chart 15
Contingency monitoring



Source: ECB.

Activity further intensified this year. The average daily volume reached almost €45 billion, the average number of daily transactions was 526 and the average number of

active banks was 30. The lowest number of banks actively reporting was 19, which was the day a contingent publication was triggered: 8 December 2020 (Table 1).

Table 1
Activity metrics

Measure	01 October 2019 – 30 September 2020	01 October 2020 – 30 September 2021
Average number of banks	29	30
Lowest number of banks	15	19
Average number of countries	9	9
Lowest number of countries	6	6
Average number of transactions	463	526
Lowest number of transactions	192	210
Average daily volume (EUR billions)	38.2	44.7
Lowest daily volume (EUR billions)	13.5	19.7

Source: MMSR.

If the contingency situation is put aside, the lowest number of banks reporting on a given day (20 banks on 31 December 2020, 23 and 24 around Ascension Thursday and Whit Monday) remained lower this year than in the data covering the years 2016-2018 (where year-ends 2016 and 2017 recorded 25 and 28 active banks respectively and Corpus Christi on 5 June 2017 had 25 banks). However, these figures were slightly higher than the values observed the year before.

The lower participation at reporting dates reflects regulatory constraints, which generally tend to weigh on the ability of banks to expand their balance sheet over these periods.

During bank holidays funding is more widely executed for longer maturities than overnight, typically up to one week, bridging the period where depositors are less active.

Otherwise, on normal days the metrics show the robustness of the market activity on which accurate measurement of the underlying interest is built. Therefore a change in the contingency metrics thresholds is not deemed necessary.

Contingency parameters continue to provide adequate safeguards against any scenario of insufficient data to compute the €STR. They are adequate in current market circumstances where shifts in market participation are expected, especially around holidays and reporting dates. Therefore they will be kept unchanged and monitored carefully.

5 Overall assessment

The €STR continues to provide an accurate reflection of short-term wholesale unsecured bank funding 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. The scope for the rate's computation remains adequate, as it captured all relevant market liquidity within the money market statistical reporting universe. The contingency thresholds remain commensurate to the daily changes in market participation and prove to be an adequate safeguard for representative and unbiased rate computation in all circumstances. Finally, the level of trimming embedded in the computation contributes to a desired reduction in volatility by helping to prevent idiosyncratic factors from affecting the rate level.

These findings allow the administrator to conclude that no changes to the €STR methodology are necessary.

© **European Central Bank, 2022**

Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website www.ecb.europa.eu

All rights reserved. Reproduction for educational and non-commercial purposes is permitted provided that the source is acknowledged.

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