



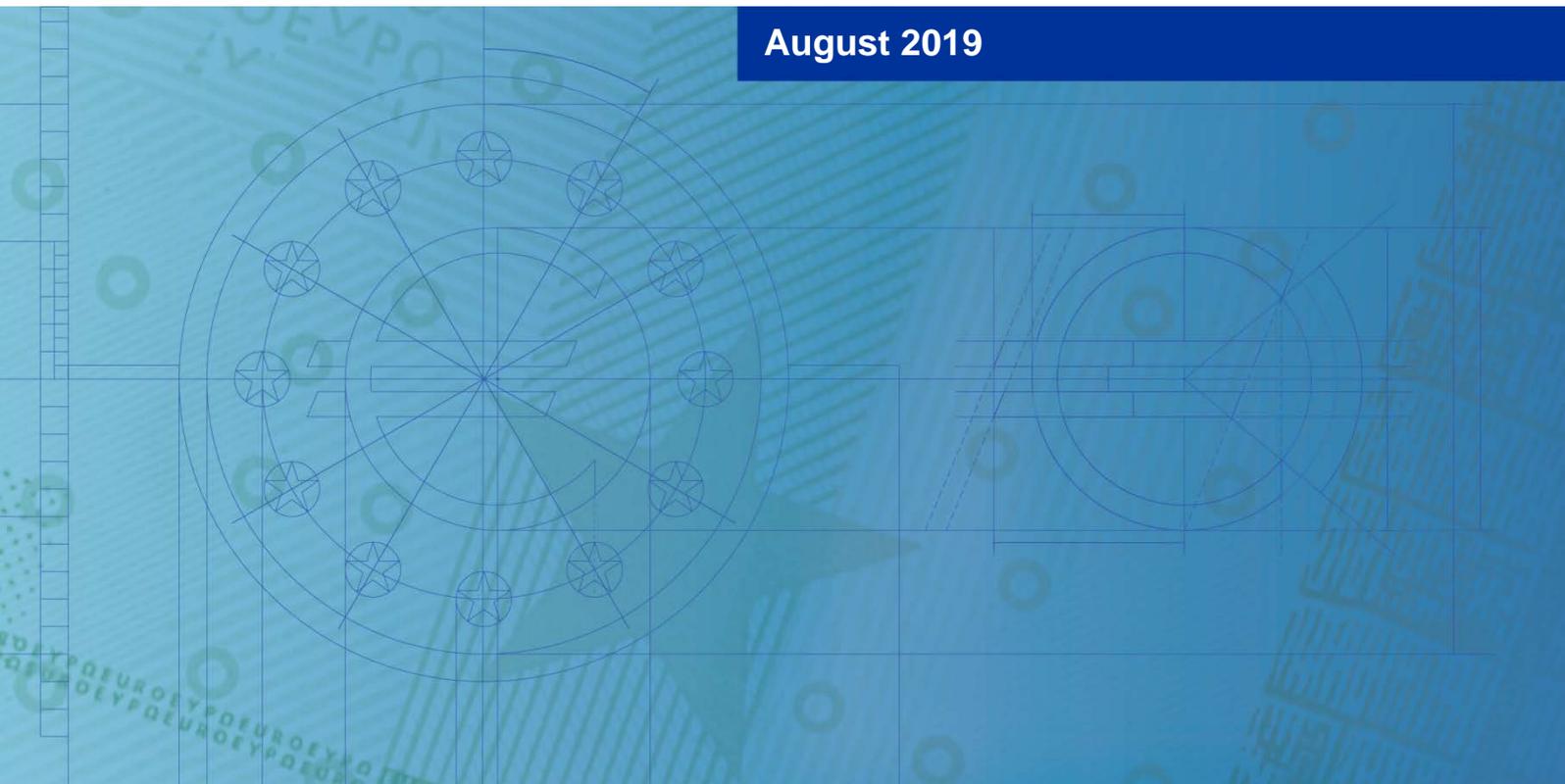
EUROPEAN CENTRAL BANK

EUROSYSTEM

Report by the working group on euro risk-free rates

On the impact of the transition from EONIA to the €STR on cash and derivatives products

August 2019



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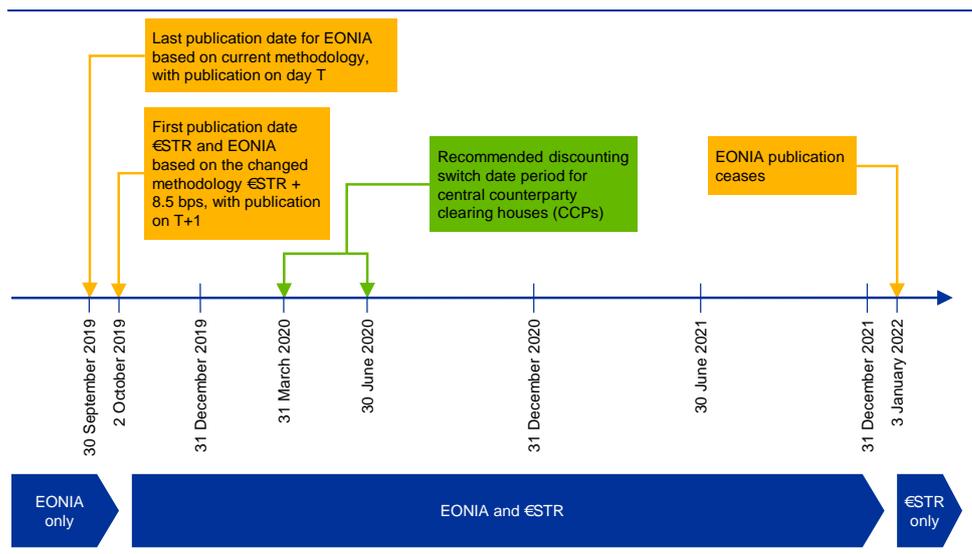
1 Executive summary

This report focuses on the impact that the transition from the current euro overnight index average (EONIA) to the ECB's euro short-term rate (€STR)¹ will have on cash and derivatives products. EONIA is widely used both as a reference rate and as a collateral remuneration and cash flow discounting rate for financial products across a variety of markets. It is therefore important for users to be aware of any effects this transition may have on their processes. Market participants will have to prepare extensively for this benchmark rate change by adapting IT systems, among other things, and reviewing current documentation, processes and procedures, product structures as well as terms of application. In this report, the working group on euro risk-free rates analyses the implications of this transition and provides market participants with recommendations on how to smoothen the transition. It does so primarily from an operational and valuation standpoint.

The recommendations may be broken down into two groups (see also Figure 1):

- recommendations for dealing with the change in EONIA's publication time resulting from the planned recalibration of EONIA as the €STR plus a fixed spread of 8.5 basis points as at 2 October 2019;
- recommendations for the transition from EONIA (recalibrated as the €STR + 8.5 basis points) to the €STR between 2 October 2019 and 3 January 2022, when the publication of EONIA will cease.

Figure 1
Timeline for the transition from EONIA to the €STR



¹ For background information, see Chapter 2 of this report.

Recommendations and observations for market participants to prepare for the change in EONIA's publication time resulting from the planned recalibration of EONIA as the €STR plus a fixed spread of 8.5 basis points as at 2 October 2019 (see Chapter 3 for details):

1. As a first important step, market participants are encouraged to:
 - Screen their inventory of affected transactions and system environments to assess the modifications needed to cope with the change in EONIA's publication time from 19:00 CET on T (until 30 September 2019) to 09:15 CET on T+1 (from 2 October 2019).²
 - Prepare relevant teams for enhanced oversight during the cutover period to ensure that the change in the publication time of the rate does not trigger process failures.
 - Design a communication strategy geared towards internal and external stakeholders (clients in particular) to ensure awareness of impending changes – especially when publication times are referenced in bilateral confirmations or contracts.
2. Market participants are encouraged to align their main processes with the 08:00 CET publication time for the €STR³, and 09:15 CET for EONIA⁴, respectively, and maintain exceptional procedures for €STR re-publication events. See Chapter 3.1 for details.
3. Market participants should be aware that the change in the publication time will not affect the availability of EONIA on the usual distribution channels; the unique EONIA identifiers on platforms will also remain the same. In addition, the change of the publication time will not create time series gaps, as EONIA published on 2 October will represent transactions executed on 1 October 2019⁵. See Chapter 3.2 for details.
4. The working group recommends that market participants consider adjusting the default settlement time (i.e. the lag between the last fixing date and the settlement date) in certain cases, as follows:
 - **Derivatives/money market transactions:** Currently, EONIA-related transactions are, as a rule, settled on T+1. It is recommended that market participants switch to T+2 settlement, also to accommodate international (in particular Asian) market participants' operational requirements. Please note that, for money market transactions, this may entail a one-day difference between the payment dates of the nominal and the interest. See

² See EMMI's press release entitled "[EMMI publishes stakeholder consultation feedback summary on recommendations for EONIA by the euro risk-free rates working group](#)", 31 May 2019.

³ See the ECB's press release entitled "[ECB announces publication time for euro short-term rate \(€STR\)](#)", 11 July 2019.

⁴ See EMMI's press release entitled "[EMMI publishes stakeholder consultation feedback summary on recommendations for EONIA by the euro risk-free rates working group](#)", 31 May 2019.

⁵ See EMMI's press release entitled "[EMMI publishes stakeholder consultation feedback summary on recommendations for EONIA by the euro risk-free rates working group](#)", 31 May 2019.

Chapter 3.4 for details as well as Chapter 4.1 and Recommendations no. 5 to 8.

- **Cleared derivatives:** For the remuneration of variation margin, market participants are recommended to use the last available fixing rate for price alignment interest (PAI) calculations and continue to settle on T+1. See Chapter 3.4 for details as well as Chapter 4.1 and Recommendations no. 5 to 8.
- **Securities:** As coupon payments are currently calculated using the T-1 value, no changes are expected in the current practice. Nevertheless market participants should adapt their settlement procedures and corresponding valuation and accounting systems to the new publication time, taking into account that they will have less time to perform the related operational procedures. Particular attention should be paid to the calculation of accrued interest in the secondary market depending on whether a transaction occurs before or after 09:15 CET. Given that the settlement of deals in the secondary market is mainly based on bilateral agreements and is managed manually rather than automated, the current process is expected to remain mostly unchanged. However, market conventions might change in the future, reflecting changes in volumes and traded instruments as markets evolve. Therefore, the working group recommends that trade and user associations analyse market conventions with a view to providing market participants with guidance on how the conventions related to EONIA-based securities may evolve due to the transition from EONIA to the €STR and on whether a common standard will be required in the future. See Chapter 4.2 for details as well as Recommendation no. 9.
- **Secured cash products (mainly floating rate repos):** Market participants are recommended to maintain same-day settlement for the repurchase leg by using the last available fixing rate (difference from “final” next-day fixing can be claimed). See Chapter 4.3 for details as well as Recommendation no. 10.
- **Unsecured cash products:** See Chapter 4.4 for details as well as Recommendation no. 11.
- **Current accounts, corporate and retail facilities and overdraft facilities:** According to the current market standard, the customer receives the interest payment on the next day of the interest period, i.e. on T+1. Given that the change in the publication time will shorten the time window available for the settlement, a different approach may have to be adopted. In order to preserve the economic reality of these products, the working group recommends that market participants postpone the calculation of the corresponding interest until the new interest period (for accounts with monthly or quarterly settlement). Alternatively, the most recently published interest rate can be used (for accounts with daily settlement). Operational and contractual

frameworks may, however, cause market participants to adopt different solutions and arrangements. Therefore, market participants should individually find a way to convert existing and new current account contracts to EONIA/€STR T+1, taking into account their operational procedures and the existing contractual conditions.

- **Swingline facilities:** The current wording of the LMA recommended form documentation states that interest on a swingline loan based on EONIA is payable on the business day following an interest period. Consequently the shift to T+1 should not require operational changes. However, in some cases, parties may have relied on EONIA being available at 19:00 CET on T so that the change in the publication time may result in a time constraint for the interest settlement process and might lead to a delayed payment to preserve the economic reality of the transaction. Thus market participants are recommended to assess their internal processes related to swingline facilities to establish whether the move to a T+1 publication time will cause operational issues and then update systems and processes accordingly. Moreover, it is important to consult borrowers about whether the change to a T+1 publication time will cause any operational or process issues.
- **Investment funds:** For investment funds linked to EONIA, the T+1 publication will affect net asset value (NAV) calculations and redemption/subscription processes, creating an operational challenge. At the same time, it is not materially possible to delay the publication of the NAV or review the process for redemptions and subscriptions as used by all distributors. Therefore, the process and timing for calculating the NAV cannot be modified. This implies that EONIA-based products will reference the latest available EONIA, in most cases referencing T-2 transactions. Market participants are recommended to assess their NAV-related processes (e.g. valuation, risk management) and procedures as well as their related IT systems in order to identify the implications of the shift to T+1 and to implement any necessary adjustments before 2 October 2019. When required, market participants should engage with national competent authorities and/or regulators and communicate changes in the NAV-related processes. See Chapter 4.5 for details as well as Recommendation no. 12.
- **Funds transfer pricing (FTP) models:** Once publication has shifted from T to T+1, it is recommended that users and providers of funds on T apply the rate published at 09:15 CET on T+1. Alternatively, if the one-day lag is not manageable from an operational point of view, they could use the rate of the previous day (rate on value date T-1 that is published on T). In the case of monetary policy decisions or similar events, this could be managed by using an override. See Chapter 5.1 for details as well as Recommendation no. 13.

Recommendations and observations for market participants to prepare for the transition from EONIA (recalibrated as the €STR + 8.5 basis points) to the €STR between 2 October 2019 and 3 January 2022, when the publication of EONIA will be discontinued (see Chapters 4 and 5 for details):

5. **Derivatives – floating rate options (FROs)**, see Chapter 4.1.1 for details as well as Recommendation no. 4:
 - (a) In order to adjust the FROs in existing EONIA contracts, market participants are encouraged to transition from EONIA to the €STR following either (i) a fallback approach or (ii) an active transition approach before the end of 2021. When feasible, the working group recommends that market participants actively transition FROs referencing EONIA to €STR FROs before the end of 2021.
 - (b) The working group is aware that compensating the difference in present values (PVs) by cash may have advantages in terms of operational simplicity compared with a spread adjustment or an adjustment of the fixed leg. However, market participants should individually decide on the compensation approach which is most appropriate given their particular circumstances.

6. **Derivatives – collateral remuneration rate (CRR)**, see Chapter 4.1.2 for details as well as Recommendation no. 4:
 - (a) **Discounting:**
 The working group recommends clean discounting for cleared derivatives and, when feasible, also for non-cleared derivatives.
 The working group encourages the progressive phasing-out of legacy books discounted using EONIA. This is meant to ensure that EONIA-discounted trades are moved to the €STR as quickly as possible.
 - (b) **Compensation:**
 Discounting and compensation are interlinked. The working group's preferred methodology for discounting is using €STR flat. With respect to compensation, the working group is aware that, compared with alternative ways, exchanging the difference in PVs by cash may have advantages in terms of operational simplicity. However, market participants should individually decide on the compensation approach which is most appropriate given their particular circumstances.
 In cases where the exchange of the PV difference via cash or any other suitable solution is operationally difficult to execute, it is recommended that the discounting methodology first be moved to the €STR + 8.5 basis-point spread until a move from the €STR + 8.5 basis points to €STR flat could be handled without difficulty.
 - (c) **Date for switching the discounting curve from EONIA to the €STR:**
 For cleared trades, the working group recommends that central counterparty clearing houses (CCPs) align their discounting switch dates as much as possible to transition from an EONIA discounting regime to a €STR discounting regime, which would represent a “big bang” approach for cleared markets. In addition, the CCPs are recommended to set the discounting switch date as early as possible, preferably towards the end of the second quarter of 2020.

For bilateral credit support annexes (CSAs), a phased approach is recommended to cater for individual discounting/compensation considerations. Market participants are encouraged to start this process as early as possible. The working group recognises the need to communicate these changes in an effective manner in order to achieve a successful transition.

7. **Derivatives – link between FRO and CRR adjustments in contracts**, see Chapter 4.1.3 for details as well as Recommendation no. 4:

- (a) The working group recommends avoiding the use of dual-strap curves where the projection and discount curves differ as this should reduce the potential for price disputes.
- (b) The working group expects the large-scale change in discounting to drive most bilateral conversations on the FROs for EONIA legacy contracts, and recommends that conversions be as closely aligned with the change in cleared derivatives as possible.

8. **Derivatives – swaptions**, see Chapter 4.1.4 for details as well as Recommendation no. 4:

Caution is required when valuing options on derivatives with physical settlement as after the discounting switch date the option refers to a €STR-discounted derivative, which triggers re-evaluation and compensation measures (see Chapter 4.1.3 for more details as well as Recommendation no. 16(h)).

9. **Securities**, see Chapter 4.2 for details as well as Recommendation no. 4:

- (a) Market participants should introduce all necessary modifications in order to be able to issue, buy, trade and manage new securities indexed to the €STR and should avoid issuing new securities indexed to EONIA with maturities going beyond the transition period.
- (b) Even if unlisted securities are not within the scope of the EU Benchmarks Regulation (BMR), the working group recommends that market participants apply the transition approach designed for and applied to listed securities referencing EONIA to unlisted securities referencing EONIA as well.

10. **Secured cash products**, see Chapter 4.3 for details as well as Recommendation no. 4:

- The practicalities of the EONIA-€STR transition for non-cleared repo markets have been discussed at length by the European Repo and Collateral Council (ERCC) and the ERCC Operations Group of the International Capital Market Association (ICMA).⁶ The ERCC has agreed on the following recommended best practice to be followed from 1 October 2019 onwards:

⁶ See the ICMA ERCC Committee's memorandum entitled "[Repo market best practice with respect to the transition from EONIA to €STR](#)", July 2 2019.

- The interbank market should transact purely on a fixed rate basis (“classic repo”) and should no longer use floating rate repos.
- In the case of non-interbank transactions (such as dealer-to-client), where firms agree to transact on a floating rate basis (using EONIA or the €STR), best practice will be to apply the fixing of the penultimate accrual date of the transaction to the final (repurchase) date (i.e. “crystallising” the penultimate fixing into a fixed rate for the final business day). This will allow parties to send timely settlement instructions for the repurchase leg of the transaction.
- Where parties transact on a floating basis, using the crystallisation methodology, this will create discrepancies between the repurchase price calculated and settled by the parties and the repurchase price that would have applied had it been possible to instruct after the final fixing. In this instance, the disadvantaged party can elect to claim the difference from the advantaged party, so long as the difference is equal to or greater than an agreed threshold per transaction (with the exact amount to be determined by the ERCC in the coming weeks following further discussion).
- Any claim should be made immediately (ideally on the repurchase date, once the final fixing is known), and any reimbursements should be made on the business day following the repurchase date. Ideally, any claims or reimbursements made with respect to the same day should be made in aggregate. In any event, any claims or reimbursements should be made no later than 30 days after the repurchase date.

11. **Unsecured cash products**, see Chapter 4.4 for details as well as Recommendation no. 4:

- (a) Given that current accounts and savings accounts are mass products and clients’ knowledge of the EONIA-€STR transition differs widely from country to country, a systematic outreach strategy is essential. Institutions will need to provide timely and precise information to all clients whose contracts are linked to products affected by the €STR transition.
- (b) For swingline loans, when referencing the €STR directly in new contracts, market participants should consider whether any compensation mechanism is required.

12. **Investment funds**, see Chapter 4.5 for details as well as Recommendation no. 4:

For funds using EONIA as a benchmark or a hurdle rate (e.g. money market funds, liquid strategies and total return/absolute strategies funds), the transition from EONIA to the €STR will require amendments to the calculation formulas and operational procedures as well as adjustments to the corresponding systems used by fund administrators. It will also trigger prospectus updates.

13. **Funds transfer pricing (FTP) models**, see Chapter 5.1 for details as well as Recommendation no. 4:

- (a) In the context of FTP models, market participants often use term rates such as EURIBOR. However, if market participants use EONIA as the base rate in the FTP framework, they should consider replacing EONIA with the €STR. Market participants need to keep in mind that the €STR is a bid rate while EONIA is an offered rate (which is one of the reasons for the 8.5 basis-point spread). Therefore liquidity premium calculations need to be corrected accordingly.
- (b) Market participants using EONIA in their FTP models should create a transition plan. Such a plan should cover all relevant FTP-related systems and policies and should involve all relevant internal departments and functions.

14. **Interest rate curve construction models**, see Chapter 5.2 for details:

It is recommended to use a single curve for valuation purposes per counterparty for all types of contract (i.e. new and legacy contracts). However, the working group acknowledges that during the transition period, when both EONIA and the €STR will be live, market participants may use different applicable interest rate curves, which gives rise to specific requirements with regard to operations, IT systems and valuation models that will take effect as at October 2019:

- an EONIA curve constructed from (sufficiently liquid) EONIA-based instruments;
- a “shifted EONIA curve” derived from the existing EONIA curve through a parallel shift by -8.5 basis points unless independent and liquid €STR instruments are available;
- a €STR curve constructed from (sufficiently liquid) €STR instruments;
- a “shifted €STR curve” derived from the existing €STR curve through a parallel shift of +8.5 basis points.

15. **Interest term structure models**, see Chapter 5.3 for details:

Given the wide variety of interest rate term structure models, the working group tried to identify the main challenges that are likely to apply for the majority of them. Market participants are encouraged to identify how their term structure models (e.g. input data, assumptions) will be affected by the transition from EONIA to the €STR and to monitor market developments to adjust the models in a timely and appropriate fashion.

16. **Discounted cash flow (DCF), derivatives pricing and derivatives value adjustment models**, see Chapter 5.4 for details:

- (a) The working group does not expect the transition to result in structural and conceptual changes in DCF models. The transition will, however, have an impact on input parameters and discounting curves used in models.
- (b) €STR-linked derivatives prices, while not readily available on the recalibration date, are expected to become progressively available. They will have to be consistent with the no-arbitrage condition.
- (c) Until the €STR swap curve becomes directly observable, the fixed spread relation between EONIA and €STR fixings can be applied to derive a full term structure for the €STR from EONIA-linked overnight index swaps (OISs).
- (d) Market makers, inter-dealer brokers and vendors are encouraged to publish stand-alone €STR OIS prices alongside EONIA as soon as possible after the recalibration date. This would allow market participants to start reducing their reliance on direct EONIA prices for modelling and discounting purposes and to directly monitor €STR and EONIA OIS prices during the transition.
- (e) Market participants should be aware that EURIBOR par swap rates will be affected due to the change in the discounting curve. However, it is also possible that the EURIBOR par rates as well as implied forward rates will be affected by the transition. The working group encourages market participants to consider that both scenarios could occur and may affect accounting and valuation models.
- (f) Market participants are recommended to assess both model valuation and compensation scheme impacts on their derivatives under bilateral CSAs.
- (g) Switching the PAI rate from EONIA flat to €STR flat will have an impact on non-linear interest derivatives such as caps/floors and swaptions. The working group expects that market quotes might change but implied market data should not be affected. However, market participants should be aware that the opposite cannot be entirely ruled out.
- (h) For options on derivatives with physical settlement, valuation could be more complex than just considering the constant premia or the constant implied market data schemes. If the option is, for instance, traded before the 1 October 2019 transition date but the exercise date falls after the migration of the CCPs or the bilateral counterparty to €STR remuneration/discounting, it should be taken into account that the option is written on a €STR-discounted underlying asset. See also Recommendation no. 8.
- (i) Valuation adjustment (xVa) models will need to be recalibrated to new market data. It should be noted that the use of xVa models is not limited to uncollateralised derivatives, and market participants should analyse their model to identify any necessary adjustments.

- (j) Given that the market widely uses the current EONIA OIS curve as input in discounting future cash flows related to assets or liabilities subject to fair value calculation, the working group recommends that market participants:
- monitor the corresponding derivatives market and its transition from EONIA-linked derivatives to the new €STR-based derivatives;
 - assess the impact on valuation models of switching from the EONIA OIS discounting curve to €STR OIS discounting, i.e. verify which market price of curve parameters might need to be recalibrated to current market prices (e.g. credit spreads that will be computed from comparable instrument market prices using a new discounting framework).

From a contractual standpoint, fallback provisions, where present, were often originally intended to address the temporary unavailability of EONIA instead of its permanent discontinuation. The development of robust fallback language that deals with the permanent discontinuation of contracts and transactions referencing EONIA can help to enhance legal certainty and reduce the risks stemming from its discontinuation as of 3 January 2022. Thus, as described in the EONIA to €STR legal action plan and working group recommendations⁷, the working group recommends that market participants implement a series of legal measures by asset classes in both new and legacy contracts and transactions referencing EONIA.

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The report discusses a variety of options to address the transition from EONIA to the €STR. Recipients of this report are responsible for making their own assessments as to the suitability of the various options discussed in the report. Recipients must continue to operate in an independent and competitive manner and they shall not use the content of this report to coordinate their activities in breach of applicable law.

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⁷ See the ECB's press release entitled "[Working group on euro risk-free rates seeks feedback on EONIA to €STR legal action plan](#)", 15 May 2019, and the working group's [recommendations on the EONIA to €STR legal action plan](#), 16 July 2019.

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2 Introduction

2.1 Background

Since its introduction in 1999 the euro overnight index average (EONIA) has been one of the most widely used interest rate benchmarks in the euro area. EONIA is used as a reference rate in financial instruments – spot contracts and overnight index swaps (OISs) – and also as a discounting curve for collateralised euro cash flows, including those referenced to the euro interbank offered rate (EURIBOR). The total notional amount of contracts referenced or valued using EONIA exceeds €100 trillion. This also illustrates that the liquidity of the EONIA-based OIS market is relatively high compared with other jurisdictions.

Due to its systemic importance, the European Commission added EONIA to the list of critical benchmarks on 28 June 2017 pursuant to Article 20 of the EU Benchmarks Regulation (BMR).⁸ Owing to its current methodology, EONIA is not compliant with the BMR⁹ and consequently, in its current form, EONIA cannot be used in new contracts after 1 January 2020.

2.2 The working group on euro risk-free rates

In September 2017 the European Central Bank (ECB), the Financial Services and Markets Authority (FSMA), the European Securities and Markets Authority (ESMA) and the European Commission established the [working group on euro risk-free rates](#) (hereinafter “working group”) to identify and recommend alternative euro risk-free rates. Such rates could serve as a basis for an alternative to current benchmarks used in a variety of financial instruments and contracts in the euro area. The [terms of reference of the working group](#) also include developing an adoption plan, and, if necessary, creating a transition plan for legacy contracts referencing existing benchmarks.

On 13 September 2018 the working group recommended the euro short-term rate (€STR) as the risk-free rate for the euro area.¹⁰ Following a public consultation, on 14 March 2019 the working group recommended that EONIA’s administrator, the European Money Markets Institute (EMMI), modify the current EONIA methodology to become the €STR plus a spread for a transition period, covering the time from the first

⁸ Commission Implementing Regulation (EU) 2017/1147 of 28 June 2017 amending Implementing Regulation (EU) 2016/1368 establishing a list of critical benchmarks used in financial markets pursuant to Regulation (EU) 2016/1011 of the European Parliament and of the Council.

⁹ 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.

¹⁰ See the ECB’s press release entitled “[Private sector working group on risk-free rates recommends ESTER as euro risk-free rate](#)”, 13 September 2018.

publication date of the €STR on 2 October 2019 until the end of 2021, to give market participants sufficient time to transition to the €STR.¹¹

EMMI announced on 31 May 2019 that, based on market feedback, it adopted the new methodology recommended by the working group, which will take effect on 2 October 2019.¹² EMMI also indicated that it will provide EONIA under the recalibrated methodology until 3 January 2022, the date on which EONIA will be discontinued. This date should act as an incentive for the market to fully adopt the €STR as EONIA's replacement. On the same day, the ECB announced the spread between the €STR and EONIA, based on the methodology recommended by the working group and adopted by EMMI for the recalibration of EONIA, to be used between 2 October 2019 and EONIA's discontinuation.¹³ The ECB calculated this spread at 0.085% (8.5 basis points) using daily EONIA and pre-€STR data from 17 April 2018 to 16 April 2019.

2.3 The sub-group on cash products and derivatives

To ensure a smooth transition from EONIA to the €STR, the working group set up a sub-group on cash products and derivatives (hereinafter “sub-group”) in April 2019. The sub-group is, among other things, tasked with investigating, on a product-by-product basis and from an operational and valuation standpoint, how to support market participants in their efforts to transition from EONIA to the €STR, in view of the discontinuation of EONIA as of 3 January 2022.

The sub-group members have a wide range of expertise and market experience as both providers and users of financial instruments and contracts referencing EONIA. Representatives from the ECB, the ESMA, the European Commission and the FSMA have observer status in the sub-group.

The sub-group's main objectives in relation to the transition from EONIA to the €STR have been to:

- identify system and infrastructure issues that might arise due to the transition, and provide guidance for market participants to mitigate such issues;
- identify use cases for the €STR in cash products;
- provide details on the discounting regime to enable the transition from EONIA to the €STR;
- design a possible methodology for closing out or transitioning legacy EONIA exposures, including, in particular, a possible compensation mechanism to smooth out the effects of the transition from EONIA to the €STR.

¹¹ See the ECB's press release entitled “[Working group on euro risk-free rates recommends transition path from EONIA to €STR and €STR-based forward-looking term structure methodology](#)”, 14 March 2019.

¹² See EMMI's press release entitled “[EMMI publishes stakeholder consultation feedback summary on recommendations for EONIA by the euro risk-free rates working group](#)”, 31 May 2019.

¹³ See the ECB's press release entitled “[ECB provides a one-off spread between €STR and EONIA](#)”, 31 May 2019.

2.4 Structure of the report

The drafting of this report was divided among all sub-group members to take advantage of their wide range of expertise. Conference calls were held on a weekly basis and drafts were open for comments from the sub-group and working group members. The report was endorsed by the working group on 12 August 2019.

In addition to the Executive Summary, the report has three main parts:

Chapter 3, entitled “Moving from T to T+1 publication”, discusses the implications of the change in the publication time of the recalibrated EONIA that will take effect on 2 October 2019, when the €STR will be published for the first time. It also presents recommendations for market participants on how to deal with this change.

Chapter 4, entitled “Product-specific transition recommendations”, offers guidance on how to mitigate the implications for products and procedures in order to smoothen the transition from EONIA to the €STR.

Chapter 5, entitled “Model-specific transition recommendations”, analyses implications for models and discusses recommendations with a view to smoothening the transition from EONIA to the €STR.

3 Moving from T to T+1 publication

3.1 Timeline

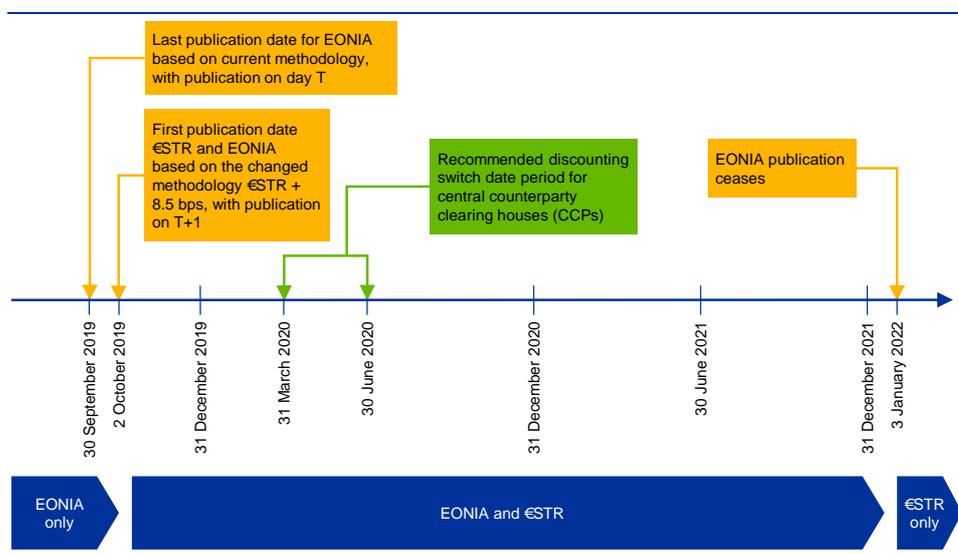
On 2 October 2019 the ECB will start publishing the €STR (see Figure 2). The €STR will be calculated based on the data reflecting trading activity on day T and published by the ECB on the next TARGET2 business day T+1 at 08:00 CET.¹⁴

On that same date, EONIA will be recalibrated as the €STR plus a fixed spread of 8.5 basis points. Given the dependency on the €STR, the publication time of EONIA will then also change from 19:00 CET on T to 09:15 CET on T+1.¹⁵ The transition phase will last until 3 January 2022, after which date EONIA will be discontinued.

The change in the publication time will have several implications for market participants and users of EONIA and of the €STR. The working group therefore recommends that market participants take any steps necessary to prepare for the change in the publication time from T to T+1 on 2 October 2019 – when both the €STR and the recalibrated EONIA will be published for the first time.

Figure 2

Timeline for the transition from EONIA to the €STR



Recommendations and observations for market participants to prepare for the changeover of EONIA's publication from T to T+1 on 2 October 2019:

1. As a first important step, market participants are encouraged to:

¹⁴ See the ECB's press release entitled "[ECB announces publication time for euro short-term rate \(€STR\)](#)", 11 July 2019. More information on the €STR can be found on the [ECB's website](#).

¹⁵ See EMMI's press release entitled "[EMMI publishes stakeholder consultation feedback summary on recommendations for EONIA by the euro risk-free rates working group](#)", 31 May 2019.

- Screen their inventory of affected transactions and system environments to assess the modifications needed to cope with the change in EONIA's publication time from 19:00 CET on T (until 30 September 2019) to 09:15 CET on T+1 (from 2 October 2019).
- Prepare relevant teams for enhanced oversight during the cutover period to ensure that the change in the publication time of the rate does not trigger process failures.
- Design a communication strategy geared towards internal and external stakeholders (clients in particular) to ensure awareness of impending changes – especially when publication times are referenced in bilateral confirmations or contracts.

Re-publication event

If errors are detected following the publication of the €STR that affect it by more than 2 basis points, the ECB will revise and re-publish the €STR on the same day at 09:00 CET.¹⁶ Once EONIA is based on the €STR + 8.5 basis points, starting on 2 October 2019, EMMI will publish EONIA at or shortly after 09:15 CET.¹⁷

Market participants should treat the re-publication of the €STR as an event that is not likely to occur often, align their main processes to the 08:00 CET (€STR) and 09:15 CET (EONIA) publication times and maintain exceptional procedures for €STR re-publication events.

Recommendations and observations for market participants to prepare for the changeover of EONIA's publication from T to T+1 on 2 October 2019:

2. Market participants are encouraged to align their main processes with the 08:00 CET publication time for the €STR, and 09:15 CET for EONIA, respectively, and maintain exceptional procedures for €STR re-publication events.

3.2 Implications for operational procedures

The shift of EONIA's publication time from 19:00 CET on T to 09:15 CET on T+1 will not affect EONIA's availability via the usual distribution channels or its unique identifiers on platforms. For instance, on Bloomberg, if today <EONIA Index> identifies the euro overnight index average relative to the overnight period between T and T+1

¹⁶ See the ECB's press release entitled "[ECB announces publication time for euro short-term rate \(€STR\)](#)", 11 July 2019.

¹⁷ See EMMI's press release entitled "[EMMI confirms publication time for recalibrated EONIA](#)", 24 July 2019.

published at 19:00 CET on T, then on 2 October 2019, <EONIA Index> will provide the euro overnight index average relative to the overnight period between T and T+1 published at 09:15 CET on T+1. The same applies to the publication of Eonia= on Reuters.

Changing the publication time from T to T+1 does not lead to time series gaps. In other words, even though the recalibrated EONIA is published at 09:15 CET on T+1, it still represents the annualised interest rate that is on average charged overnight between T and T+1. This is true even for Tuesday, 1 October, when no EONIA fixing will be published (the rate for the previous night, from 30 September to 1 October, is published on 30 September, and the rate for the night from 1 October to 2 October is published on 2 October). Therefore, the shift to T+1 does not lead to any gap in the historical data series for either EONIA or the associated interest rate curves.

Other data-related implications:

- All reference data systems which consume and distribute monikers need to be changed (e.g. timing, naming convention).
- FpML¹⁸ specifications and schemes need to be updated.
- FpML specification and schema updates are expected to be accepted by swap data repositories (SDRs) and ANNA-DSB¹⁹ soon afterwards.

Recommendations and observations for market participants to prepare for the changeover of EONIA's publication from T to T+1 on 2 October 2019:

3. Market participants should be aware that the change in the publication time will not affect the availability of EONIA on the usual distribution channels; the unique EONIA identifiers on platforms will also remain the same. In addition, the change of the publication time will not create time series gaps, as EONIA published on 2 October will represent transactions executed on 1 October 2019.

3.3 Risk and finance

Having analysed what the change in the publication date might imply for finance and risk models, the working group concludes that T+1 publication mainly affects data storage processes. Hence, all fixing input data sources should be updated and set to register data available at the new fixing time.

¹⁸ FpML® (Financial products Markup Language) is the open source XML standard for the electronic dealing and processing of (over-the-counter) OTC derivatives. It establishes the industry protocol for sharing information on, and dealing in, financial derivatives and structured products. See <https://www.fpml.org> for more information.

¹⁹ The ANNA Derivatives Service Bureau (DSB) is a fully automated generator of International Securities Identification Numbers (ISINs) for OTC derivatives. See <https://www.anna-dsb.com/> for more information.

In addition to the model-specific recommendations in Chapter 5, please note that work in this respect is ongoing by sub-group 6 of the working group, which deals with financial accounting and risk management.²⁰

3.4 Collateral and settlements

For bilateral trades, any calculation process involving EONIA will have to be postponed until the next morning once EONIA's publication has changed to T+1. Such processes relate, for instance, to the calculation of prices, coupons, interest or collateral remuneration and involve contractual settlement dates. Postponing the calculation until the next day may not be possible for all instruments. The combination of a delay in the calculation time and an unchanged settlement date will effectively shorten the time window between the moment the settlement prices and amounts are calculated and the dates when the amounts must be exchanged, which increases operational risks. Firms using overnight batch processing to calculate settlement amounts or prices will have to reschedule their IT systems and processes to the next morning, effectively shortening the time window between calculation and settlement. The operational risk will depend on the volumes and diversity of contracts, the adaptability of the IT systems, the frequency of EONIA-based calculations (e.g. daily, monthly, annually) and the possibility that the settlement dates may be delayed.

For cleared trades, EONIA fixing is mainly used for floating rate options (FROs) of euro-denominated overnight index swaps (OISs), for the settlement of EONIA futures, for collateral remuneration in connection with variation margin (VM) (i.e. price alignment interest or PAI), and in some cases also for the remuneration of cash initial margin (IM).²¹ Internal systems used for FRO calculations will be affected by the shift of the fixing delivery date from T to T+1. In the systems, the fixing time will have to be mapped to the appropriate period of reference in order to ensure that the cash flow on OIS trades is calculated correctly. Moreover, for EONIA futures, currently the last trading day and the last settlement date coincide (last EONIA fixing published on that day T). After the transition to T+1, EONIA relative to the overnight period between T to T+1 will only be published on T+1, and therefore the final settlement price can only be determined on T+1. This means that the final settlement date of EONIA futures is shifted to T+1.

Remuneration of VM (PAI) is currently calculated daily in conjunction with the VM using end-of-day market data on T (settlement of VM and PAI is on the next business day following T). Once EONIA is published on T+1, (i) PAI can either continue to be calculated during the end-of-day processing on T using EONIA fixings as at T published at 09:15 CET (last available EONIA) or (ii) the PAI batch processing needs to be delayed to the next business day following T (i.e. T+1). Delaying parts of the end-of-day process to the next business day might significantly complicate settlement procedures and the timely overnight distribution of member reports and reconciliation processes on both the CCP and member side. While CCPs might decide differently

²⁰ The analysis will be published on the [ECB's website](#) in the next months.

²¹ For a more in-depth analysis, see the product-specific information in Chapter 4.1 "Derivatives".

this time, there are some CCPs that apply the “last available rate” option to PAI calculations for other currencies with a T+1 rate publication, such as SONIA (GBP) and the federal funds rate (USD). Therefore, for VM remuneration, market participants are recommended to use the last available fixing rate for PAI calculations and continue to settle on T+1.

In addition to these considerations, product-specific analysis as detailed below in Chapter 4 points to the following recommendations and observations regarding settlement defaults:

4. The working group recommends that market participants consider adjusting the default settlement time (i.e. the lag between the last fixing date and the settlement date) in certain cases, as follows:

- **Derivatives/money market transactions:** Currently, EONIA-related transactions are, as a rule, settled on T+1. It is recommended that market participants switch to T+2 settlement, also to accommodate international (in particular Asian) market participants' operational requirements. Please note that, for money market transactions, this may entail a one-day difference between the payment dates of the nominal and the interest. See also Chapter 4.1 and Recommendations no. 5 to 8.
- **Cleared derivatives:** For the remuneration of variation margin, market participants are recommended to use the last available fixing rate for price alignment interest (PAI) calculations and continue to settle on T+1. See also Chapter 4.1 and Recommendations no. 5 to 8
- **Securities:** As coupon payments are currently calculated using the T-1 value, no changes are expected in the current practice. Nevertheless market participants should adapt their settlement procedures and corresponding valuation and accounting systems to the new publication time, taking into account that they will have less time to perform the related operational procedures. Particular attention should be paid to the calculation of accrued interest in the secondary market depending on whether a transaction occurs before or after 09:15 CET. Given that the settlement of deals in the secondary market is mainly based on bilateral agreements and is managed manually rather than automated, the current process is expected to remain mostly unchanged. However, market conventions might change in the future, reflecting changes in volumes and traded instruments as markets evolve. Therefore, the working group recommends that trade and user associations analyse market conventions with a view to providing market participants with guidance on how the conventions related to EONIA-based securities may evolve due to the transition from EONIA to the €STR and on whether a common standard will be required in the future. See Chapter 4.2 for details as well as Recommendation no. 9.
- **Secured cash products (mainly floating rate repos):** Market participants

are recommended to maintain same-day settlement for the repurchase leg by using the last available fixing rate (difference from “final” next-day fixing can be claimed). See Chapter 4.3 for details as well as Recommendation no. 10.

- **Unsecured cash products:** See Chapter 4.4 as well as Recommendation no. 11.
- **Current accounts, corporate and retail facilities and overdraft facilities:** According to the current market standard, the customer receives the interest payment on the next day of the interest period, i.e. on T+1. Given that the change in the publication time will shorten the time window available for the settlement, a different approach may have to be adopted. In order to preserve the economic reality of these products, the working group recommends that market participants postpone the calculation of the corresponding interest until the new interest period (for accounts with monthly or quarterly settlement). Alternatively, the most recently published interest rate can be used (for accounts with daily settlement). Operational and contractual frameworks may, however, cause market participants to adopt different solutions and arrangements. Therefore, market participants should individually find a way to convert existing and new current account contracts to EONIA/€STR T+1, taking into account their operational procedures and the existing contractual conditions.
- **Swingline facilities:** The current wording of the LMA recommended form documentation states that interest on a swingline loan based on EONIA is payable on the business day following an interest period. Consequently the shift to T+1 should not require operational changes. However, in some cases, parties may have relied on EONIA being available at 19:00 CET on T so that the change in the publication time may result in a time constraint for the interest settlement process and might lead to a delayed payment to preserve the economic reality of the transaction. Thus market participants are recommended to assess their internal processes related to swingline facilities to establish whether the move to a T+1 publication time will cause operational issues and then update systems and processes accordingly. Moreover, it is important to consult borrowers about whether the change to a T+1 publication time will cause any operational or process issues.
- **Investment funds:** For investment funds linked to EONIA, the T+1 publication will affect net asset value (NAV) calculations and redemption/subscription processes, creating an operational challenge. At the same time, it is not materially possible to delay the publication of the NAV or review the process for redemptions and subscriptions as used by all distributors. Therefore, the process and timing for calculating the NAV cannot be modified. This implies that EONIA-based products will reference the latest available EONIA, in most cases referencing T-2 transactions.

Market participants are recommended to assess their NAV-related processes (e.g. valuation, risk management) and procedures as well as their related IT systems in order to identify the implications of the shift to T+1 and to implement any necessary adjustments before 2 October 2019. When required, market participants should engage with national competent authorities and/or regulators and communicate changes in the NAV-related processes. See Chapter 4.5 for details as well as Recommendation no. 12.

- **Funds transfer pricing (FTP) models:** Once publication has shifted from T to T+1, it is recommended that users and providers of funds on T apply the rate published at 09:15 CET on T+1. Alternatively, if the one-day lag is not manageable from an operational point of view, they could use the rate of the previous day (rate on value date T-1 that is published on T). In the case of monetary policy decisions or similar events, this could be managed by using an override. See Chapter 5.1 for details as well as Recommendation no. 13.

3.5 Testing, documentation and client communication

CCPs and exchanges have a standard set of documentation, member testing environments, communication channels, and release cycles. Documentation updates and client outreach are also relevant for cash products and investment funds. The changes relating to T+1 will be rolled out according to this general framework as has been successfully done for T+1 changes in other jurisdictions. Client communication plays an essential role in this process. To this end, it is recommended to identify and spell out all changes in detail from a client's point of view and communicate the transition process both in a transparent way and as far in advance as possible.

4 Product-specific transition recommendations

In this chapter the working group presents product-specific transition recommendations, in particular for those products that would be affected by the transition period between 2 October 2019 and 3 January 2022.

4.1 Derivatives

The working group investigated the impact of the EONIA-€STR transition on two key areas for derivatives and the links between them:

1. **Floating rate options (FROs):**

First, an EONIA FRO may be referenced within derivatives transactions and used to determine the floating amount payable (a “EUR-EONIA-OIS- COMPOUND” self-compounding FRO is referenced in EONIA OISs)²²; in other words, here the transition will have an impact on the projection curve. Please see Chapter 4.1.1 for details.

2. **Collateral remuneration rate (CRR):**

Second, EONIA is widely used as the remuneration rate for EUR cash collateral, which in turn determines the discounting curve for the underlying exposure²³. Please see Chapter 4.1.2 for details.

3. **Link between FROs and CRR adjustments in contracts:**

The number of market participants using EONIA as their CRR (as defined within the ISDA/CSA) is far larger than the number using EONIA-linked derivatives, i.e. where an EONIA FRO is used in derivatives contracts. Furthermore, the timelines and incentives to transition for the adjustment of FROs may differ from those for the change of the rate applicable for the CRR. Please see Chapter 4.1.3 for details.

4.1.1 Floating rate option transition

The working group distinguishes between the following three time periods when assessing the impact of the EONIA-€STR transition on FROs:

- **Current status quo: EONIA OISs (until 2 October 2019)**

²² The term floating rate option (FRO) is a term defined under the 2006 ISDA Definitions and refers to the methodology used to determine the floating rate that is applicable to a swap transaction for a particular day. See also Annex 1.

²³ See Chapter 4.2 of the “[Report by the working group on euro risk-free rates on the transition from EONIA to ESTER](#)”, revised March 2019.

Only EONIA OISs can be entered into. If a spread is entered into over the floating rate under the 2006 ISDA Definitions and the current EONIA self-compounding FRO referenced in EONIA OISs, this spread is not compounded and will be added after the determination of the floating rate as set out in the FRO definition, unless otherwise specifically agreed.

- **From 2 October 2019 to 3 January 2022: EONIA OISs + €STR OISs**

The introduction of the €STR will lead to two changes:

- (b) EONIA will become dependent on the €STR and its methodology changes to the €STR + 8.5 basis points. For EONIA OISs that reference the “EUR-EONIA-OIS-COMPOUND” self-compounding FRO, the €STR + the 8.5 basis-point spread will be compounded daily.
- (c) €STR OISs will be introduced, and ISDA will publish a €STR self-compounding FRO (similar to the EONIA self-compounding FRO). Under the 2006 ISDA Definition any added spread will not be compounded and will be added after the determination of the rate as set out in the FRO definition.

- For derivatives referencing EONIA with maturities beyond 2021, counterparties will need to define and agree how to proceed after EONIA is discontinued. The approaches could broadly fall into two categories:

- (a) **Fallback approach**, i.e. to introduce and rely on contractual fallbacks to EONIA (e.g. the €STR + 8.5 basis points) in the contract.

Under this approach, references to EONIA in derivatives contracts would be deemed to be references to the €STR + 8.5 basis points. Therefore, for EONIA OISs that reference the EONIA self-compounding FRO, the spread of 8.5 basis points is compounded, which will mitigate the PV impact.

- (b) **Active transition**, i.e. to agree on a process to actively transition the EONIA-based contract to a €STR-based contract (e.g. by changing an EONIA FRO to a €STR FRO).

Under this approach, legacy derivatives contracts would be amended so that the €STR FRO replaces the EONIA FRO, which would likely be accompanied by a process aimed at rebalancing any residual economic value transfer between parties. This could be achieved through one or a combination of the following mechanisms:

- (i) Replacing the EONIA FRO with a €STR FRO that is designed to include the 8.5 basis points in the compounding formula.
- (ii) Replacing the EONIA FRO with a €STR FRO (that does not include a spread) and agreeing on a cash compensation for neglecting the spread of 8.5 basis points.

- (iii) Replacing the EONIA FRO with a €STR FRO (that does not include a spread) in OIS trades and a subsequent rebalancing of the fixed rate of the trade so as to achieve P&L neutrality which will be approximately the “fixed rate minus 8.5 basis points”.

- **After 3 January 2022: €STR OISs only**

For new contracts only the €STR OISs – which will presumably follow the ISDA market standard (i.e. the €STR FRO) unless otherwise specifically agreed – can be entered into.

Legacy contracts converted under the corresponding fallback, however, would continue to compound the spread as part of the self-compounding EONIA FRO.

For contracts maturing beyond 2021, this raises the obvious question of (1) whether the FROs referencing EONIA should be actively transitioned in a structured manner to €STR FROs before 3 January 2022; or (2) whether the EONIA FROs should be generally left untouched and the affected derivatives should use the EONIA fallback provisions (if included in the contracts), which will be triggered as of 3 January 2022.

The coexistence of these two contract types, €STR flat and EONIA operating on its fallback, beyond 2021 raises several concerns:

- First, it will become more and more difficult to actively manage the legacy EONIA book past 2021 (with an active fallback of the €STR + 8.5 basis points after EONIA is discontinued on 3 January 2022) in parallel with the standard €STR book. Despite the fact that both represent almost identical exposures and can be hedged from a market risk perspective, actually closing out or netting any long-dated legacy trades might turn out to be difficult especially for small to mid-sized market participants. A similar situation could arise after 2021 in the context of cleared markets where CCPs might be required to close out remaining legacy EONIA swaps in the case of a clearing member’s default.
- Second, this would require many market participants and CCPs to carry out a dual setup for the €STR and EONIA operating under its fallback (€STR + 8.5 basis points) until the remaining EONIA derivatives have expired (potentially 20+ years).

For these reasons, the working group recommends market participants to actively transition EONIA FROs to €STR FROs before the end of 2021.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

5. Derivatives – floating rate options (FROs):

- (a) In order to adjust the FROs in existing EONIA contracts, market participants

are encouraged to transition from EONIA to the €STR following either (i) a fallback approach or (ii) an active transition approach before the end of 2021. When feasible, the working group recommends that market participants actively transition FROs referencing EONIA to €STR FROs before the end of 2021.

- (b) The working group is aware that compensating the difference in present values (PVs) by cash may have advantages in terms of operational simplicity compared with a spread adjustment or an adjustment of the fixed leg. However, market participants should individually decide on the compensation approach which is most appropriate given their particular circumstances.

4.1.2 Collateral remuneration rate and discounting transition

Clean vs. dual discounting

During the period in which EONIA and the €STR will co-exist, it will be possible to use either (i) a clean discounting regime (single discounting curve is used with a given counterparty and specifically with a given CCP) or (ii) a dual discounting regime (two discounting regimes are in simultaneous operation with a given counterparty, and specifically with a given CCP).

Under a dual discounting regime, users can choose to discount different contracts using EONIA or €STR curves. The drawbacks of a dual framework include: fragmentation, discounting risk introduced by the fixed spread of 8.5 basis points, decreased price transparency and increased operational risk due to the necessity for systems and processes to support dual discounting. Therefore, the progressive phasing-out of legacy books under EONIA should be encouraged where necessary, with the aim of ensuring that a maximum number of EONIA-discounted trades is moved to the €STR as soon as possible.

In March 2019 the working group therefore recommended single-counterparty clean discounting²⁴ to ensure a consistent valuation approach per client. As the €STR will be the preferred discounting curve, one of the advantages of clean discounting is that the liquidity of the €STR forward curve is expected to take off rapidly.

Choice of standard discounting regime and transition methodology

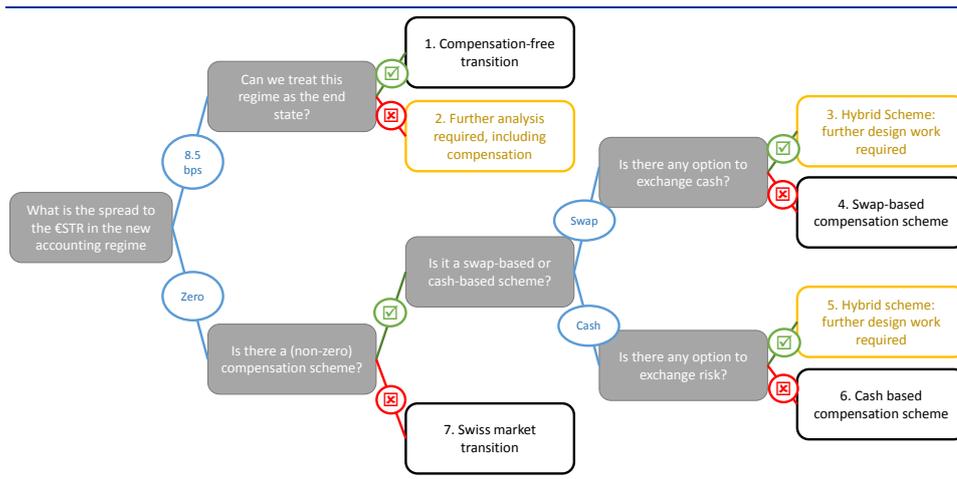
Under the assumption of a single standard discounting curve, we therefore face two choices once EONIA is discontinued:

²⁴ See the working group document entitled "[Recommendations of the working group on euro risk-free rates on the transition path from EONIA to the €STR and on a €STR-based forward-looking term structure methodology](#)", 14 March 2019.

- discounting at the €STR + 8.5 basis points;
- discounting at €STR flat.

As the following chart shows, the choice of discounting methodology determines whether compensation between counterparties needs to be sought. Several options are available (see Figure 3).

Figure 3
Choice of discounting methodology and options available for compensation



- **Discounting at the €STR + 8.5 basis point spread:** Discounting/CSAs are changed from EONIA to the €STR + 8.5 basis points.
- **Discounting without spread:**
 - (a) Scenario 6: Cash-based compensation scheme – counterparties agree bilaterally on a cash compensation amount.
 - (b) Scenario 4: Basis swap – counterparties exchange EONIA-€STR basis swaps to offset the PV and risk impact of the change in discounting.
 - (c) Scenarios 3 and 5: These hybrid schemes would require further design work.
 - (d) Other – another instrument to transfer value.

See Table 1 for an analysis of the pros and cons of each discounting regime (+8.5 basis points or flat).

Table 1

Pros and cons of €STR discounting regimes

(+8.5 basis points or flat)

	Pros	Cons
With spread	<p>This approach would involve changing the remuneration rate on collateral from EONIA to the €STR + 8.5 basis points in the CSA of the relevant derivatives portfolio</p> <p>Removes the need for a compensation mechanism for the change in CRR as EONIA and the €STR + 8.5 basis points will be economically identical after 2 October 2019.</p> <p>It has no impact on other risk parameters of the trade.</p> <p>The €STR + 8.5 basis points could act as a potential fallback in case no consensus can be reached for the switch to €STR flat.</p>	<p>Continued hedging of discount spread delta may face small inefficiencies from the non-inclusion of an 8.5 basis-point spread into compounding on any new €STR hedges after the transition period, i.e. beyond January 2022.</p> <p>Using a spread over the €STR may lead to implications with regards to the negative rates protocol.</p> <p>It could result in a lack of alignment with the cleared model where the €STR without a spread would be the most likely choice.</p> <p>Some market users may struggle with the implementation of a spread into their IT systems, both as a remuneration rate on collateral and for valuation purposes; this may be particularly challenging if two separate curves have to be established due to new contracts being entered into at the €STR.</p> <p>Trading new €STR swaps on a €STR + 8.5 basis point CSA will lead to undesirable convexity effects.</p>
Without spread	<p>This approach would have the advantage of being aligned with the most likely choice for the cleared market and would simplify the number of curves to be maintained.</p> <p>The use of a standard compensation mechanism by clearing houses would reassure less sophisticated bilateral counterparty by making these calculations transparent and easy to apply, and would generally provide clarity to the market.</p> <p>This would also reduce the complexity hurdle for the use of a compensation mechanism.</p> <p>For new transactions where the €STR is the floating rate option under this CSA there is an implicit benefit from a pricing perspective of projecting and discounting at the same rate. The need to dual-strap curves where the projection and discount curves are different is then avoided, which should reduce the potential for price disputes.</p>	<p>This approach will create a requirement for adjustments/compensation.</p> <p>The change of discounting is expected to affect other sensitivities of the underlying derivatives (e.g. DV01, measure of the interest rate risk). This will also affect other cross-currency sensitivities in the case of non-EUR derivatives collateralised using EUR cash.</p> <p>Additionally, the change of the collateral remuneration rate to €STR flat may require rebalancing trades to account for the change in discounting. This could constitute a lifecycle event and could bring the rebalancing trades into the scope of regulations such as EMIR to centrally clear depending on the counterparty's categorisation.²⁵</p> <p>Equally, this may delay the repapering exercise for those participants who are not operationally ready to use €STR curves in their systems. By contrast, they may be more comfortable with changing to the €STR + 8.5 basis points earlier as operationally there is no change as they are able to continue to use EONIA discounting in their systems until the end of 2021.</p> <p>Significant coordination efforts required.</p>

Counterparties must carefully evaluate these impacts and decide on the required compensation size and mechanism.

Compensation

Compensation can be achieved by exchanging the change in the net present value (NPV) of the transaction(s) to be migrated either in (a) cash or via (b) a derivative that accounts for the change in risk, namely an EONIA/€STR basis swap (see also Annex 2):

- (a) Cash compensation may represent the most intuitive tool to exchange the change in PVs and would be also easier to implement from an operational

²⁵ In this regard, the working group recently requested confirmation from the European Commission and the ESMA that neither the incorporation of fallback provisions nor the amendment and replacement of EONIA would impose a margin or clearing obligation under the European Market Infrastructure Regulation (EMIR). See the letter from the working group on “[IBOR Transition and EMIR grandfathering](#)” dated 2 July 2019.

point of view, but may cause second-order effects, e.g. for market participants holding dirty CSAs or no CSAs.

- (b) Compounding effect aside, an EONIA/€STR basis swap effectively represents a stream of fixed cash flows in the form of 8.5 basis points. A basis swap would represent the initial risk transfer at the time of changing EONIA to the €STR. This is expected to introduce further complexities. Several considerations would need to be analysed, including:
- (i) The convexity effect from the compounding element of the 8.5 basis-point spread.
 - (ii) While the basis swap initially meets the risk from a change from EONIA to the €STR flat, this risk changes over time and therefore the basis swap would need to be adjusted/actively managed.
 - (iii) Only a limited number of market participants will be able to manage a risk transfer via basis swap.
 - (iv) Furthermore, from an accounting perspective, it must be ensured that the basis swap is aligned with the accounting of the original derivative. Challenges may arise in this regard for some market participants as the basis swap may not meet the definition of a derivative under IFRS (this consideration should be less relevant for broker-dealers under a fair value business model. The fair value option may be applied for liability hedges).²⁶
 - (v) The basis swap itself is more complex to design, and for CCPs would likely involve a third-party vendor.
 - (vi) The legal framework would need to be reviewed.

The working group recommends clean discounting for cleared trades. Discounting and compensation are interlinked. The working group's preferred methodology for discounting is using €STR flat. With respect to compensation, the working group is aware that, compared with alternative ways, exchanging the difference in PVs by cash (scenario 6) may have advantages in terms of operational simplicity. However, market participants should individually decide on the compensation approach which is most appropriate given their particular circumstances.

Only in case the exchange of PV via cash or any other suitable solution is operationally difficult to execute is it recommended that the discounting methodology is moved first to the €STR + 8.5 basis-point spread (scenario 1 – compensation-free transition) until that point of time when a move from the €STR + 8.5 basis points to €STR flat (scenario 6) could be handled without difficulty.

²⁶ Please refer to the upcoming work of the working group's sub-group 6 for more details.

Timing of the change of discounting regime from EONIA to the €STR

The working group identifies two extreme cases for the timing of the change of discounting regime from EONIA to the €STR. Suitable solutions will most likely lie somewhere in between, and may differ for different market participants.

- **“Big bang” approach** for the whole market – documentation which changes margin interest away from EONIA is implemented on a single, predetermined date for both CCPs and bilateral contracts.
 - Market participants could agree to amendments to CSAs which only become effective at a single point in the future. This would give the market a longer period of time to renegotiate bilateral documentation, but it would only kick in at a single point.
- **Phased approach** – market participants agree bilaterally to amend their documentation as and when they feel prepared to do so.
 - Resourcing could be an issue for some larger market participants if they need to agree every single CSA bilaterally.
 - This could be limited to a short period of time (e.g. three months) or allowed to continue throughout the entire transition period.

In order to avoid undesirable CCP bases, the timing of discounting/PAI transition for CCPs should be as closely aligned as possible. It will be important to have a high degree of clarity about the transition methodology and compensation methodology. However, given the scope of the transition, there is a preference for a phased approach for bilateral documentation.

In particular, a time lag in switching from EONIA to €STR flat among different CCPs, multilateral trading facilities (MTFs)/swap execution facilities (SEFs) and third-party price providers may have unintended second-order effects, as outlined in the following (non-exhaustive) list:

- **Bloomberg:**
Bloomberg aims to follow CCPs in order to (i) adjust default discounting curves in the Swap Manager (SWPM), (ii) change their EUR swap tickers to €STR flat discounting and (iii) change bootstrapping of their forward curves to €STR flat discounting; clarity is required as to how Bloomberg would proceed if CCPs moved at different points in time.
- **ICE Swap Rate:**
Used for swap fixings (such as in cash-settled swaptions, for early termination events and constant maturity swaps), the ICE Swap Rate is a volume-weighted average of multiple MTFs and SEFs. Clarity from the ICE Benchmark Administration (IBA) is required to clarify what would happen if the various contributors do not move in sync.

- **Broker-dealers:**

Broker-dealers may change their discounting curve at a point (i) different from Bloomberg and (ii) different from multiple other pricing providers. This would create price uncertainty and mismatches, especially for the purposes of risk management if two trades or different components of a single trade change discounting at different times.

While there is a preference for a phased approach for bilateral documentation, minimising the time lag between the transitions of the stakeholders outlined above must therefore be a key priority.

It is noted that larger banks/dealers with a high number of CSAs that will be affected by the transition may favour a scalable solution with no economic impact, in order to facilitate a large-scale repapering exercise.

Additionally, for any second-order implications (e.g. change in par swap rate) and the indirect impact on other counterparties, the date on which the market standard switches from EONIA discounting to €STR flat should be coordinated.

See Table 2 for an overview of the pros and cons of a “big bang” approach.

Table 2
Pros and cons of a “big bang” approach

Pros “big bang”	Cons “big bang”
<p>Potential elimination of disputes relating to compensation schemes and collateral exchanges.</p> <p>Less repapering effort for CSAs.</p> <p>All instruments are subject to a unique discounting regime for all counterparties and corresponding netting sets from a given date after a short transition period during which there may be misalignments.</p> <p>A potentially short switching time frame (to be agreed by market participants) would allow counterparties to assess and certify the net present value delta due to the discounting curve switch for all derivatives under the corresponding CSAs.</p> <p>More internal flexibility to choose contingency solutions.</p>	<p>Even if the switch happens on the same date (T), some days might be needed to assess and certify the net present value delta due to the discounting curve switch for all derivatives under the corresponding CSAs.</p> <p>In the case of a cash-settled compensation scheme, this NPV delta will need to be paid on T+1 or T+x – after the corresponding checks have been performed – by the counterparty which observes an NPV increase. On T+1 margins will be exchanged in the new discounting valuation framework.</p> <p>The adoption of the same compensation schemes over a short time frame might allow only partial netting of compensation cash flows of opposite signs.</p> <p>There may be some disputes regarding collateral exchanges during the switch.</p> <p>All instruments will be subject to a unique discounting regime for all counterparties and corresponding netting sets from a given date only after a long transition period during which there may be misalignments; the adoption of the same compensation schemes over a long time period will not allow partial netting of compensation cash flows of opposite signs.</p> <p>Negotiations on a bilateral basis for several counterparties might require major efforts from both a legal and an operational point of view.</p> <p>Some (hedging) instruments might be subject to different discounting regimes with different compensation schemes effective on different dates, thus avoiding the possibility of netting compensating cash flows of opposite signs.</p> <p>Issues might arise with respect to basis spreads among CCPs.</p>

Taking into account the pros and cons, the working group recommends for cleared trades that CCPs align their discounting switch date as much as possible to transition from an EONIA discounting regime to a €STR discounting regime using a “big bang” approach. In addition, the CCPs are recommended to set the discounting switch date as early as possible, preferably towards the end of the second quarter of 2020.

For bilateral trades, however, it is recommended that there be a phased approach to cater for individual discounting/compensation considerations. Market participants are encouraged to start this process as early as possible. The working group recognises the need to communicate these changes in an effective manner in order to achieve a successful transition.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

6. Derivatives – collateral remuneration rate (CRR):

(a) Discounting:

The working group recommends clean discounting for cleared derivatives and, when feasible, also for non-cleared derivatives.

The working group encourages the progressive phasing-out of legacy books discounted using EONIA. This is meant to ensure that EONIA-discounted trades are moved to the €STR as quickly as possible.

(b) Compensation:

Discounting and compensation are interlinked. The working group's preferred methodology for discounting is using €STR flat. With respect to compensation, the working group is aware that, compared with alternative ways, exchanging the difference in PVs by cash may have advantages in terms of operational simplicity. However, market participants should individually decide on the compensation approach which is most appropriate given their particular circumstances.

In cases where the exchange of the PV difference via cash or any other suitable solution is operationally difficult to execute, it is recommended that the discounting methodology first be moved to the €STR + 8.5 basis-point spread until a move from the €STR + 8.5 basis points to €STR flat could be handled without difficulty.

(c) Date for switching the discounting curve from EONIA to the €STR:

For cleared trades, the working group recommends that central counterparty clearing houses (CCPs) align their discounting switch dates as much as possible to transition from an EONIA discounting regime to a €STR discounting regime, which would represent a “big bang” approach for cleared markets. In addition, the CCPs are recommended to set the discounting switch date as early as possible, preferably towards the end of the second quarter of 2020.

For bilateral credit support annexes (CSAs), a phased approach is recommended to cater for individual discounting/compensation considerations. Market participants are encouraged to start this process as

early as possible. The working group recognises the need to communicate these changes in an effective manner in order to achieve a successful transition.

4.1.3 Link between FRO and CRR adjustments in contracts

In order to provide more clarity, a distinction should be made between transactions executed before and after the €STR begins to be published on 2 October 2019.

- Transactions entered into after 2 October 2019:

For new transactions where the €STR will be the floating rate option under a EUR cash CSA, there is an implicit benefit from a pricing perspective of projecting and discounting at the same rate, i.e. using a €STR CSA for €STR trades. The need to dual-strap curves where the projection and discount curves are different should then be avoided, reducing the potential for price disputes. However, new transactions may still be entered into using EONIA as a CSA index because of late adoption of the €STR as a CSA index by certain market participants depending on their readiness.

- Transactions entered into before 2 October 2019:

The situation becomes more complicated where existing EONIA-linked exposures sit on an EONIA-linked CSA. In this case, a transition mechanism must be agreed for both the CRR (which drives discounting) and the FRO. The two processes may be separate.

- (a) The working group expects the large-scale change in discounting to drive most bilateral conversations, and recommends that bilateral trades be as closely aligned with the change in cleared derivatives as possible. However, it may not be operationally feasible to change all FRO-linked contracts at exactly the same time.
- (b) Certain participants with EONIA-linked derivatives maturing beyond 2021 may prefer to rely on a fallback mechanism implemented via a multilateral protocol, rather than a more manual transition. This could reduce the need for a compensation mechanism as well as the potential for creating a lifecycle event that could bring these derivatives within the scope of EMIR central clearing provisions.
- (c) By contrast and as discussed above, relying on a fallback for the change in the remuneration rate away from EONIA is less likely due to the following economic implications of dual discounting which suggest the change could be implemented more proactively and closely aligned with clearing house action:
 - (i) a significant reduction in price transparency;

- (ii) reduced ability to compress trades with resulting balance sheet gross-up;
- (iii) a convexity mismatch between €STR flat and €STR + spread discounting;
- (iv) further pricing and risk implications for CSAs that reference multiple currencies and other “cheapest to deliver” collateral;
- (v) an effect on negative rates protocols in CSAs.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

7. Derivatives – link between FRO and CRR adjustments in contracts:

- (a) The working group recommends avoiding the use of dual-strap curves where the projection and discount curves differ as this should reduce the potential for price disputes.
- (b) The working group expects the large-scale change in discounting to drive most bilateral conversations on the FROs for EONIA legacy contracts, and recommends that conversions be as closely aligned with the change in cleared derivatives as possible.

4.1.4 Specific implications for physically settled and collateralised cash price swaptions

A number of euro-denominated swaptions will have settlement mechanisms which are either collateralised cash price or physically settled. The transition by clearing houses from an EONIA to €STR flat discounting regime could create a value transfer for those swaptions if this situation is not properly addressed.

More precisely, the European swaption market for euro-denominated swaps is based on three main types of settlement:

- Cash settlement (par yield curve – unadjusted): (almost) limited to legacy trades, has been deprecated as a standard for new EUR swaptions since 26 November 2018. Payoff at option expiry is computed as the present value of an annuity equal to the difference between the amounts that would be payable by the fixed rate payer under the underlying swap and the amounts that would be payable by the fixed rate payer if the fixed rate were the ICE Swap Rate. The discount rate used to calculate the present value is the ICE Swap Rate.
- Cash settlement (collateralised cash price): has been the market standard for new EUR swaptions since 26 November 2018. Payoff at option expiry also requires calculating the present value of the underlying swap, however, (i) if a mutually agreed clearing house is specified in the confirmation, discounting is at

a rate that would apply if the underlying swap was cleared at such a mutually agreed clearing house, or (ii) if no mutually agreed clearing house is specified, discounting is calculated from the rate specified in the collateral cash price matrix (for euro EONIA swaptions). Also, either party has the option of choosing to adjust the settlement if the underlying swap was to be cleared through such a mutually agreed clearing house (see Supplement 58 to the 2006 ISDA Definitions).

- Cleared physical settlement: at option expiry, upon exercise, the two counterparties will enter into a swap that is cleared via the mutually agreed clearing house (specified in the confirmation), or if no mutually agreed clearing house is specified in the confirmation, a clearing house agreed by the parties upon exercise.

If the relevant clearing houses switch the PAI interest from EONIA to the €STR, the swaps underlying current European swaptions will change their contractual constraints and should be revalued using €STR discounting. Consequently, swaption prices will have to be recalculated by the counterparties as well. If no compensation scheme were agreed, P&L impacts could be generated by revaluing trading books with modified PAI conditions. These P&L impacts would be present even if counterparties decided to switch the CSA collateral rate to mimic central counterparties.

The impact on PV is summarised in Table 3.

Table 3
Impact on present value by settlement type

Settlement type	Present value impact
Cash par yield	Caused by a change in the relevant swap index only As the difference between EONIA and the €STR is small (0.085%), the impact would probably be material only for deep in-the-money trades
Cash collateralised/physical delivery	Caused by a change in the par rate of the underlying swap and a change in the discounting of the swap's flows at expiry As the difference between EONIA and the €STR is small (0.085%), the impact would probably be material only for deep in-the-money trades

It is also worth noting that, between the CCP and bilateral CSA switch dates, market participants will have to discount swaptions at EONIA and the underlying swaps at the €STR. This further discrepancy would be absent given a coordinated switch of cleared and collateralised instruments.

For swaptions that are traded under a CSA with EONIA as remuneration rate, the repapering of that CSA can be the catalyst for the compensation payment to address the aforementioned situation. However, this will not capture use cases where the swaption is traded under different CSA terms, e.g. European government bonds that will not go through this repapering process. This is likely to require a more coordinated approach, most likely via a change to ISDA definitions that capture the switch in discounting by the relevant clearing houses.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

8. Derivatives – swaptions:

Caution is required when valuing options on derivatives with physical settlement as after the discounting switch date the option refers to a €STR-discounted derivative, which triggers re-evaluation and compensation measures (see also Recommendation no. 16(h)).

4.2 Securities

The chapter below outlines the following issues: (i) the typical maturity of the EONIA-based securities and the need to roll off the legacy book to the €STR, (ii) the documentation formats, (iii) the possible issues arising from the shift to a T+1 publication time in the primary and secondary market, and (iv) issues related to market conventions.

Currently, EONIA is mainly used for such money market debt instruments as negotiable European commercial paper (NEUCP), negotiable European medium-term note (NEUMTN), certificate of deposit (CD) and rarely euro commercial paper (ECP). Most of them, in particular NEUCPs, CDs and ECPs, are issued with maturities ranging from 1 day to 365 days (one year) and some, like NEUMTNs (formerly *bons à moyen terme négociable*, or BMTNs), for even more than two years. The issuance of these instruments is country-specific and particularly widespread in the French market.

Considering the maximum maturity of the instruments, the EONIA discontinuation date on 3 January 2022 should leave enough time for legacy books to roll off. The working group therefore recommends that market participants stop initiating new deals referencing EONIA that will mature beyond 3 January 2022, and instead start issuing securities referencing the €STR. Moreover, the structure of the market might change in the future, with a higher proportion of longer-dated bonds compared with the current situation.

The markets for short-term paper in Europe currently rely on different sets of standard pro forma documentation provided for users, either by regulatory authorities and/or trade associations (the Banque de France and ACI France for NEUCP-NEUMTNs, ICMA for ECPs)²⁷. This documentation can currently include a reference to any variable rate agreed by the parties, including EONIA. Parties can include a new reference rate and applicable definitions at the time of issue.

The coupon of the EONIA-indexed securities is usually based on a capitalisation of the daily rate fixings calculated on the actual/360 basis and “in arrears”. The settlement

²⁷ This documentation usually contains a pro forma information memorandum, dealer agreement, and other related documentation. The ICMA pro forma standard ECP documentation consists of the ECP Dealer Agreement, Information Memorandum and Multicurrency Global Note.

process for CPs and CDs will be affected by the shift of the publication date from T to T+1 but is not seen as a cause for concern by front/back offices, issuing and payment agents (IPAs), depositories and the main central securities depository (CSD), Euroclear France, as the coupon calculation is already performed using the T-1 value. However, starting on 2 October 2019, the calculation will be performed not during the night between T-1 and T, but on T once EONIA is published at 09:15 CET. Market participants should therefore adapt their valuation, pricing and accounting systems accordingly, taking into account the shorter period available to perform all necessary valuations without delaying their current processes.

The working group also analysed issues that may arise in the secondary market depending on when the accrued interest needs to be calculated, i.e. whether the related transaction occurs before 09:15 CET (before the front office systems are updated with the new rate, i.e. still based on T-2) or after 09:15 CET (based on the just-published T-1 value). The conclusion was that the volume of the current secondary market is less significant compared with the primary market and that the settlement of deals mainly relies on bilateral agreements (agreed payment instructions, reference rate value to be used) that are processed manually rather than automated. It is expected that the same approach can be applied also after 2 October 2019.

The lack of a market standard procedure for the calculation of the accrual could become an issue should the market start to grow in terms of transactions and volumes, consequently requiring the adoption of some automated procedures and a common standard.

Several conventions can be observed in use across different jurisdictions²⁸ (please refer to Annex 4). However, not all of them can be considered appropriate for short-term securities, e.g. the lookback T-5 approach used for compounded SONIA bonds, if envisaged for €STR OISs and €STR OIS-linked short-term securities, could in this case represent the corresponding market less accurately than the current market standard. The current processes, affected by the move from T to T+1, and future processes should also be applicable to trading in other time zones. This may require a special settlement convention to be defined in the future. The working group therefore suggests that trade and user associations should perform a specific analysis of market practices and standards to provide market participants with guidance on whether they need to be changed for the current market and whether a common convention needs to be defined for bond markets that will reference the €STR, including short-term and longer-dated securities.

It will also be important to achieve convergence in market conventions for the €STR OIS market and €STR securities to the greatest extent possible. Indeed, the development of securities referencing the €STR needs to take place in parallel with the development of a €STR swap market to avoid the systematic generation of a basis risk between cash instruments and derivatives used for hedges.

²⁸ See the Financial Stability Board (FSB) user guide entitled “[Overnight Risk-Free Rates](#)”, 4 June 2019, for a broad overview of possible calculation methods.

Since the BMR applies to securities traded on a trading venue, unlisted instruments are beyond its scope. However, the working group recommends that market participants screen all such exposures referencing EONIA and adopt the same approach as for listed securities referencing EONIA to prepare for the discontinuation of EONIA on 3 January 2022.

Recommendations and observations regarding settlement defaults:

4. The working group recommends that market participants consider adjusting the default settlement time (i.e. the lag between the last fixing date and the settlement date) in certain cases, as follows:
 - **Securities:** As coupon payments are currently calculated using the T-1 value, no changes are expected in the current practice. Nevertheless market participants should adapt their settlement procedures and corresponding valuation and accounting systems to the new publication time, taking into account that they will have less time to perform the related operational procedures. Particular attention should be paid to the calculation of accrued interest in the secondary market depending on whether a transaction occurs before or after 09:15 CET. Given that the settlement of deals in the secondary market is mainly based on bilateral agreements and is managed manually rather than automated, the current process is expected to remain mostly unchanged. However, market conventions might change in the future, reflecting changes in volumes and traded instruments as markets evolve. Therefore, the working group recommends that trade and user associations analyse market conventions with a view to providing market participants with guidance on how the conventions related to EONIA-based securities may evolve due to the transition from EONIA to the €STR and on whether a common standard will be required in the future.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

9. **Securities:**
 - (a) Market participants should introduce all necessary modifications in order to be able to issue, buy, trade and manage new securities indexed to the €STR and should avoid issuing new securities indexed to EONIA with maturities going beyond the transition period.
 - (b) Even if unlisted securities are not within the scope of the EU Benchmarks Regulation (BMR), the working group recommends that market participants apply the transition approach designed for and applied to listed securities referencing EONIA to unlisted securities referencing EONIA as well.

4.3 Secured cash products

The focus of this chapter is to investigate possible implications of the transition from EONIA to the €STR for secured cash products. The main types of product affected are floating rate repos and reverse repos.

The practicalities of the EONIA-€STR transition for the non-cleared repo markets have been discussed at length by the ICMA ERCC and the ERCC Operations Group²⁹. The ERCC has agreed on the following recommended best practice to be followed from 1 October 2019 onwards:

- The interbank market should transact purely on a fixed rate basis (“classic repo”) and should no longer use floating rate repos.
- In the case of non-interbank transactions (such as dealer-to-client), where firms agree to transact on a floating rate basis (using EONIA or the €STR), best practice will be to apply the fixing of the penultimate accrual date of the transaction to the final (repurchase) date (i.e. “crystallising” the penultimate fixing into a fixed rate for the final business day). This will allow parties to send timely settlement instructions for the repurchase leg of the transaction.
- Where parties transact on a floating basis, using the crystallisation methodology, this will create discrepancies between the repurchase price calculated and settled by the parties and the repurchase price that would have applied had it been possible to instruct after the final fixing. In this instance, the disadvantaged party can elect to claim the difference from the advantaged party, so long as the difference is equal to or greater than an agreed threshold per transaction (with the exact amount to be determined by the ERCC in the coming weeks following further discussion).
- Any claim should be made immediately (ideally on the repurchase date, once the final fixing is known), and any reimbursements should be made on the business day following the repurchase date. Ideally, any claims or reimbursements made with respect to the same day should be made in aggregate. In any event, any claims or reimbursements should be made no later than 30 days after the repurchase date.

It should be noted that the recommended best practice for floating rate (EONIA or €STR) repos is largely similar to current market best practice for overnight index (OI)-based repos if the publication of the OI fixing is too late to send settlement instructions to the (I)CSD in time for settlement.

Other considerations:

- Averaging vs. compounding:

Currently, market practice for EONIA-based repos is to apply the average rate over the life of the trade, rather than compounding, even though daily

²⁹ See the ICMA ERCC Committee’s memorandum entitled “Repo market best practice with respect to the transition from EONIA to €STR”, July 2 2019.

compounding is used in the EONIA swap market. The ERCC agreed that this practice should continue for EONIA or €STR repos, noting that it is also possible for parties to agree to a compounding methodology.

- Reference to EONIA in the Global Master Repurchase Agreement (GMRA) annexes³⁰

While none of the GMRAs reference EONIA, some bilaterally negotiated annexes may make reference to EONIA with respect to interest payable on cash collateral. Where this is the case, firms will need to update these bilateral annexes to reference a suitable alternative benchmark. While ICMA, as sponsor of the GMRA, cannot do anything directly to assist firms in identifying or updating any bilateral contractual arrangements that may be affected, together with the ERCC it will seek to raise awareness of the issue so that affected firms can take the steps necessary to prepare for the discontinuation of EONIA on 3 January 2022.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

10. Secured cash products:

- The practicalities of the EONIA-€STR transition for non-cleared repo markets have been discussed at length by the European Repo and Collateral Council (ERCC) and the ERCC Operations Group of the International Capital Market Association (ICMA). The ERCC has agreed on the following recommended best practice to be followed from 1 October 2019 onwards:
 - The interbank market should transact purely on a fixed rate basis (“classic repo”) and should no longer use floating rate repos.
 - In the case of non-interbank transactions (such as dealer-to-client), where firms agree to transact on a floating rate basis (using EONIA or the €STR), best practice will be to apply the fixing of the penultimate accrual date of the transaction to the final (repurchase) date (i.e. “crystallising” the penultimate fixing into a fixed rate for the final business day). This will allow parties to send timely settlement instructions for the repurchase leg of the transaction.
 - Where parties transact on a floating basis, using the crystallisation methodology, this will create discrepancies between the repurchase price calculated and settled by the parties and the repurchase price that would have applied had it been possible to instruct after the final fixing. In this instance, the disadvantaged party can elect to claim the difference from the advantaged party, so long as the difference is equal

³⁰ See ICMA’s documentation page entitled “[Global Master Repurchase Agreement \(GMRA\)](#)”.

to or greater than an agreed threshold per transaction (with the exact amount to be determined by the ERCC in the coming weeks following further discussion).

- Any claim should be made immediately (ideally on the repurchase date, once the final fixing is known), and any reimbursements should be made on the business day following the repurchase date. Ideally, any claims or reimbursements made with respect to the same day should be made in aggregate. In any event, any claims or reimbursements should be made no later than 30 days after the repurchase date.

4.4 Unsecured cash products

The following products are most likely to be affected by the transition from EONIA to the €STR: current accounts, savings accounts, overdraft facilities, time deposits, call accounts and swingline, bilateral or intracompany loans. Note that some of these products may also be subject to collateral and security interest (e.g. loans). However, the considerations related to the EONIA-€STR transition are the same whether such products are secured or not, and so they are covered in this chapter on unsecured cash products.

Current account and overdraft facilities

With regards to current account and overdraft facilities, the current market standard assumes that the customer receives interest payments on the next TARGET2 business day of the interest period, i.e. T+1. However, the change in the publication time of the recalibrated EONIA from T to T+1 will lead to a shortening of the time period available for valuations and interest settlements, to be performed either on a daily basis (e.g. for corporate clients) or on a monthly/quarterly basis (e.g. for retail clients). Specific consideration should be given to month-end, quarter-end and year-end reporting dates when the applicable rate for the interest period is published outside of the interest period and falls on a non-business day (e.g. 30 November 2019). Therefore the change in the publication time from T to T+1 may require changes to all processes concerning contracts referencing EONIA.

It should be noted that the application of the current market standard already foresees the possibility of settling the payment at the earliest opportunity, setting the maturity date as the last business day of the reporting period. In this case, following the commonly used “modified following business day convention” the corresponding interest is settled during the next calculation period unless otherwise agreed with the customer.

Therefore, in case the current settlement procedure cannot be managed with a shorter time window, it would be advisable to postpone the settlement of the interest applicable to the corresponding period, for which no EONIA/€STR is available, until

the new interest period. This would provide the customers with the price aligned with the market every day. On the other hand, it could require a specific change in the operational processes and accrued interest must be taken into account for accounting purposes. Alternatively, the most recently published reference interest rate could be used for the calculation of the interest applicable to the corresponding period (i.e. the T-1 rate published on T and referencing the period from T-1 to T). However, current market operational and contractual frameworks may lead to the adoption of different solutions or arrangements by different market participants. Market participants should individually identify ways to convert existing and new current account contracts to EONIA/€STR T+1, taking into account their operational procedures and the existing contractual conditions.

Given that current accounts and savings accounts are mass products and clients' knowledge of the transition from EONIA to the €STR differs widely from country to country, a systematic outreach strategy is essential. Institutions will need to provide timely and precise information to all clients whose contracts are linked to products affected by the €STR transition.

Swingline facilities

Swingline loans are loans typically granted to support a borrower's CP programme. They can usually be requested on a same-day basis for very short drawing periods (typically one to seven days). Swinglines denominated in euro mostly refer to EONIA plus a spread. Swingline loans which are documented as part of a syndicated loan are typically based on the loan market association (LMA)'s recommended form documentation.

The following considerations relating to the shift to the new benchmark rate and the T+1 publication time are detailed below: (i) the possible changes in documentation; (ii) the activation of fallbacks after the discontinuation of EONIA; (iii) the timing of possible amendments to facility agreements; (iv) the expected impact on the interest calculation and a preference for the delayed payment solution (compared to the lookback period solution), should the interest rate calculation be affected.

LMA documentation defines EONIA by reference to the screen rate: "the euro overnight index average administered by the European Money Markets Institute (or any other person which takes over the administration of that rate) displayed on page EONIA= of the Thomson Reuters screen (or any replacement Thomson Reuters page which displays that rate)". LMA documentation also does not specify a publication time for EONIA. As a result, for loan agreements which mature before 3 January 2022 (the discontinuation date of EONIA), the references to EONIA should apply to modified EONIA.

However, the LMA recommended form documentation is often adapted by market participants and so the terms in loan agreements referencing EONIA may differ from those described above. They may, for example, contain detailed timetables which refer to the publication of EONIA at 19:00 CET on T. Consideration will need to be

given in these cases as to how such references are to be read following the change in publication time and therefore whether amendments to the agreement are required.

When EONIA is discontinued, the fallbacks in the loan documentation would apply. These fallbacks are, however, designed for short-term unavailability (the LMA recommended forms currently provide for reference bank rates and, ultimately, cost of funds as fallbacks should EONIA be discontinued). However, since 2014 the LMA recommended forms have also contained a replacement of the screen rate clause which would apply when or in case EONIA is unavailable. This clause was subsequently revised in 2018³¹ to allow majority lenders and obligors to select a replacement rate and adjust the pricing to reduce or eliminate any transfer of economic value.

When referencing the €STR directly, parties will need to consider whether a compensation mechanism will be required to account for the differences between EONIA and the €STR (as the spread of 8.5 basis points which is part of the revised EONIA's methodological change will otherwise not apply when reference is made to the €STR directly).

For the timing of amendments to facility agreements (should they be required), it should be noted that swingline facilities form a small part of a syndicated facility (the main part of which will be a term loan and/or revolving credit facility linked to an IBOR). As a result, parties may not seek to amend their loan agreements solely to replace references to EONIA, and are instead likely to wait to amend their agreements until fallbacks for EURIBOR are known and appropriate replacement rates in other currencies have been identified in the context of a multicurrency facility.

The transition from EONIA to the €STR will involve a shift from a T to a T+1 publication time as early as 2 October 2019. Given that swingline loans can be borrowed on the day of the utilisation request, the change to T+1 publication may raise issues that parties must consider when determining the interest rate applicable to the day when the utilisation request is filed and funds will be drawn down.

The current wording in the LMA recommended form documentation states that interest on EONIA-based swingline loans is payable not on the last day of an interest period but on the subsequent day. This is because EONIA is currently available at 19:00 CET on the last day of that interest period and the assumption is that this is too late for parties to make the necessary calculations and interest payments. Therefore, according to the LMA recommended form documentation, the principal of an EONIA-linked swingline loan is repaid on the last day of the interest period, but the interest payment is calculated and made on the day after the last day of the interest period. As a result, the process for EONIA-linked swingline loans is not expected to be affected by the shift from T to T+1 publication since in practice the interest calculation is already performed on the morning of T+1.

Following the transition to the €STR, which is published on T+1, the €STR applicable on the last day of an interest period will be available at 08:00 CET on the following

³¹ See the LMA's alert entitled "[LMA publishes revised Replacement of Screen Rate clause to provide further flexibility in light of uncertainty over the future of LIBOR](#)", 25 May 2018.

swingline business day, which is also the day on which interest would have to be paid. As this is in line with current practices (i.e. calculation and settlement on a T+1 basis) it should not require operational changes.

In some cases, however, parties may have relied on EONIA being available at 19:00 CET on T so that interest could be calculated and communicated in time for interest to be paid on T+1. The change in the publication time may in these cases restrict the interest settlement process. Parties may also wish to consult their borrowers on this change (particularly where the borrower is a non-bank entity or midcap), as the delay in publication may mean that the borrower does not have sufficient time to calculate and make interest payments on T+1. There may also be operational practices in place whereby principal and interest payments are not separated (differing from the LMA recommended form documentation).

In this case, participants may choose from two possible approaches in relation to the change from T to T+1:

- **Delayed interest payment:** As the applicable interest rate will not be known until T+1, the interest payment could be delayed one day (e.g. T+2). Two different payments occur (principal and interest), so changes to the system are required.
- **Lookback period:** The applicable interest rate would be the rate published on T (which represents T-1 transactions). A single payment occurs at the end of the utilisation date and no system changes are required.

The use of the delayed payment option seems to better reflect the economic reality surrounding the operation. Although this delayed payment alternative may increase the impact on operational systems, swingline facilities are only drawn very rarely. The relative complexity resulting from the impact may not justify a decision not to preserve the economic reality of the transaction.

Recommendations and observations regarding settlement defaults:

4. The working group recommends that market participants consider adjusting the default settlement time (i.e. the lag between the last fixing date and the settlement date) in certain cases, as follows:

Unsecured cash products:

- **Current accounts, corporate and retail facilities and overdraft facilities:** According to the current market standard, the customer receives the interest payment on the next day of the interest period, i.e. on T+1. Given that the change in the publication time will shorten the time window available for the settlement, a different approach may have to be adopted. In order to preserve the economic reality of these products, the working group recommends that market participants postpone the calculation of the corresponding interest until the new interest period (for accounts with monthly or quarterly settlement). Alternatively, the most recently published interest rate can be used (for accounts with daily settlement). Operational

and contractual frameworks may, however, cause market participants to adopt different solutions and arrangements. Therefore, market participants should individually find a way to convert existing and new current account contracts to EONIA/€STR T+1, taking into account their operational procedures and the existing contractual conditions.

- **Swingline facilities:** The current wording of the LMA recommended form documentation states that interest on a swingline loan based on EONIA is payable on the business day following an interest period. Consequently the shift to T+1 should not require operational changes. However, in some cases, parties may have relied on EONIA being available at 19:00 CET on T so that the change in the publication time may result in a time constraint for the interest settlement process and might lead to a delayed payment to preserve the economic reality of the transaction. Thus market participants are recommended to assess their internal processes related to swingline facilities to establish whether the move to a T+1 publication time will cause operational issues and then update systems and processes accordingly. Moreover, it is important to consult borrowers about whether the change to a T+1 publication time will cause any operational or process issues.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

11. Unsecured cash products:

- (a) Given that current accounts and savings accounts are mass products and clients' knowledge of the EONIA-€STR transition differs widely from country to country, a systematic outreach strategy is essential. Institutions will need to provide timely and precise information to all clients whose contracts are linked to products affected by the €STR transition.
- (b) For swingline loans, when referencing the €STR directly in new contracts, market participants should consider whether any compensation mechanism is required.

4.5 Investment funds

This chapter covers the following topics: (i) the specific changes for the funds industry in relation to the EONIA-€STR transition and (ii) the impact on the calculation of the NAV.

- Specific changes for the funds industry in relation to the EONIA-€STR transition:
 - Money market funds and some types of fixed income funds are the main type of investment fund exposed to EONIA as they use it as a benchmark or as a reference index. The institutions managing these types of funds will therefore be required to change their benchmark policy and to adjust any applicable fund prospectuses accordingly.

- EONIA can also be used in the CSA for derivatives products used by asset managers.
- Finally, some funds, e.g. those pursuing liquid strategies and total return/absolute strategies, may use EONIA as a hurdle rate for performance fee calculations. The transition from EONIA to the €STR will therefore also require amendments to the calculation formulas and adjustments to the systems used by fund administrators, and will also require updates to the prospectuses.

This clearly shows that portfolio managers need time to consider the different options and engage with their national competent authorities where necessary.

It is also important to clarify what type of disclosure to funds' investors is required regarding the transition to the new benchmark. This could be notification that, during the transition period until 3 January 2022, EONIA will be provided based on the €STR plus a spread of 8.5 basis points. For the transition from EONIA to the €STR a review of prospectuses will be necessary, and should be sufficient with no further investor-specific information.

- Impact on the calculation of the NAV:

The calculation of the NAV and the related processes (such as NAV publication, fund redemption and subscription) will be affected by the change in the publication time from T to T+1). The NAV publication and redemption delay may indeed cause several system issues and have some regulatory implications for the affected institutions.

Systems do not rely entirely on rates published in the morning, as the systems of depositories, accounting and conservation agents can also rely on rates that were published previously.³² Prospectuses detail the NAV calculation, publication and subscription/redemption cut-offs and should be respected. This implies that the process is workable throughout the whole chain.

At the same time, it is not materially possible to delay the publication of the NAV or review the process for redemptions and subscriptions that is used by all distributors. Therefore, the process and timing for calculating the NAV cannot be modified. This implies that the reference for EONIA products will be the latest available EONIA, in most cases referencing T-2 transactions. Moreover, in some cases the information on the NAV is to be provided by 10:00 CET, while the €STR will be published at 08:00 CET and the recalibrated EONIA will be available only at 09:15 CET. This might not allow for sufficient time to calculate and validate NAVs. There is no standard publication time/process across Europe, which is why in some jurisdictions the information is to be provided as early as 10:00 CET. However, and in order to process the subscriptions/redemptions received for the

³² A clear example of this are CSDs (e.g. Euroclear) which are interlinked and ensure that the daily NAV (i.e. as defined by the Undertakings for Collective Investment in Transferable Securities Directive (UCITS)) is calculated and validated in order to proceed with subscriptions and redemptions that have been received.

day, publications generally take place early in the morning and sometimes even based on the estimates of the previous evening.

The appropriate timing for a move to the €STR will depend on the observed increase in liquidity and the quantification of the impact of the delays on the NAV publication and therefore on redemptions.

Recommendations and observations regarding settlement defaults:

4. The working group recommends that market participants consider adjusting the default settlement time (i.e. the lag between the last fixing date and the settlement date) in certain cases, as follows:
 - **Investment funds:** For investment funds linked to EONIA, the T+1 publication will affect net asset value (NAV) calculations and redemption/subscription processes, creating an operational challenge. At the same time, it is not materially possible to delay the publication of the NAV or review the process for redemptions and subscriptions as used by all distributors. Therefore, the process and timing for calculating the NAV cannot be modified. This implies that EONIA-based products will reference the latest available EONIA, in most cases referencing T-2 transactions. Market participants are recommended to assess their NAV-related processes (e.g. valuation, risk management) and procedures as well as their related IT systems in order to identify the implications of the shift to T+1 and to implement any necessary adjustments before 2 October 2019. When required, market participants should engage with national competent authorities and/or regulators and communicate changes in the NAV-related processes.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

12. Investment funds:

For funds using EONIA as a benchmark or a hurdle rate (e.g. money market funds, liquid strategies and total return/absolute strategies funds), the transition from EONIA to the €STR will require amendments to the calculation formulas and operational procedures as well as adjustments to the corresponding systems used by fund administrators. It will also trigger prospectus updates.

4.6 Other products

Other products may be affected by the transition from EONIA to the new benchmark (e.g. procurement contracts, reinsurance contracts, investment/insurance policies such as unit-linked/hybrid products).

For example, reinsurance contracts could be affected by the move from EONIA to the €STR in several ways. First of all, collateral remuneration could be linked to EONIA. IT systems might also use EONIA for valuation purposes, and it must be ensured that the correct data are used following the change in the EONIA's publication time as of 2 October 2019. There could be fallback provisions in existing contracts in the case of a switch to a new reference rate, which would need to be taken into account when moving to the €STR.

There might also be references to EONIA in financial reinsurance contracts for payments between the reinsurer and the ceding company, which would need to be checked and amended.

Furthermore, penalty clauses used in different contracts could be indexed to EONIA and would need to be renegotiated with the counterparties.

Market participants are advised to screen their products and identify those exposed to EONIA, paying particular attention to the effects resulting from the change in the publication date.

5 Model-specific transition recommendations

The working group has identified the following models widely used by the market as the main ones exposed to the EONIA-€STR transition. However, the list below might not be exhaustive and there may be other models used by market players that are affected by the transition to the new benchmark (e.g. liquidity risk models, best estimate liability calculation models).

Market participants are recommended to map all models exposed to EONIA, paying particular attention to impacts coming from the change in the publication date, and to design a transition plan for the models.

5.1 Funds transfer pricing models

Funds transfer pricing (FTP) is the internal system used by the central treasuries of financial institutions (banks, insurance companies) and non-financial corporates to compensate deposit-raising business units for the funding they raise and to charge lending business units for the funding they consume. In this way, business units are isolated from interest rate, liquidity and funding risks. Specifically, the central treasury applies an internal price, i.e. a transfer rate, to the users and providers of funds according to the FTP framework. The FTP framework might vary from institution to institution and from industry to industry, but all institutions aim to reflect the term value of the funding that business units raise or consume.

Regulatory framework: Institutions based in member countries of the Organisation for Economic Co-operation and Development (OECD) shall adhere to the [OECD Transfer Pricing Guidelines](#) issued in July 2017 and act at arm's length in their intragroup transactions. Moreover, according to the [Guidelines on Liquidity Cost Benefit Allocation](#) issued by the Committee of European Banking Supervisors (CEBS) in Oct 2010, "institutions should have in place an adequate internal mechanism – supported where appropriate by a transfer pricing mechanism – which provides appropriate incentives regarding the contribution to liquidity risk of the different business activities."

FTP frameworks are usually based on the following methods:

- **Net funding method:** Business units raise and consume funds and approach the central treasury only for surplus/deficit funds. The central treasury charges business units a flat rate for surplus/deficit funds. The method usually considers the risk-free rate ("base rate"), a spread for the term liquidity premium ("liquidity spread") and sometimes a country risk premium. This method is mainly used in the non-financial/corporate sector.
- **Matched maturity method:** Funds are priced to business units based on the marginal cost of funds matching the maturity of the asset. Prevailing bid-ask rates

for maturities are used to determine the pricing curve. The method may include a multi-rate method where assets and liabilities are aggregated into additional groups based on selected characteristics giving a more granular view. The internal transfer rate may include several financial risk components such as the risk-free rate (“base rate”), the term liquidity premium (“liquidity spread”), country risk premia, the interest rate spread versus the risk-free rate (swap rate, basis risk, inflation), the option spread (prepayment, cap, floor), the credit spread (provision, counterparty). The inclusion of risk components varies substantially from institution to institution depending on product characteristics or on the need to centralise a particular risk away from business units. This method is mainly used by large credit institutions and insurances companies.

- In practice, **combinations of these two methods** are widely used by the corporate sector. For example, companies may choose to combine the components of the net funding method with the application of differentiated bid-ask rates. Their choice is mainly influenced by factors such as tax requirements, efficient capital allocation, the degree of treasury centralisation, complexity management as well as company size.

The base rate is the interest rate market risk component of the transfer price. The price charged or paid should be directly linked to a commonly accepted market index, and it should be set according to the repricing (fixing) date or maturity date of the transaction.

In the context of FTP pricing models, market participants often use term rates (e.g. EURIBOR). However, if market participants use EONIA as the base rate in the FTP framework, they should consider replacing EONIA with the €STR. Market participants need to keep in mind that the €STR is a bid rate while EONIA is an offered rate (which partially explains the spread of 8.5 basis points). Therefore liquidity premium calculations need to be corrected accordingly. Market participants using EONIA in their FTP models should draw up a transition plan. Such a plan should cover all relevant FTP-related systems and policies and should involve all relevant internal business departments and functions.

Recommendations and observations regarding settlement defaults:

4. The working group recommends that market participants consider adjusting the default settlement time (i.e. the lag between the last fixing date and the settlement date) in certain cases, as follows:
 - **Funds transfer pricing models:** Once publication has shifted from T to T+1, it is recommended that users and providers of funds on T apply the rate published at 09:15 CET on T+1. Alternatively, if the one-day lag is not manageable from an operational point of view, they could use the rate of the previous day (rate on value date T-1 that is published on T). In the case of monetary policy decisions or similar events, this could be managed by using an override.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

13. Funds transfer pricing models:

- (a) In the context of FTP models, market participants often use term rates such as EURIBOR. However, if market participants use EONIA as the base rate in the FTP framework, they should consider replacing EONIA with the €STR. Market participants need to keep in mind that the €STR is a bid rate while EONIA is an offered rate (which is one of the reasons for the 8.5 basis-point spread). Therefore liquidity premium calculations need to be corrected accordingly.
- (b) Market participants using EONIA in their FTP models should create a transition plan. Such a plan should cover all relevant FTP-related systems and policies and should involve all relevant internal departments and functions.

5.2 Interest rate curve construction

EONIA is used not only as a reference rate but also as a discounting curve (OIS) for collateralised euro cash flows (e.g. collateralised derivatives). Moreover, it is used for stripping other curves (e.g. EURIBOR curves as well as cross-currency curve construction) and as parameter for calculating credit adjustments (e.g. for curves used to discount best estimate insurance/pension liabilities). EONIA in interest rate discounting curve construction defines the very short end of the curve itself and serves as the floating leg of euro-denominated OISs.

The EONIA curve is currently built based on forward EONIA-linked rates (EONIA swaps) but ultimately the choice of the curve calibration instrument depends on market liquidity. For EUR curves (EONIA/EURIBOR), the general market practice is to calibrate to standard fixed-float swaps, three-month/six-month basis swaps and EONIA/three-month basis swaps.

The impact on curve construction will eventually depend on which €STR-linked products gain liquidity in the market. For example, if €STR futures and fixed-float swaps are highly liquid, market participants may seek to calibrate the €STR curve directly to these instruments and then base other curves as a spread over the €STR curve. Conversely, if the existing EONIA-based market instruments remain liquid, merely referencing the €STR instead of EONIA, then the curve construction may largely remain the same.

Once the €STR is substituted for EONIA and is recognised as a risk-free curve (with the related curve), the €STR curve will start being used in euro curve bootstrapping procedures.

Market participants should be aware that some transition paths may pose additional challenges. Different curves could coexist during the transition period, for example:

- an EONIA curve constructed from (sufficiently liquid) EONIA-based instruments;
- a “shifted EONIA curve” derived from the existing EONIA curve through a parallel shift by -8.5 basis points (see also Chapter 5.4) unless independent and liquid €STR instruments are available;
- a €STR curve constructed from (sufficiently liquid) €STR instruments;
- a “shifted €STR curve” derived from the existing €STR curve through a parallel shift of +8.5 basis points.

The latter curve could serve as a fallback in case EONIA is no longer sufficiently liquid or in case market participants cannot agree bilaterally on transitioning to the €STR so that €STR + 8.5 basis points would eventually replace EONIA after 2021.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

14. Interest rate curve construction:

It is recommended to use a single curve for valuation purposes per counterparty for all types of contract (i.e. new and legacy contracts). However, the working group acknowledges that during the transition period, when both EONIA and the €STR will be live, market participants may use different applicable interest rate curves, which gives rise to specific requirements with regard to operations, IT systems and valuation models that will take effect as at October 2019:

- an EONIA curve constructed from (sufficiently liquid) EONIA-based instruments;
- a “shifted EONIA curve” derived from the existing EONIA curve through a parallel shift by -8.5 basis points unless independent and liquid €STR instruments are available;
- a €STR curve constructed from (sufficiently liquid) €STR instruments;
- a “shifted €STR curve” derived from the existing €STR curve through a parallel shift of +8.5 basis points.

5.3 Interest rate term structure models

Interest rate term structure models (e.g. short-rate models, stochastic volatility interest rate models, volatility surface models) are applied to estimate and forecast interest rates. They are used for pricing interest rate derivatives, especially for swaptions, caps and floors, constant maturity swaps, and for multi-curve interest rate modelling.

When transitioning from EONIA to the €STR, market participants should consider the following aspects of the market environment:

- the impact of changing the discounting curve from EONIA to the €STR (see Chapter 5.2);
- the impact on instruments used for model calibration such as caps, floors and swaptions. For instance, the moneyness of swaptions could change when (forward) swap rates of underlying EURIBOR swaps change as a result of switching to €STR collateralisation. This would affect the volatility surfaces used as an input for term structure models.
- Particular caution might be necessary if instruments used for model calibration and non-linear derivatives do not share the same collateralisation rate. While the effect may be small, in principle, term structure models could be at risk of being calibrated based on market instruments that do not perfectly match the underlying rate of the derivatives.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

15. Interest rate term structure models:

Given the wide variety of interest rate term structure models, the working group tried to identify the main challenges that are likely to apply for the majority of them. Market participants are encouraged to identify how their term structure models (e.g. input data, assumptions) will be affected by the transition from EONIA to the €STR and to monitor market developments to adjust the models in a timely and appropriate fashion.

5.4 Discounted cash flow, derivatives pricing and derivatives value adjustment models

Discounted cash flow (DCF) models relate the future amount of a cash flow (CF) to be paid or received to its expected present value (PV) today. This can be achieved by discounting the CF from its future payment date T to today using (implied) discount factors (DFs) which are derived from quoted market instruments $PV(T=0) = DF(0;T) * CF(T)$.

For cleared and collateralised markets, the DFs are commonly derived from market-observed prices for collateralised (cleared) OIS, which reference the benchmark index used to remunerate the posted cash collateral. For euro cash collateralised CFs, EONIA is the remuneration rate most commonly used in bilateral CSAs and in CCP rulebooks. CCPs typically refer to the remuneration as price alignment interest (PAI); in bilateral CSAs the remuneration can involve a spread on EONIA.

In general, there seems to be no reason to modify the structure and concept behind DCF models as a result of the transition from EONIA to the €STR. However, the transition will have an impact on the data and the discounting curves that feed into the DCF models.

The question therefore arises how EONIA and €STR curves may relate to each other once the EONIA methodology has been recalibrated based on €STR + 8.5 basis points on 2 October 2019.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

16. Discounted cash flow, derivatives pricing and derivatives value adjustment models:

- (a) The working group does not expect the transition to result in structural and conceptual changes in DCF models. The transition will, however, have an impact on input parameters and discounting curves used in models.

This chapter analyses the milestones that are expected to be achieved in order to move from an EONIA-only to a €STR-only market.

The first milestone of the process would be the creation of a new market based on €STR-linked derivatives (see Figure 4).

Figure 4

First milestone – creation of a new market based on €STR-linked derivatives



Once the €STR is published and the EONIA methodology is recalibrated (€STR + 8.5 basis points), this constant spread will be the main difference between the corresponding EONIA and €STR term structures (mid-market levels). No systematic, significant stochasticity of the EONIA-€STR basis is expected, i.e. the EONIA-€STR constant spread will be applied across the term structure without distortion on each instantaneous/daily forward rate or uniformly across all €STR and EONIA zero rates. After 2 October 2019, it will be possible to directly derive a €STR term structure from available EONIA term structures (see Annex 3).

As a next step, and not too long after the initial publication of the €STR on 2 October 2019, market participants are expected to start quoting and trading €STR instruments. The quoted instruments are expected to be mainly OISs (fixed vs. €STR) and basis swaps (€STR vs. EURIBOR; see also Chapter 4.1.2). It will be possible to construct a €STR curve based on these quotes while respecting the CSAs underlying the quoted instruments.

All in all, the EONIA and €STR term structures will be readily available to all market participants under the following modalities:

- a €STR zero rate curve that is expected to be used in the first instance mainly to project future €STR cash flows for €STR-linked floating rate products;
- an EONIA zero rate curve that is expected to be used for discounting purposes and for the projection of EONIA cash flows.

By comparing quoted EONIA and €STR market instruments, market participants can monitor both term structures. Market participants can thus monitor the validity and accuracy of a constant spread across the two term structures depending on their individual usage of the two rates.

Both pricing and settlement procedures should be verified in order to ensure that correct data are being used by each corresponding procedure.

Derivatives pricing model under the EONIA discounting framework

It is assumed that CCPs will be able to clear €STR instruments not too long after the €STR is published using the €STR and EONIA term structures as described above.

During this initial transition period, CCPs are expected to use the €STR curve to estimate future cash flows and the existing EONIA interest rate curve as discounting curve for all euro-denominated cleared derivatives, clearing all interest rate derivatives in the same clearing hub with the PAI rate being $EONIA = €STR + 8.5$ basis points. In addition, counterparties with bilateral CSAs are expected to value derivatives subject to existing CSAs in a similar way by using the same PAI rate, i.e. $EONIA = €STR + \text{spread}$.

In this phase, no model valuation impact will be observed for other interest rate derivatives and derivatives on other risk factors using the EONIA interest rate curve as discounting curve.

The following interest rate curves are expected to co-exist during the transition phase (see Chapter 5.2):

- a unique discounting curve given by the (still) existing EONIA OIS interest rate curve;
- a new €STR interest rate curve for underlying forwards/future underlying cash flows for new €STR-linked derivatives:

- either derived from the EONIA curve through a parallel shift by -8.5 basis points or
- bootstrapped directly from liquid €STR instruments;
- the old EONIA OIS interest rate curve or the new €STR + 8.5 basis-point spread as forwarding curve for legacy EONIA derivatives.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

16. Discounted cash flow, derivatives pricing and derivatives value adjustment models:

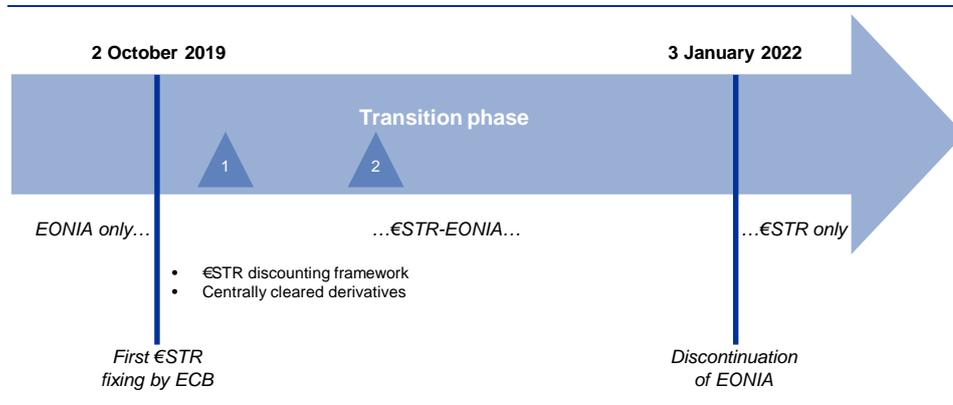
- (b) €STR-linked derivatives prices, while not readily available on the recalibration date, are expected to become progressively available. They will have to be consistent with the no-arbitrage condition.
- (c) Until the €STR swap curve becomes directly observable, the fixed spread relation between EONIA and €STR fixings can be applied to derive a full term structure for the €STR from EONIA-linked overnight index swaps (OISs).
- (d) Market makers, inter-dealer brokers and vendors are encouraged to publish stand-alone €STR OIS prices alongside EONIA as soon as possible after the recalibration date. This would allow market participants to start reducing their reliance on direct EONIA prices for modelling and discounting purposes and to directly monitor €STR and EONIA OIS prices during the transition.

Derivatives pricing model under the €STR discounting framework

The second milestone is the PAI and discounting regime switch performed by CCPs (see Figure 5).

Figure 5

Second milestone – PAI and discounting regime switch performed by CCPs



For centrally cleared derivatives, CCPs should switch to €STR PAI and discounting rates during the second quarter of 2020 (see Recommendation no. 6(c)). As a result, all cleared derivatives would become subject to a new discounting regime. Compensation schemes should be devised to counter adverse price effects on derivatives due to the transition.

To compute initial and variation margins related to these derivatives exposures, CCPs will thus use:

- a unique discounting curve given by the €STR interest rate curve;
- the new €STR interest rate curve for underlying forwards/future underlying cash flows for new €STR-linked derivatives;
- the old EONIA OIS interest rate curve as forwarding curve for legacy EONIA derivatives as long as these quotes are still available and, later, the €STR interest rate curve plus spread (see also Chapter 4.1.1 on floating rate options).

With respect to linear interest rate derivatives, market participants should be aware that switching the PAI rate from EONIA flat to €STR flat will also affect EURIBOR-based interest rate curves.

In particular, the working group expects market makers and brokers to quote par swap rates based on the assumption that implied forward rates will not be affected by the transition from EONIA to the €STR discounting framework (scenario 1). €STR OIS discounting will be used to obtain the corresponding par swap rates by imposing a zero net present value. In this case, an impact on market quotes, i.e. par swap rates, would be observed due to the transition; the new par rates would, however, assume €STR discounting instead of EONIA discounting.

However, secondary effects of the transition observed at the CCP level might cause some market participants to execute some deals in the market to adjust their hedged positions. This might affect par rates and EURIBOR implied forward rates through offer and demand dynamics (scenario 2).

Both scenarios should be considered when assessing the impact on accounting books and valuation models.

Under scenario 1, implied forward rates are assumed to remain unaffected by the transition from the EONIA to the €STR discounting framework. Therefore, the working group estimated the impact on par swap rates resulting from the change in discount factors by keeping the EURIBOR six-month implied forward rates constant.

The differences computed between the market-quoted EURIBOR six-month par swap rates and the theoretical EURIBOR six-month par swap rates are shown in Table 4.

Table 4
Comparison between market-quoted EURIBOR six-month par swap rates and theoretical EURIBOR six-month par swap rates

Time to maturity	5 years	10 years	15 years	20 years	30 years	40 years	50 years
(1) Market-quoted EURIBOR six-month par swap rate	-0.0900%	0.3400%	0.6730%	0.8430%	0.9260%	0.9210%	0.9040%
(2) Theoretical EURIBOR six-month par swap rate, obtained by discounting with EONIA OIS curve shifting down the market quotes by 8.5 basis points, forwarding with the original EURIBOR six-month implied forward rates with initial NPV=0	-0.0898%	0.3411%	0.6752%	0.8458%	0.9286%	0.9229%	0.9052%
(1) – (2) Market quotes – theoretical par rates	-0.0002%	-0.0011%	-0.0022%	-0.0028%	-0.0026%	-0.0019%	-0.0012%

Notes: The figures refer to an indicative market data set on a given date. Different results might be obtained under different market conditions (i.e. with respect to different interest rate levels). The reference date is 31 May 2019.

Under scenario 2, EURIBOR six-month par swap rates are considered with respect to different maturities (fixed rate with annual payments versus floating rate with semi-annual payments). Within the exogenous discounting framework, i.e. the framework that assumes a given discounting curve to be used in the bootstrapping algorithm, the implied forward rates are obtained from market-quoted swap par rates in a recursive way, by using the given discounting curve that corresponds to a given PAI rate discounting regime.

If the discounting regime changes, the bootstrapping algorithm will produce different implied forward rates (given the same par swap rates in input), i.e. the delta OIS sensitivities of a EURIBOR swap equal zero.

According to computations performed by the working group under scenario 2, the difference between (i) the values of the current EURIBOR forward rates, i.e. the forward rates obtained by considering the current EONIA OIS discounting curve, and (ii) the theoretical EURIBOR forward rates obtained by using the €STR discounting curve, i.e. the curve obtained by shifting down each EONIA OIS rate by 8.5 basis points, ranges from minus five-tenths of a basis point to two/three tenths of a basis point with respect to different maturities.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

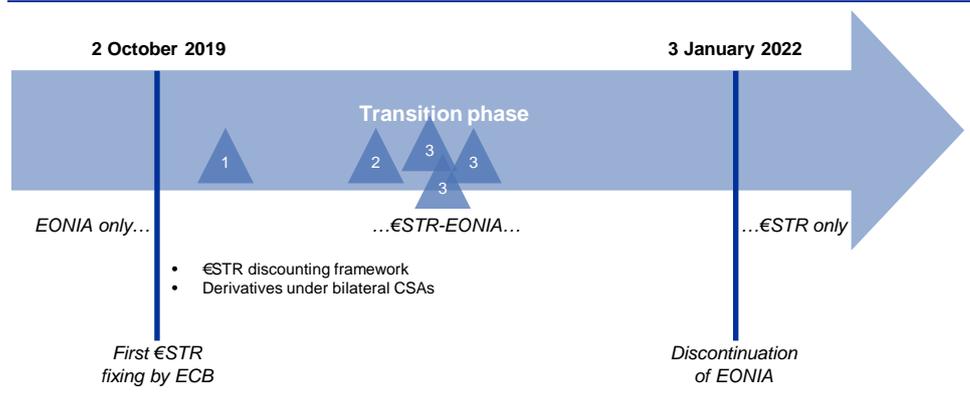
16. Discounted cash flow, derivatives pricing and derivatives value adjustment models:

- (e) Market participants should be aware that EURIBOR par swap rates will be affected due to the change in the discounting curve. However, it is also possible that the EURIBOR par rates as well as implied forward rates will be affected by the transition. The working group encourages market participants to consider that both scenarios could occur and may affect accounting and valuation models.

The third milestone is the PAI and discounting regime switch performed by counterparties with respect to their derivatives positions under bilateral CSAs (see Figure 6).

Figure 6

Third milestone – PAI and discounting regime switch performed by counterparties with respect to their derivatives positions under bilateral CSAs



For derivatives under bilateral CSAs, multilateral protocols will be required to switch bilateral CSAs to a €STR PAI rate, including compensation schemes – similar to those used by CCPs with their clearing members.

Most market participants will start migrating their bilateral CSAs and discounting from EONIA to the €STR once CCPs have made this switch. Assuming a step-by-step approach, there will be timing mismatches in switching dates unless there is a coordinated effort from both CCPs and market participants to switch on a specific date (i.e. a “big bang” transition, see also Chapter 4.1.2).

Under the new €STR discounting framework, a model valuation impact might be observed for all interest rate derivatives and derivatives on other risk factors using the EONIA interest rate curve that are part of a netting set subject to the amended CSAs. Compensation schemes will be devised to counter adverse price effects on derivatives due to the transition, in the same way as for CCPs.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

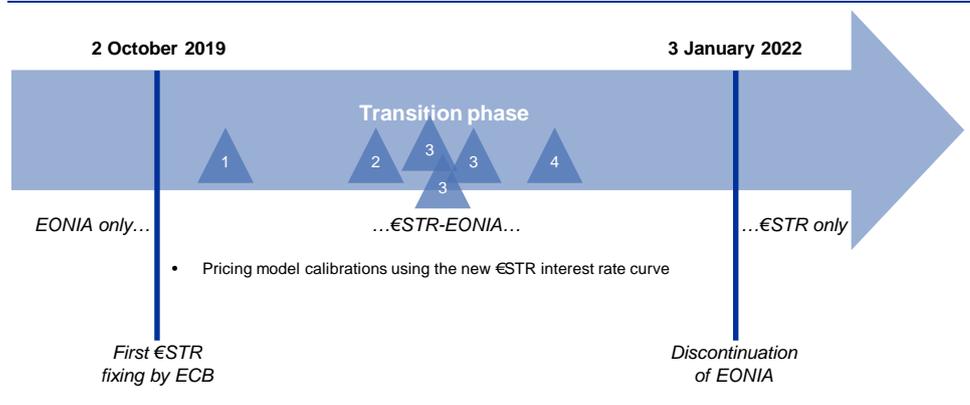
16. Discounted cash flow, derivatives pricing and derivatives value adjustment models:

- (f) Market participants are recommended to assess both model valuation and compensation scheme impacts on their derivatives under bilateral CSAs.

The fourth milestone is the decision by market makers and brokers on how to quote non-linear/volatility/correlation derivatives (see Figure 7).

Figure 7

Fourth milestone – Decision by market makers and brokers on how to quote non-linear/volatility/correlation derivatives



Market participants should be aware that switching the PAI rate from EONIA flat to €STR flat will have an impact on non-linear interest derivatives, such as caps/floors and swaptions.

In particular, with respect to interest rate derivatives pricing model calibrations for non-linear products, the working group expects that market makers and brokers will quote non-linear/volatility/correlation derivatives on the assumption that implied market data (e.g. implied volatilities) should not be affected by the transition from the EONIA to the €STR discounting framework (scenario 1). €STR OIS discounting will be used to obtain premia. In this case, market quotes are expected to be affected by the transition.

However, the working group cannot rule out a different scenario, e.g. due to offer and demand dynamics and possible ex ante embedding of expectations in premia. Non-linear/volatility/correlation derivatives premia might not significantly change during the transition from the EONIA to the €STR discounting framework (scenario 2). The €STR OIS discounting curve will be used to obtain implied market data (e.g. forward volatilities) and to recalibrate the corresponding pricing models from market-observed quotes.

Both scenarios should be considered when assessing the impact on accounting books and valuation models.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

16. Discounted cash flow, derivatives pricing and derivatives value adjustment models:

- (g) Switching the PAI rate from EONIA flat to €STR flat will have an impact on non-linear interest derivatives such as caps/floors and swaptions. The working group expects that market quotes might change but implied market data should not be affected. However, market participants should be aware that the opposite cannot be entirely ruled out.
- (h) For options on derivatives with physical settlement, valuation could be more complex than just considering the constant premia or the constant implied market data schemes. If the option is, for instance, traded before the 1 October 2019 transition date but the exercise date falls after the migration of the CCPs or the bilateral counterparty to €STR remuneration/discounting, it should be taken into account that the option is written on a €STR-discounted underlying asset. See also Recommendation no. 8.

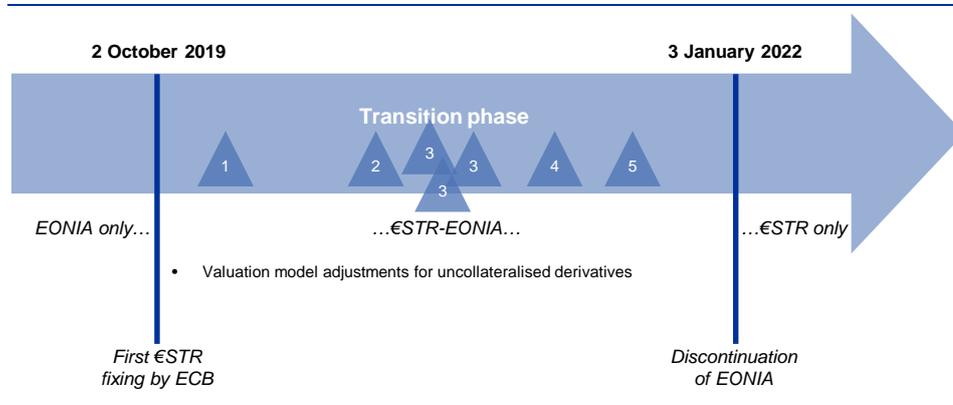
Adjusting the PAI rate in legacy CSAs by the fixed EONIA-€STR spread might be used as a very last resort/fallback rule only when counterparties do not sign compensation-related multilateral agreements before January 2022.

Under the new €STR discounting framework, no model valuation impact will be observed for any interest rate derivatives and derivatives on other risk factors that are part of a netting set subject to CSAs with PAI rate = €STR + spread. Derivatives in these netting sets should be valued under the EONIA-€STR + spread discounting framework. It is important to identify the derivatives that are subject to CSAs with PAI rate = €STR + spread and to verify that either the pricing models used for these derivatives consider the €STR + 8.5 basis points discounting curve or that these derivatives are subject to valuation adjustments, in case their pricing model considers the €STR discounting curve.

The fifth milestone is the decision by market participants to revise risk-free net present values and valuation adjustments (xVAs) pricing models or to perform new valuation adjustments (see Figure 8).

Figure 8

Fifth milestone – Decision by market participants to revise risk-free net present values and xVAs pricing models or to perform new valuation adjustments



No compensation schemes will be set for uncollateralised derivatives. A universal and market-wide mitigation arrangement is considered unachievable because it would:

- significantly rely on counterparty-specific factors;
- have to be subject to bilateral negotiations.

Switching the discounting curve might affect input data used to evaluate risk-free net present values and valuation adjustments (xVAs). It might be necessary to recalibrate xVA pricing models to new market data because of new input interest rate curves.

Considering that market participants' use of xVAs is not just limited to uncollateralised derivatives, other products such as collateralised derivatives and bonds might also be affected by some changes.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

16. Discounted cash flow, derivatives pricing and derivatives value adjustment models:

- (i) Valuation adjustment (xVa) models will need to be recalibrated to new market data. It should be noted that the use of xVa models is not limited to uncollateralised derivatives, and market participants should analyse their model to identify any necessary adjustments.

The EONIA OIS curve may also be used as input in discounting future cash flows related to assets and liabilities subject to fair valuation. The present value of future cash flows is thus obtained by using the EONIA OIS curve as a backbone discounting curve that can be adjusted by the corresponding market price of risk of each specific instrument (e.g. credit spreads implied from the market prices of comparable instruments).

Market participants should identify the credit instruments (e.g. loans) and debt instruments (e.g. bonds, commercial papers) in their portfolios that are valued at “fair value” and that require, as a pricing input, the EONIA OIS discounting curve. In a next step, they should assess the impact of the switch to the new €STR discounting curve on their valuation models. In other words, they should verify which market prices of risk parameters might have to be recalibrated to current market prices, e.g. credit spreads that will be computed from the market prices of comparable instruments by using a new discounting framework. For this purpose, market participants are recommended to monitor the transition of the corresponding derivatives market from EONIA-linked instruments to the new €STR-based derivatives.

Recommendations and observations for market participants to prepare for the transition from EONIA to the €STR:

16. Discounted cash flow, derivatives pricing and derivatives value adjustment models:

- (j) Given that the market widely uses the current EONIA OIS curve as input in discounting future cash flows related to assets or liabilities subject to fair value calculation, the working group recommends that market participants:
- monitor the corresponding derivatives market and its transition from EONIA-linked derivatives to the new €STR-based derivatives;
 - assess the impact on valuation models of switching from the EONIA OIS discounting curve to €STR OIS discounting, i.e. verify which market price of curve parameters might need to be recalibrated to current market prices (e.g. credit spreads that will be computed from comparable instrument market prices using a new discounting framework).

6 Annexes

6.1 Annex 1 – Floating rate option according to 2006 ISDA Definitions

“‘Floating rate option’ means, in respect of a swap transaction and the calculation of a floating amount, the floating rate option specified as such, which may be specified by reference to a rate option or may be specified by defining the floating rate option in the related confirmation or in any agreement between the parties governing that swap transaction.”

“‘EUR-EONIA-OIS-COMPOUND’ will be calculated as follows, and the resulting percentage will be rounded, if necessary, in accordance with the method set forth in Section 8.1(a), but to the nearest one ten-thousandth of a percentage point (0.0001%):

$$\left[\prod_{i=1}^{d_0} \left(1 + \frac{EONIA_i \times n_i}{360} \right) - 1 \right] \times \frac{360}{d}$$

where:

‘ d_0 ’, for any calculation period, is the number of TARGET settlement days in the relevant calculation period;

‘ i ’ is a series of whole numbers from one to d_0 , each representing the relevant TARGET settlement days in chronological order from, and including, the first TARGET settlement day in the relevant calculation period;

‘ $EONIA_i$ ’, for any day ‘ i ’ in the relevant calculation period, is a reference rate equal to the overnight rate as calculated by the ECB and appearing on the Reuters Screen EONIA Page in respect of that day;

‘ n_i ’, is the number of calendar days in the relevant calculation period on which the rate is $EONIA_i$; and

‘ d ’ is the number of calendar days in the relevant calculation period.”

6.2 Annex 2 – Example cash compensation mechanism for derivatives

Both approaches (i.e. exchanging the change in the NPV of the transaction(s) to be migrated either in cash or via a derivative) seem to capture the value transfer involved in switching from the EONIA to the €STR discount curve in a comparable way. In particular for the majority of linear derivatives like interest rate swaps (IRSs) with only a small second-order sensitivity to rate levels (Gamma), the value transfer is

predominantly a function of the first-order dependency on the discount curve level (Delta or DV01). Note that the value of the spread between EONIA and the €STR is static (8.5 basis points) and not stochastic. Therefore, the spread itself does not need to be agreed as part of the process.

Taking the example of a cash compensation mechanism, the following table illustrates the residual impact of a 1-basis-point parallel shift of the EONIA discount curve level on the estimated value transfer. A dummy IRS portfolio with an overall NPV of €6 billion ranging from 2 to 50 years is taken as an example (see Table A.1; most values rounded to €1,000; EONIA replaced by €STR as the discounting curve and all EURIBOR zero curves kept constant).

Table A.1

Residual impact of a 1-basis-point parallel shift of the EONIA discount curve level on the estimated value transfer

Trade tenor (years)	EONIA DV01	EONIA Gamma	NPV (EONIA discounting)	NPV (€STR discounting)	NPV change (value transfer)	NPV change (shifted EONIA level + 1 basis point)	Estimated impact on value transfer (absolute)
2	€159,000	-€30	-€1,041,252,000	-€1,042,599,000	-€1,347,000	-€1,347,000	€0
5	€296,000	-€100	-€988,968,000	-€991,481,000	-€2,513,000	-€2,513,000	€0
10	€575,000	-€400	-€1,102,064,000	-€1,106,968,000	-€4,904,000	-€4,900,000	€4,000
20	€897,000	-€1,200	-€955,363,000	-€963,061,000	-€7,699,000	-€7,688,000	€11,000
30	€1,269,000	-€2,500	-€910,859,000	-€921,753,000	-€10,894,000	-€10,873,000	€21,000
50	€2,443,000	-€8,000	-€1,063,998,000	-€1,085,060,000	-€21,062,000	-€20,993,000	€69,000
Total	€5,638,000	-€12,200	-€6,062,504,000	-€6,110,923,000	-€48,419,000	-€48,314,000	€105,000

6.3 Annex 3 – Rationale for using a constant spread along the EONIA and €STR curve

The following rationale is based on mid-market levels. Assume without loss of generality that a pay EONIA – receive €STR+S basis swap can be traded with maturity T at par [$PV(t=0)=0€$] with compounded spread S and $S>X$, with X being a constant spread (the spread compounds and is added to the daily €STR fixings). Then at maturity of the trade at T, the probability for making a profit equals 1 as the traded spread satisfies $S>X$. The trade will generate a guaranteed profit under all circumstances. As a result, this would constitute an arbitrage opportunity and only trades with $S=X$ are arbitrage free.

It follows from the recalibrated benchmark index definition $EONIA=€STR+X$ and the OIS floating rate option definition that one can extend the same fixed spread relation also to the simple compounded n-day implied forwards $f(EONIA;T;T+n) = f(€STR;T;T+n)+X$ (representing implied future index fixings for small n). In continuous compounded notation, $DF(T)=exp(-r(T)*T)$, this is equivalent to $r(EONIA; t; T) = r(€STR; t; T)+X$, which is the relation as described above except for the difference between simple and continuous compounded forward rates (order of a few hundredths of a basis point for small n).

The relation between zero bond yields on EONIA and the €STR allows to derive a €STR curve in the presence of an EONIA swap curve. For the sake of simplicity the spread relation can also be applied to the EONIA par swap quotes directly without significant loss of precision (difference to modelling the n-day forward directly should be of the order of less than a few hundredths of a basis point). This is also sufficient for many use cases.

More precisely, overnight index swaps with different maturities (fixed rate versus compounded daily interest with yearly payments) are considered. The spread given by 8.5 basis points is then subtracted from daily overnight forward rates obtained from the EONIA OIS curve: every Y-th yearly cash flow rate of the floating leg is thus given by the following formula:

$$\left[\prod_{i=1}^{n_Y} (1 + \tau_i \cdot (EONIA_i - SPREAD)) - 1 \right] \frac{1}{\tau_Y}$$

where

- n_Y is the number of EONIA fixings within the Y-th year
- τ_i is the day count fraction for the i-th period (ACT/360)
- τ_Y is the day count fraction for the Y-th year (ACT/360)

For each maturity, the following is then computed:

- a “theoretical €STR OIS par rate”, i.e. the par rate obtained by imposing an initial zero value to the net present value (NPV) of the swap whose floating leg cash flows are obtained by shifting down each 1 day ON EONIA forward rate by 8.5 basis points and discounting all the future cash flows with the EONIA OIS discounting curve;
- a “heuristic €STR OIS par rate”, i.e. the rate obtained by shifting down each market-quoted EONIA par rate by 8.5 basis points.

The difference between the “heuristic €STR OIS par rates” and the “theoretical €STR OIS par rates” ranges from a few hundredths of a basis point for shorter maturities to five/six-hundredths of a basis point for longer maturities (i.e. from 20-year up to 50-year maturity swaps; see Table A.2).

It should also be noted that €STR+X will very likely be adopted as the fallback for contracts referencing EONIA beyond end-2021; as a result the above argument is also valid for longer-dated exposures.

Table A.2

Estimated differences between the theoretical spread and the heuristic spread based on market data as at 31 May 2019

Time to maturity	1 year	5 years	10 years	15 years	20 years	30 years	40 years	50 years
(1) Market-quoted EONIA OIS par rate	-0.3973%	-0.2500%	0.1695%	0.5096%	0.6890%	0.7875%	0.7936%	0.7867%
(2) “Theoretical €STR OIS par rate”, obtained by shifting down each overnight EONIA forward rate by 8.5 basis points, discounting with the EONIA OIS discounting curve and with initial NPV=0	-0.4819%	-0.3348%	0.0844%	0.4242%	0.6035%	0.7019%	0.7080%	0.7011%
(3) “Heuristic €STR OIS par rate”, obtained by shifting down each market-quoted EONIA par rate by 8.5 basis points	-0.4823%	-0.3350%	0.0845%	0.4246%	0.6040%	0.7025%	0.7086%	0.7017%
(1) – (2) Market quotes – theoretical par rates	0.0846%	0.0848%	0.0851%	0.0854%	0.0856%	0.0856%	0.0856%	0.0856%
(1) – (3) Spread = €STR – EONIA spread	0.0850%	0.0850%	0.0850%	0.0850%	0.0850%	0.0850%	0.0850%	0.0850%
(2) – (3) Theoretical-heuristic difference	0.0004%	0.0002%	-0.0001%	-0.0004%	-0.0006%	-0.0006%	-0.0006%	-0.0006%

Note: The figures refer to an indicative market data set at a given date. Different results might be obtained under different market conditions (i.e. with respect to different interest rate levels).

6.4 Annex 4 – Overview of possible conventions for cash products

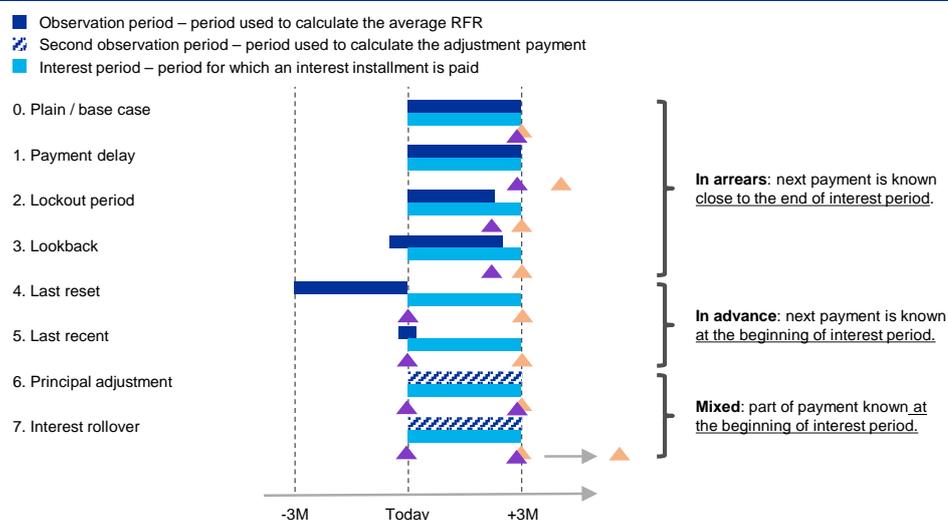
An averaging approach or a compound approach may be applied to accrual calculations in the following ways.

- The simple average is used to calculate the average risk-free rate, which is then applied to the number of days.
- The compound option implicitly mimics an overnight deposit whose accrual is re-deposited the next day. This is more appropriate from a purely economic perspective, and this method is also used for OISs, which allows for a better fitting hedge.

Regardless of the calculation method that market participants opt for and considering the [Financial Stability Board \(FSB\)’s recent user’s guide on overnight risk-free rates](#), markets can choose to adopt several options when considering “in arrears” day count structures for securities. These are presented and explained in Figure A.1.

Figure A.1

Overview of possible conventions for cash products



Source: FSB.

In arrears:

0. Plain/base case: There is no delay in coupon payments as the accruing period ends; this is not applicable because the €STR will be published on the next TARGET2 day.

1. Payment delay: The coupon is paid x days after the end of the accrual period; this solves the problem of preparing the settlement systems after the calculation of the accruals has been completed. On the other hand, at maturity notional amounts would be paid regularly, while last coupons would be paid x days after systems need to be updated, and a residual credit risk would remain with lenders for x days after the security expires.

Note: It is worth liaising with settlement agents such as the (I)CSDs, to understand what would be a prudent approach to determining “x”. The experience of the Working Group on Sterling Risk-Free Reference Rates could be useful.

2. Lockout period: The rate is frozen for a certain number of days before the end of the interest period. This is the method recently adopted for SOFR floating rate notes (FRNs). There would be a slight, albeit small, difference between the market rate and the frozen rate; one may also consider that an OIS would not perfectly transform this coupon into a fixed rate.

3. Lookback: Calculation starts and ends with a lag of x days. This method has been used for some SONIA FRNs and is explained in a [discussion paper](#) of the Working Group on Sterling Risk-Free Reference Rates. This method allows an almost perfect match between the rates behaviour and the coupons throughout the entire span of the security, except for the x-day gap.

In advance:

4. Last reset: The coupons are calculated according to previous period fixings. A basis risk pops up as a consequence of yield curve slope and curvature.

5. Last recent: A single fixing or the average of a few days is applied throughout the entire following period. Interest rate risk cannot be hedged using the tools currently available.

Mixed:

6. Principal adjustment: Combines a first payment known at the beginning with an adjustment payment known at the end of the coupon period so as to reflect the change between the agreed rate and the realised one. As it involves some calculations, this method is somewhat more complicated and therefore less suitable for less sophisticated market participants. Moreover, it does not offer a solution to the T+1 delay in the publication of the €STR.

7. Interest rollover: This method is the same as above, but the payment is delayed by x days. Again, the method involves some calculations and may therefore be less suitable for less sophisticated market participants.

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