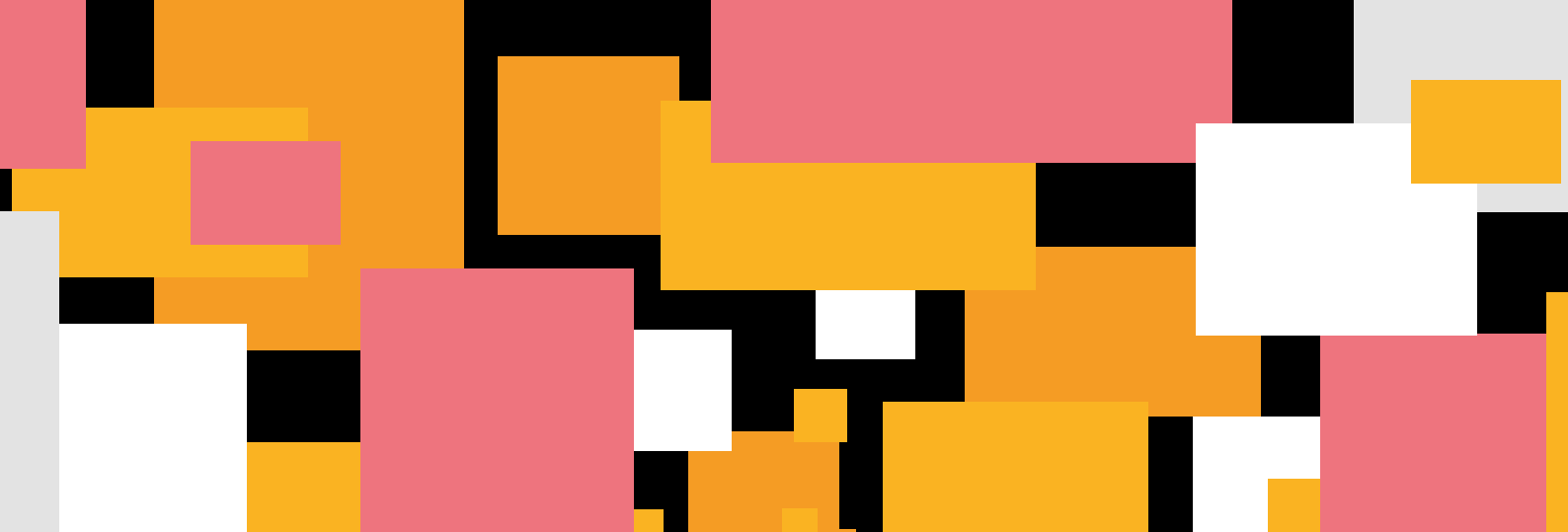


The LIBOR transition

Where are we now?
Q1 2019



The LIBOR transition – Where are we now?

A new paradigm, ...

The transition away from currently used interbank offered rates, particularly LIBOR, to new or reformed benchmark rates poses one of the biggest challenges for financial firms in the upcoming years. Whereas some time ago, only few subject matter experts and newly appointed transition managers at financial firms dealt with the topic, it has in the meanwhile been brought to the attention of a broad range of industry practitioners. They all, however, face the same challenge of coping with the growing complexity and faster pace of the developments around the transition.

...growing complexity...

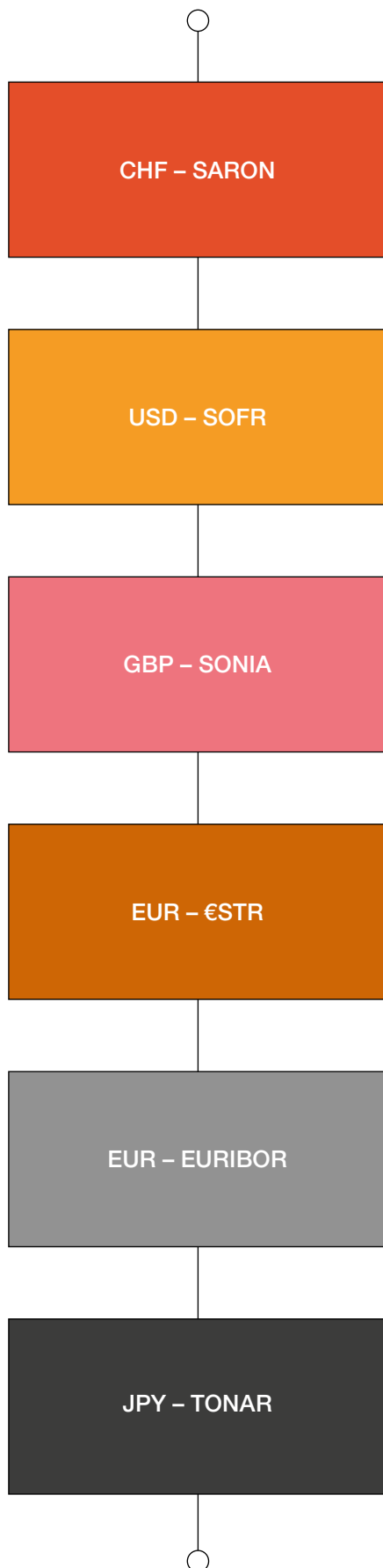
Staying ahead of the knowledge curve during the LIBOR transition increasingly resembles looking at a mosaic of information. Where LIBOR ensured a common, homogeneous approach across multiple currencies, this simplicity will be lost under the new paradigm. The complexity is the result of multiple dimensions that accompany the transition. Different currencies, markets, approaches, fallback languages, etc. show how fragmented the landscape is.

...and our way to deal with it

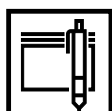
To deal with this complexity, the present overview provides the current status of the transition process alongside the five major currencies. We use a structured grid to evaluate the administrative and methodological set-up of the new benchmarks, their envisaged fallback and term approaches, the dynamics of their underlying borrowing and lending markets, and the adoption of the rates by cash and derivatives markets.

For further thought leadership on this journey towards a new financial paradigm, please have a look at [pwc.com/libor](https://www.pwc.com/libor).

Rates overview



The Swiss Average Rate Overnight (SARON)



Administration and governance overview

- The National Working Group on Swiss Franc Reference Rates (“working group”) combines representatives of private-sector banks and the Swiss National Bank [1]
- The working group has recommended SARON as the alternative for the CHF LIBOR
- Originally, SARON dates back to 2009, when it replaced the previously used repo overnight index
- SIX Swiss Exchange calculates and publishes SARON [2]
- An application process for SARON to be endorsed under the EU BMR is planned. SIX expects the process to be completed around end-2019 [3]



Methodology & eligible transactions

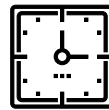
- SARON is a secured rate
- It is continually calculated in real time and published every ten minutes. In addition, fixing is conducted three times a day: at 12am, 4pm and 6pm. The 6pm fixing serves as the main daily reference for subsequent usage, e.g. for derivative payments or the valuation of financial assets [2]
- SARON is based on concluded transactions and trade quotes posted on the SIX Repo trading platform, provided they lie within the parameters of a quote filter. The filter prevents quotes that diverge too much from the current interest level from distorting the average rate and thus limits the possibilities for manipulation. The rate is recalculated every time a trade is concluded or a new quote is issued, provided they meet certain specifications [2]
- Only standardised, CHF-denominated repurchase agreements with fixed-income securities eligible for SNB repo transactions (general collateral) are used to calculate the reference rates and indices





Fallback solutions

- ISDA is working on amending its 2006 Definitions to implement viable fallbacks for the discontinuation of different IBORs [4]
- Although the approach is ISDA-specific, it can be considered as having a significant signalling effect for all IBOR-referencing products, not least since ISDA reached out to a broad group of market participants in its consultation
- The approach covers CHF LIBOR and proposes SARON to be its fallback rate as soon as CHF LIBOR is permanently discontinued (based on defined triggers)
- Since CHF LIBOR is an unsecured term rate, adjustments for the term and the credit component have to form part of the fallback
- For the term adjustment, it was concluded after the consultation that backward-looking, daily compounding of the o/n rate (i.e. SARON) is the most suitable approach
- This is combined with calculation of a historical average credit spread prior to discontinuation to account for the credit risk component that forms part of CHF LIBOR but not of SARON
- For CHF, this likely means that at the discontinuation of LIBOR, the average difference between LIBOR and term-adjusted SARON will be calculated for a time period yet to be defined (probably several years) and applied as a fixed spread to the term-adjusted SARON for the legacy contract
- Notably, this term approach for fallback language is conceptually close to the envisaged methodology of the working group for deriving term rates generally from SARON for cash products (see below) [5]; thus a chance can be seen for CHF to create a relatively harmonised approach between legacy fallback language and the actual market convention for term rates in the future
- The majority of respondents to ISDA's consultation process prefer using the term and credit spread adjustment across all currencies/benchmarks covered by the consultation
- Discussions on the fallback language for legacy retail loans referencing CHF LIBOR after 2021 continue on a Swiss-domestic level. A first draft basis for language respecting Swiss legislation is being discussed for retail loans
- Switzerland can typically be seen as a jurisdiction that particularly values the rights of individual parties to a contract. It seems unlikely that governmental or regulatory bodies could impose the acceptance of an industry solution upon parties against their consent
- Based on the consultation feedback, ISDA will analyse the results in further detail and continue to develop the final proposal for parameters in the fallback language with its independent advisors



Envisaged approach for term rate construction

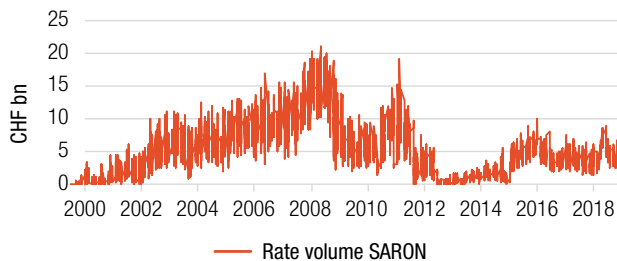
- The working group came to the conclusion that a robust derivatives-based term rate is unlikely to be feasible given the limited liquidity in Swiss derivatives markets. A forward-looking term rate based on derivatives referencing SARON is not expected to be as robust as the reference rate itself. If this changes in the future, the use of a derivatives-based term rate as a fallback rate might be re-assessed. The working group therefore opted for a backward-looking calculation method based on the average of daily SARON rates over a given period. Wherever possible, a compounded SARON should thus be used as term rate [5]
- Using a backward-looking compounded term rate can lead to cash flow uncertainty. However, there are ways to explore to mitigate this uncertainty, and further work needs to be conducted as to how these could work in practice and regarding potential legal challenges
- Given that derivatives markets in other currencies do have substantial liquidity and that those markets are actually considered as a favourable option for deriving term rates, the transition over the next years might lead to a fragmentation of conceptual approaches across currencies
- In March 2019, SIX started to publish rolling, compounded SARON rates with different time windows for illustrative purposes [6]
- The working group is continuing to work out solutions as to how uncertainty about cash flows can be addressed best under a given backward-looking approach
- The working group is further continuing to develop the design of SARON-based derivatives such as options and cross currency basis swaps
- The 3M followed by the 6M tenors are most widely used for CHF LIBOR according to a survey by ICE [24]



Liquidity and rate dynamics

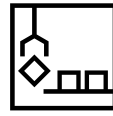
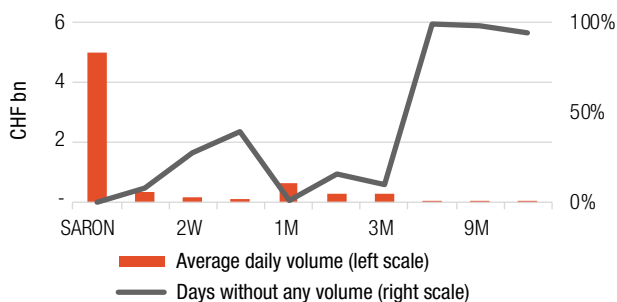
- The transactions that underlie the calculation of SARON and the adjacent volume permitted (binding quotes) amount to approx. CHF 5bn daily [2]
- Historically, the volume of such transactions can vary (see graph) [2]

Historical rate volume underlying SARON



- Various term rates up to one year exist for the SAR (e.g. SAR1M). The liquidity is, however, not high enough to support the derivation of term rates directly (see graph below for 2018 [2]), hence the previously mentioned approach via compounding on o/n rates is considered

Liquidity of SAR[ON] and SAR[Term]



Markets and products

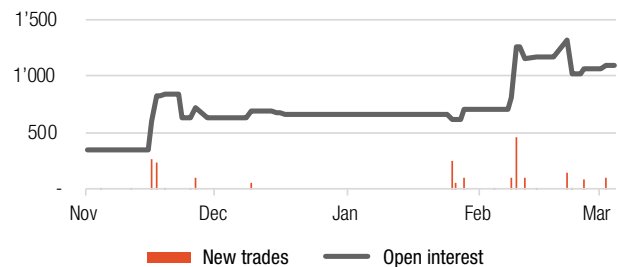
Cash

- Debt issuances linked to SARON are not known so far

Futures

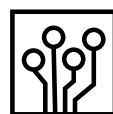
- EUREX launched SARON futures in October 2018 for 3M based on the recommended specifications by the working group, with a contract size of CHF 1m [7]
- The current naming convention by EUREX may be changed in 2019 to align with futures contracts in other currencies
- The future volume for SARON has been steadily increasing since launch (see graph below); at the end of Q1 2019, open interest stood at approx. 1,100 contracts [8]

SARON 3M future volume at EUREX



Swaps

- SARON swaps have started to be cleared by LCH and EUREX. The observable volume indicates that SARON swaps have reached the levels of former TOIS swaps. However, volumes are still relatively small compared to swaps referencing CHF LIBOR. It is expected that volumes will continue to pick up once cash products are based on SARON
- Looking at US transactions reported under swap repositories (DTCC/Bloomberg SDRs), ISDA counted 16 cumulative trades with a notional of CHF 2.5bn as per end-2018, up from 10 trades/CHF 1.3bn in the quarter before [30]
- At the end of 2017, SARON replaced the old TOIS with overnight rates, e.g. for PAI; market participants such as clearing houses have implemented this change

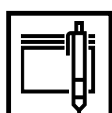


Adjacent developments

- We are not aware of adjacent or alternative developments for IOSCO-compliant benchmarks related to CHF so far



The Secured Overnight Financing Rate (SOFR)



Administration and governance overview

- In 2014, the Federal Reserve convened the Alternative Reference Rates Committee (ARRC), which in 2017 named SOFR as its preferred alternative reference rate [10]
- The ARRC is a group of private-market participants convened by the Federal Reserve Board and Federal Reserve Bank of New York in cooperation with the US Department of the Treasury, the CFTC and the OFR
- The New York Fed is the administrator and producer of SOFR and has been publishing it since early April 2018 [11]
- In October 2018, the FASB added SOFR to its list of US benchmark interest rates for the purposes of hedge accounting [12]



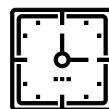
Methodology & eligible transactions

- SOFR is a secured rate
- It is a broad transaction-based measure of the cost of borrowing cash overnight collateralised by Treasury securities [13]
- The New York Fed publishes SOFR on a daily basis on its website at approx. 8am ET
- SOFR comprises a broad universe of overnight Treasury repo trade activity; this should, amongst other things, provide a certain robustness of the rate to shifts of market activities in bilateral versus tri-party repo. SOFR is calculated as a transaction-weighted median repo rate with the following components [14]:
 - Tri-party Treasury general collateral (GC) repo transactions cleared and settled by BNYM; this excludes, however, transactions via the FICC GCF repo market and those trades in which the FED is a counterparty
 - Tri-party Treasury GC repo transactions made through the FICC GCF repo market, for which the FICC acts as central counterparty
 - Bilateral Treasury repo transactions cleared through the FICC DVP service
- The trade-volume-weighted median methodology can be considered a more robust statistic than alternatives such as e.g. the trade-volume-weighted average
- The value derived from it is generally an interest rate level that has actually been observed and at which business has actually been conducted
- Further, it aligns with the calculation method for the daily EFFR and for the daily OBFR, which was adopted by the Fed in 2016



Fallback solutions

- ISDA is working on amending its 2006 Definitions to implement viable fallbacks for the discontinuation of different IBORs [4]
- Although the approach is ISDA-specific, it can be considered as having a significant signalling effect for all IBOR-referencing products, not least since ISDA reached out to a broad group of market participants in its consultation
- The approach covers USD LIBOR only in that preliminary questions were asked, and is followed by further consultation by ISDA; SOFR is the proposed fallback rate as soon as USD LIBOR is permanently discontinued (based on defined triggers)
- Since USD LIBOR is an unsecured term rate, adjustments for the term and the credit component should form part of the fallback
- For the term adjustment, it was concluded for other currencies after the consultation that backward-looking, daily compounding of the o/n rate is the most suitable approach – this could be a viable option for USD as well
- For SOFR, this can be combined with calculation of a historical average credit spread prior to discontinuation to account for the credit risk component that forms part of USD LIBOR but not of SOFR
- For USD, this would imply that at the discontinuation of LIBOR, the average difference between LIBOR and term-adjusted SOFR will be calculated for a time period yet to be defined (probably several years) and applied as a fixed spread to the term-adjusted SOFR for the legacy contract
- For cash products, the ARRC has released several guiding principles and consultations as well [15]
- This refers e.g. to business loans, securitisations and FRNs



Envisaged approach for term rate construction

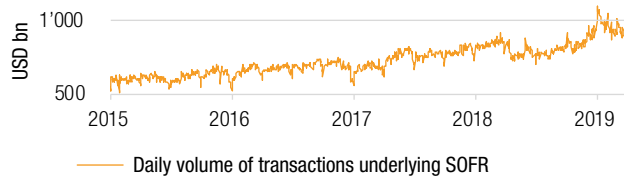
- As with other currencies, several methods for deriving a term rate for the new alternative reference rates are being discussed; for forward-looking term rates, the ARRC intends to follow a derivative-based approach; the committee is aiming for production of a term rate from the futures traded on SOFR in 2021 [16]
- Further, the New York Fed plans to publish a series of backward-looking term rates in the first half of 2020 [47]
- The availability of a properly calculated and administered term rate should facilitate the broader use of SOFR in cash products
- It remains to be seen how these approaches, which are envisaged to become market standards used going forward, will compare to the fallback language adjusting for the term component in legacy contracts
- The 3M and the 1M tenors are most widely used for USD LIBOR according to a survey by ICE [24]



Liquidity and rate dynamics

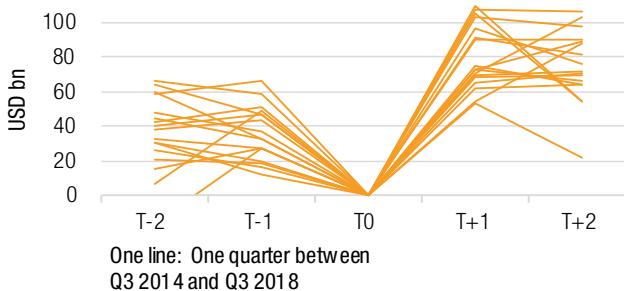
- The US Treasury repo market underlying SOFR is highly liquid; between 2015 and 2018, daily trading volumes were between USD 600bn and 1,000bn (see graph below) [17]

Historical rate volume underlying SOFR



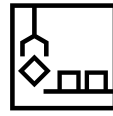
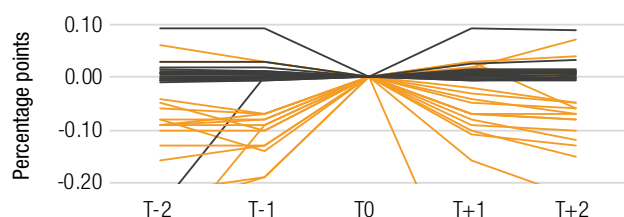
- Over recent years, it was observed that volume drops slightly at quarter ends, potentially reflecting the impact of exposure management steering at banks for quarterly reporting purposes as well as other effects (e.g. treasury settlements; graph below shows absolute changes in volume for 17 quarters two days before and after the last working day in a quarter (T0), normalised to zero USD at T0)

Quarter-end day (T0) volume difference



- Notably, unlike events impacting both USD LIBOR and SOFR (e.g. monetary policy rate hikes), this is reflected in SOFR with higher rates at quarter-ends but not in LIBOR (graph shows absolute rate changes of SOFR – or its approximation before 2018 – in orange and LIBOR in black; again the rate is normalised to zero bps at T0) [17]
- While conceptually interesting, these spikes do not significantly affect averaged values that are typically used in products

Quarter-end absolute rate difference of SOFR (or pre-2018 approx.) and LIBOR



Markets and products

Cash

- Until Q1 2019, more than USD 80bn of SOFR-referenced FRNs had been issued with growing momentum [43]
- Typically, FRNs reference an average of daily SOFR rates over a certain period of time for determining periodic payments with a few days of lock-out at the end to be able to calculate cash flows [46]

Futures

- The CME launched SOFR futures in May 2018 with steadily increasing volume; open interest in 1M and 3M futures stood at approx. 150,000 contracts as per end-Q1 2019 [42]

Swaps

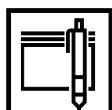
- OTC fixed versus SOFR as well as basis swaps including SOFR still show relatively low yet increasing volume
- The LCH began clearing SOFR swaps in July 2018 [18]
- The CME began clearing SOFR swaps in October 2018, using SOFR for discounting and PAI [19]
- LCH is expected to move to SOFR discounting and PAI in late-2020 [16]



Adjacent developments

- ICE, the administrator of LIBOR, is exploring how further alternative reference rates can enrich the repertoire of rates market participants can use for different purposes. The so-called ICE Bank Yield Index, which would incorporate the credit risk of a basket of banks, could potentially serve as an alternative to SOFR with a credit component. The challenge attached is, however, to make the calculation of such rates compliant with IOSCO principles; the index is currently being worked out with a consultation that ended in Q1 2019 [48]
- While many market participants see a clear use for such credit-component alternatives to SOFR, it remains to be seen whether financial institutions can rely on such alternatives for future use; many act according to the principle “hope for the best, plan for the worst” in this respect
- It also remains to be seen to what extent such an alternative rate could cannibalise the transition of liquidity from USD LIBOR to SOFR

The Sterling Overnight Index Average (SONIA)



Administration and governance overview

- The Sterling Risk-Free Reference Rate Working Group (“working group”) was established in 2015 by the BoE and the FCA [20]
- The working group is made up of banks and dealers, investment managers, non-financial corporates, infrastructure firms and trade associations
- In 2017, the working group proposed SONIA as the alternative to GBP LIBOR
- In April 2018, SONIA was reformed following several rounds of consultation (“SONIA+”); since then, the working group has engaged regularly in consultations and discussions on specific aspects of the transition
- The BoE has been the administrator for SONIA since April 2016 (before, it was the WMBA) and is responsible for the calculation and publication of SONIA [21]
- The BoE uses the Sterling Money Market Data Collection for applying its methodology (see below) on the data for deriving SONIA
- In September 2018, the PRA and FCA wrote a letter to the CEOs of large financial companies to seek assurance that firms’ senior managers and Boards understand the risks associated with the IBOR transition and are taking appropriate actions [22]
- They requested – among other things– a Board-approved summary of firms’ assessments of key risks relating to the LIBOR discontinuation and details of actions planned to mitigate those risks



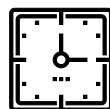
Methodology & eligible transactions

- SONIA is an unsecured rate
- Since its reform by the BoE in 2018, it has been determined as follows [23]
- The SONIA rate for a given London business day is published at 9am on the following London business day
- SONIA is measured as a volume-weighted, trimmed mean, rounded to four decimal places, of interest rates paid on eligible sterling-denominated deposit transactions
- The trimmed mean is calculated as the volume-weighted mean rate based on the central 50% of the volume-weighted distribution of rates
- Eligible transactions are reported to the BoE’s Sterling Money Market Daily Data Collection, in accordance with the corresponding reporting form
- Eligible transactions are:
 - unsecured and overnight;
 - executed until 6pm London time and settled on the same day; and
 - greater than or equal to GBP 25 million in transaction value



Fallback solutions

- ISDA is working on amending its 2006 Definitions to implement viable fallbacks for the discontinuation of different IBORs [4]
- Although the approach is ISDA-specific, it can be considered as having a significant signalling effect for all IBOR-referencing products, not least since ISDA reached out to a broad group of market participants in its consultation
- The approach covers GBP LIBOR and proposes SONIA to be its fallback rate as soon as GBP LIBOR is permanently discontinued (based on defined triggers)
- Although both GBP LIBOR and SONIA are unsecured rates, there is a spread caused by the different natures and dynamics of the underlying markets (hence the term “adjustment spread” is more appropriate than “credit spread”); adjustments for this spread and for the term spread component have to form part of the fallback
- For the term adjustment, it was concluded after the consultation that backward-looking, daily compounding of the o/n rate (i.e. SONIA) is the most suitable approach
- This is combined with calculation of a historical average spread between GBP LIBOR and SONIA prior to discontinuation
- For GBP, this would mean that at the discontinuation of LIBOR, the average difference between LIBOR and term-adjusted SONIA will be calculated for a time period yet to be defined (probably several years) and applied as a fixed spread to the term-adjusted SONIA for the legacy contract
- The working group acknowledges this feedback for defining an adjustment spread in the derivative space and wants to proceed with consultation for the cash market [25]



Envisaged approach for term rate construction

- The working group completed a first consultation on SONIA term rates in November 2018 [26]
- Similar to other currencies, market participants see the need for a SONIA term rate particularly in cash products, but also conclude that this is not necessarily the case for derivative markets, assuming that the general usage of term rates in GBP is expected to decline in the post-LIBOR future compared to now [26]
- Provided there is IOSCO compliance, the market prefers a derivative-based approach for determining term rates, with OIS and/or futures [26]
- The working group anticipates that term rates could be available in the second half of 2019
- The 3M and 6M tenors are most widely used for GBP LIBOR according to a survey by ICE [24]



Liquidity and rate dynamics

- The average volume of transactions underpinning SONIA is typically between GBP 40 and 50 billion per day [27]
- Although the volume can decline (at the end of 2018, it dropped below GBP 40bn), this volatility is not observed to translate into volatility of SONIA [28]

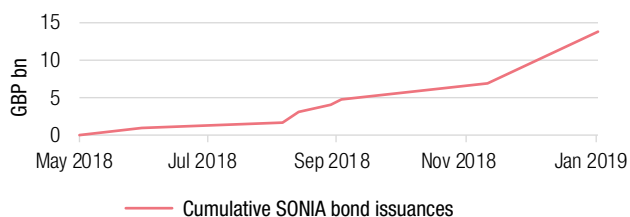


Markets and products

Cash

- Since 2018, several SONIA-linked bonds have been issued by different market participants, amongst them banks and supranational entities like the World Bank. Before that, SONIA had typically not been used in cash markets so the first issuances marked a key milestone. The majority of sterling floating-rate issuance since September 2018 has been SONIA-linked
- These bonds typically use daily compounding with a five-day difference between actual payment and determination of interest rates after the observation period [29]
- In March 2019, the working group published a discussion paper on conventions for referencing SONIA in (new) financial contracts for various products [29]

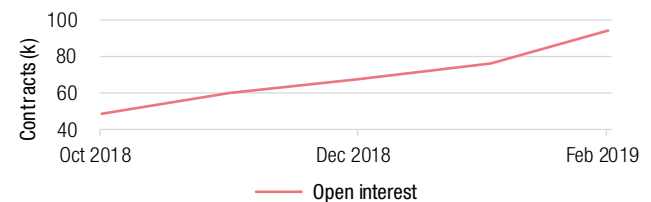
Issuance volume of SONIA-linked bonds



Futures

- The CME and the ICE launched SONIA-linked futures during 2018 with steadily rising volume since then [32] [33]
- During October 2018 and February 2019, open interest increased by 92% to 94k contracts where open interest in GBP LIBOR futures (still higher by a factor of >40) increased by 13% [34]

Open interest SONIA Futures

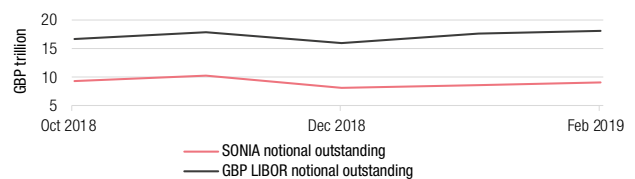




Swaps

- SONIA is already used as a reference rate in GBP OIS, adding substantial volume to the swap statistics [29]
- Looking at cumulative US transactions reported under swap repositories (DTCC/Bloomberg SDRs), volume in SONIA swap trades (IRS and basis swaps) is quite significant compared to GBP LIBOR; with USD-equivalent 2 trillion of traded notionals, ISDA saw almost as much volume in SONIA swaps as in GBP LIBOR swaps (USD 2.3 trillion) in Q4 2018; the GBP LIBOR swap trades, however, comprise more than ten times as many single transactions compared to SONIA swaps [30]
- At LCH, close to GBP 50 trillion of notionals were traded in SONIA-swaps in 2018, which was already more than in GBP LIBOR swaps (approx. GBP 46 trillion) [31]
- There is still twice as much GBP LIBOR notional outstanding at LCH compared to SONIA, with no indication in recent months that SONIA might pick up (see graph)

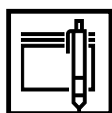
LCH outstanding swap notional



Adjacent developments

- We are not aware of adjacent or alternative developments for IOSCO-compliant benchmarks related to GBP so far

The Euro Short-Term Rate (€STR)



Administration and governance overview

- The ECB decided in 2017 to develop a euro unsecured overnight interest rate on the basis of data available in the Eurosystem
- The Working Group on Euro Risk-Free Rates (“working group”) is chaired by a private sector representative while the ECB provides the secretariat. The working group is made up of credit institutions as voting members and further institutions as non-voting members and invitees [35]
- The group was set up by the ECB, together with the FSMA, the ESMA and the European Commission; these institutions have observer status in the group
- After two consultation rounds during 2018, the working group recommended that the euro short-term rate (ESTER; acronym changed to €STR in 2019) should be used as the IOSCO-compliant overnight rate
- The Euro Overnight Index Average EONIA and the Euro Interbank Offered Rate EURIBOR are not expected to meet the criteria of the EU Benchmarks Regulation and will therefore see their use restricted, at the latest when the regulation comes into force on 1 January 2022 (this includes a two-year grace period for administrators, as envisaged in 2019 and yet to be formally approved)
- The ECB is the administrator of €STR and has overall responsibility for providing the rate [36]
- Until €STR is available, the ECB will publish figures referred to as pre-€STR, which market participants can use to assess the suitability of the new rate [38]
- Pre-€STR is calculated using the same methods as defined for €STR. Pre-€STR differs in that it is based on final data and includes all revisions in terms of cancellations, corrections and amendments submitted by reporting agents at the time of calculating the rate, while €STR is planned to be published every morning and take into account only the data received by the submission deadline of 7am CET that morning
- The ECB will begin publishing €STR on 2 October 2019 as per 1 October 2019
- EONIA and €STR will be published in parallel for a transition period
- However, it is expected that EMMI, the administrator of EONIA, will tie EONIA to €STR plus a spread as soon as €STR starts to be reported in October 2019
- The working group has made recommendations on how to calculate the spread, and the ECB envisages calculating it once EMMI announces the change in methodology





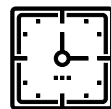
Methodology & eligible transactions

- €STR is an unsecured rate
- It aims to reflect the wholesale euro unsecured overnight borrowing costs of euro area banks. The rate is published for each business day (according to TARGET2 definition) based on transactions settled on the day before and which are deemed to be executed at arm's length [36]
- €STR is based on borrowing transactions in euro conducted with financial counterparties that banks report in accordance with the MMSR Regulation (which provides the conceptual basis for €STR) [37]
- In concrete terms, €STR is calculated using overnight unsecured fixed-rate deposit transactions over EUR 1m
- Unsecured deposits are standardised and are the most frequent means of conducting transactions on the basis of a competitive procedure, thereby limiting factors potentially influencing the volatility of €STR
- €STR is calculated for each day as a volume-weighted trimmed mean as follows:
 1. Ordering transactions from the lowest rate to the highest rate;
 2. Aggregating the transactions occurring at each rate level;
 3. Removing the top and bottom 25% in volume terms; and
 4. Calculating the mean of the remaining 50% of the volume-weighted distribution of rates
- A pro rata calculation is applied to volumes that span the thresholds for trimming to ensure that exactly 50% of the total eligible volume is used in the calculation of the volume-weighted mean
- The ECB publishes €STR to three decimal places at 9am CET at the latest on T+1



Fallback solutions

- ISDA is working on amending its 2006 Definitions to implement viable fallbacks for the discontinuation of different IBORs [4]
- Although the approach is ISDA-specific, it can be considered as having a significant signalling effect for all IBOR-referencing products, not least since ISDA reached out to a broad group of market participants in its consultation
- As with USD LIBOR, the approach covers EUR LIBOR and EURIBOR only in that preliminary questions were asked, and is followed by further consultation by ISDA; €STR is the proposed fallback rate as soon as these rates are permanently discontinued (based on defined triggers)
- Although both EUR LIBOR/EURIBOR and €STR are unsecured rates, there is a spread caused by the different natures and dynamics of the underlying markets (hence the term “adjustment spread” is more appropriate than “credit spread”); adjustments for this spread and for the term spread component have to form part of the fallback
- For the term adjustment, it is concluded for other currencies (those that were part of the first consultation) that backward-looking, daily compounding of the o/n rate is the most suitable approach – this could be an option for EUR as well
- This is combined with calculation of a historical average spread between EUR LIBOR/EURIBOR and €STR prior to discontinuation
- A fallback for EONIA might turn out to be simple if – as envisaged – the definition of EONIA is changed at the root and tied to €STR plus a fixed spread



Envisaged approach for term rate construction

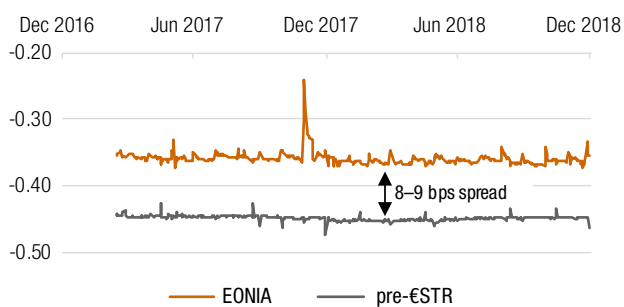
- The methodology to determine a term structure for €STR is expected to be finalised in 2019. In doing so, the working group aims to find a robust solution for market participants while taking note of the approaches undertaken in other jurisdictions/currencies
- Provided there is enough liquidity, the working group favours an OIS-based approach for a term rate that can be a fallback for EURIBOR [38]
- It can be expected that the determination of a term rate for €STR is closest to what will likely replace EURIBOR



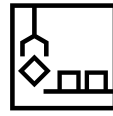
Liquidity and rate dynamics

- Pre-€STR shows significant volumes, notably above EONIA volumes; in the first half of 2018, daily volumes, based on actual transactions, ranged between EUR 25 and 40 billion compared to the EONIA volume, which hovered around EUR 5 billion [39]
- For the period from March 2017 to July 2018 that the ECB considered in an analysis, pre-€STR was very stable with an average daily volatility of 0.4 bps. Low volatility, amongst other things, reflects the aforementioned methodology of (pre-)€STR [39]
- Over that period, pre-€STR was trading at a stable spread of around 9 bps below EONIA. This spread reflects the fact that €STR is a borrowing rate and not a lending rate, as is the case for EONIA, and that it includes transactions with a broad range of financial corporations, not just banks [39]

Comparison of pre-€STR and EONIA



- Certain of EONIA's rate dynamics, such as spiking at specific dates due to reserve requirements, do not seem to be so apparent in €STR



Markets and products

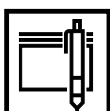
- Since €STR is not yet published and pre-€STR is not a sustainable basis for (nor does it have the purpose of) referencing in financial contracts, it remains to be seen how the liquidity in products will shift and what the market conventions will look like
- In 2018, there was an estimated EUR >20 trillion of EONIA-linked derivative notionals outstanding (compared to EUR >110 trillion of EURIBOR-linked derivatives notionals) [41]
- It is estimated that EONIA was referenced in over EUR 6 trillion of secured and unsecured money market instruments and overnight interest swaps. These contracts are used by corporate entities, pension and investment funds, insurance companies, banks and other entities [40]
- Given the envisaged parallel publication of EONIA and €STR, a slow and steady shift of EONIA's liquidity to €STR during that transition period can be expected
- CCPs are expected to change PAI and discounting from EONIA to €STR somewhere around mid-2020 after consulting with their stakeholders



Adjacent developments – EURIBOR reform

- EURIBOR represents the most important euro-denominated term interest rate and is critically important for the Eurozone
- EMMI, the administrator, is committed to delivering a reformed and robust methodology for EURIBOR in order to meet stakeholder expectations and make it EU BMR compliant [44]
- EMMI concludes that a fully transaction-based benchmark is (under current market conditions) not feasible for EURIBOR; as a result, EMMI decided to start developing a hybrid methodology [45]
- Two consultation rounds were conducted in 2018 on the hybrid methodology to seek the market's view on the proposed methodology and to seek feedback on the results from a first test phase (with the majority of EURIBOR panel banks participating)
- EMMI is confident that the reformed EURIBOR should be compliant with the EU BMR [45]
- The application for authorisation to the Belgian FSMA is planned for Q2 2019, with the phased implementation of the methodology planned for the same year
- Although regulators are supportive of this reform and there have recently been positive signs regarding EURIBOR's compliance with the EU BMR, some contingencies to its final approval still remain. As the working group still considers the outcome of the EURIBOR reform as uncertain, an €STR-based term structure remains a viable option (see above)
- The hybrid methodology follows a hierarchical approach and consists of three levels. Each day, each individual panel bank's submission for a given tenor will be determined on the basis of one of these levels [44]
- Potential risk remains with the approach in the sense that FSMA (overseeing EMMI) may not approve the new methodology, that panel participants may not be willing to continue submitting data and that the volume of transactions may turn out not to be sufficient

The Tokyo Overnight Average Rate (TONA)



Administration and governance overview

- The Cross-Industry Committee on Japanese Yen Interest Rate Benchmarks (“committee”) was established in 2018, with the aim of enabling market participants to choose and use JPY interest rate benchmarks appropriately [49]
- The committee was preceded by a study group consisting of experts from financial institutions and various associations that selected TONA as the alternative reference rate for JPY
- The BoJ is the administrator of TONA; it is responsible for the daily calculation and publication based on information provided by money market brokers [51]



Methodology & eligible transactions

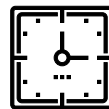
- TONA is an unsecured rate [46]
- It is based on overnight transactions brokered in un-collateralised call money markets [51]
- TONA is calculated as a volume-weighted average of transactions
- The data on the provisional call rates are published at around 5.15pm on the same business day, whereas the final results are published at around 10am on the following business day [50]





Fallback solutions

- ISDA is working on amending its 2006 Definitions to implement viable fallbacks for the discontinuation of different IBORs [4]
- Although the approach is ISDA-specific, it can be considered as having a significant signalling effect for all IBOR-referencing products, not least since ISDA reached out to a broad group of market participants in its consultation
- The approach covers JPY LIBOR and proposes TONA to be its fallback rate as soon as JPY LIBOR, TIBOR or Euroyen TIBOR are permanently discontinued (based on defined triggers)
- However, given the multiple rate approach (see “Adjacent developments” below) in the context of the TIBOR reformation, ISDA acknowledges that TIBOR itself could be a fallback rate under a different approach if selected as such by counterparties; if TIBOR continues to exist and is IOSCO-compliant, the fallback language proposed would simply never come into use
- Although both JPY LIBOR and TONA are unsecured rates, there is a spread caused by the different natures and dynamics of the underlying markets (hence the term “adjustment spread” is more appropriate than “credit spread”); adjustments for this spread and for the term spread component have to form part of the fallback
- For the term adjustment, it was concluded after the consultation that backward-looking, daily compounding of the o/n rate (i.e. TONA) is the most suitable approach
- This is combined with calculation of a historical average spread between JPY LIBOR and TONA prior to discontinuation
- For JPY, this would mean that at the discontinuation of LIBOR, the average difference between LIBOR and term-adjusted TONA will be calculated for a time period yet to be defined (probably several years) and applied as a fixed spread to the term-adjusted TONA for the legacy contract



Envisaged approach for term rate construction

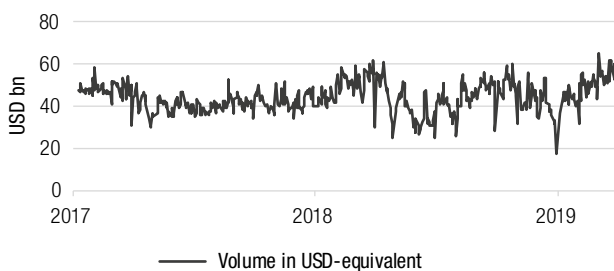
- As with EUR, the need for and usability of a TONA-based term approach will depend strongly on how cash products in particular continue to reference the reformed TIBOR if recognised as an IOSCO-compliant rate (see “Adjacent developments” below)
- Discussions on that are ongoing
- The 3M followed by the 6M tenors are most widely used for JPY LIBOR according to a survey by ICE [24]



Liquidity and rate dynamics

- The uncollateralised call money markets that underlie the calculation of TONA show robust volume for the derivation of a rate [52]
- In USD-equivalent, volume typically fluctuates around USD 50bn but can drop to a range of USD 20-30bn on month-ends [52]

Historical rate volume underlying TONA



Markets and products

Cash

- Cash markets referencing TONA still need to develop

Futures

- Futures markets referencing TONA still need to develop

Swaps

- Looking at cumulative US transactions reported under swap repositories (DTCC/Bloomberg SDRs), ISDA saw a total of USD-equivalent 102 billion of TONA-linked swap notional; this is still lower by a factor of more than 35 than the volume linked to JPY LIBOR [30]
- There is an upward trend, however, with increasing volume on the TONA side relative to JPY LIBOR shown in Q4 2019 [30]



Adjacent developments

- Similar to the EUR area, where a dual-approach of a reformed term IBOR and a new overnight rate might potentially become the market standard for product references, such a multiple rate approach might become standard for JPY as well
- TIBOR underwent a reform in 2017; it can be expected that it will continue to be used as a benchmark, particularly for cash products, if internationally recognised as an IOSCO-compliant rate as currently envisaged by the administrator (the JBATA) [52]

CHF – SARON

USD – SOFR

GBP – SONIA

EUR – €STR

EUR – EURIBOR

JPY – TONAR



Glossary

ARRC	Alternative Reference Rates Committee
BNYM	Bank of New York Mellon
BoE	Bank of England
BOJ	Bank of Japan
bps	Basis points
CHF	Swiss francs
CFTC	Commodity Futures Trading Commission
CME	Chicago Mercantile Exchange
ECB	European Central Bank
EMMI	European Money Markets Institute
ESMA	European Securities and Markets Authority
€STR/ESTER	Euro Short-Term Rate
EU BMR	EU Benchmark Regulation
EUR	Euro
EURIBOR	Euro Interbank Offered Rate
DTCC	Depository Trust & Clearing Corporation
DVP	Delivery versus payment
EFFR	Effective Federal Funds Rate
FASB	Financial Accounting Standards Board
FCA	Financial Conduct Authority
Fed	Federal Reserve
FICC	Fixed Income Clearing Corporation
FSMA	Financial Services and Markets Authority
GBP	Pound sterling
GC	General collateral
GCF	General collateral financing
ICE	Intercontinental Exchange
IOSCO	International Organization of Securities Commissions
ISDA	International Swaps and Derivatives Association
JBATA	Japanese Bankers Association Tibor Administration
JPY	Japanese yen
LCH	London Clearing House
LIBOR	London Interbank Offered Rate
MMSR	Money market statistical reporting
OBFR	Overnight Bank Funding Rate
OFR	Office of Financial Research
OIS	Overnight index swap
PAI	Price alignment interest
PRA	Prudential Regulation Authority
SARON	Swiss Average Rate Overnight
SDR	Swap data repository
SNB	Swiss National Bank
SONIA	Sterling Overnight Index Average
TOIS	Tomorrow/Next Overnight Indexed Swaps
TONA	Tokyo Overnight Average Rate
USD	United States dollar
WMBA	Wholesale Markets Brokers' Association





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