

Disclaimer

This document has been discussed at the 22nd meeting of the National Working Group on CHF Reference Rates (NWG). The NWG is the key forum to foster the transition to SARON and to discuss the latest international developments. The NWG will cease to exist once the transition to SARON is materially completed. The NWG is co-chaired by a representative of the private sector and a representative of the Swiss National Bank (SNB). The SNB supports the NWG by co-chairing the working group alongside a representative from the private sector. The NWG publishes recommendations based on consensus. Recommendations are not legally binding. The SNB acts as a moderator. Furthermore, the SNB runs the NWG's technical secretariat and facilitates the organisation of the meetings. In this capacity, the SNB also publishes on its webpage documents discussed by the NWG such as this document. The items published do not necessarily reflect the views of the SNB.

Discussion paper on SARON Floating Rate Notes

Executive Summary

- The purpose of this paper is to evaluate interest rate provisions for SARON Floating Rate Notes (FRN) assuming that a time lag is required to address operational matters related to the timely determination of interest payments. Further, a sample fallback language is provided.
- Based on the following assessment, the advantages of the approach “Lookback” (approach 3) outweigh its small inherent economic drawbacks. Thereby a time lag between three to five days is deemed sufficient to deal with operational matters. In addition, such a time lag may obtain the largest operational acceptance, as it is already applied in FRN referencing to other alternative risk-free rates (RFR).

Background

- The National Working Group on Swiss Franc Reference Rates is the key forum for considering proposals to reform reference interest rates in Switzerland and discussing the latest international developments. The NWG is co-chaired by a representative of the private sector and a representative of the SNB. NWG recommendations are not legally binding.
- The results of this assessment were discussed at the NWG meeting on 5 February 2019.¹ The NWG concluded that there are no impediments to issuing SARON FRN and supported the preference for the approach “Lookback”². Exchanges were thereby encouraged to facilitate the listing of SARON FRN.

Evaluated approaches³

- 1) Payment delay
- 2) Lockout period
- 3) Lookback

Please refer to the appendix II for a detailed description of the approaches considered and other proposed provisions.

Assessment

1. Quantitative evaluation

The approaches are being benchmarked against the “base case FRN” in different interest rate scenarios and for different levels of volatility of SARON. The base case FRN is a floating rate note that reflects

¹ C.f. https://www.snb.ch/n/mmr/reference/minutes_20190205/source/minutes_20190205.n.pdf

² Previously referred to as “reset days prior”.

³ The assumption is that for FRN “in arrears” approaches are superior to “in advance” approaches. “In arrears” refers to approaches where the interest rate payment is known close to the end of an interest rate period. Hence, interest rate payments reflect current market conditions. “In advance” approaches define the interest rate payment at the beginning of an interest rate period based on information about the previous period and are more complex to hedge.

SARON without observation or payment delays. The quarterly interest rate is determined with the publication of the last relevant SARON fixing (6 p.m.), which is one day before the payment is due.⁴ The base case FRN is compared to the approaches 1), 2) and 3) by using a hypothetical time lag of five days (t-5) and a maturity of five years (5Y).

Effect of the volatility of SARON: The volatility of SARON influences the interest rate payment. In case the observation period of the considered approach differs from the observation period of the base case FRN, the volatility of SARON causes a mismatch of the interest rate payment compared to the base case FRN. Figure 1 depicts the standard deviation (mismatches) for an interest rate payment of the various approaches compared to the base case FRN depending on the volatility of SARON. Different rate scenarios (e.g., hikes or cuts during the lifetime of the FRN) do not have an effect on this mismatch. This holds true as long as SARON follows a staircase function and no rate changes occur during the time lag. Hence, the main driver of the mismatch is the volatility of SARON. If SARON has a volatility of zero, the interest rate payments of the various approaches are identical to the base case FRN. Therefore, the plotted mismatches for the different approaches start at zero.

Figure 1: Standard deviation of interest rate payments compared to the base case FRN⁵

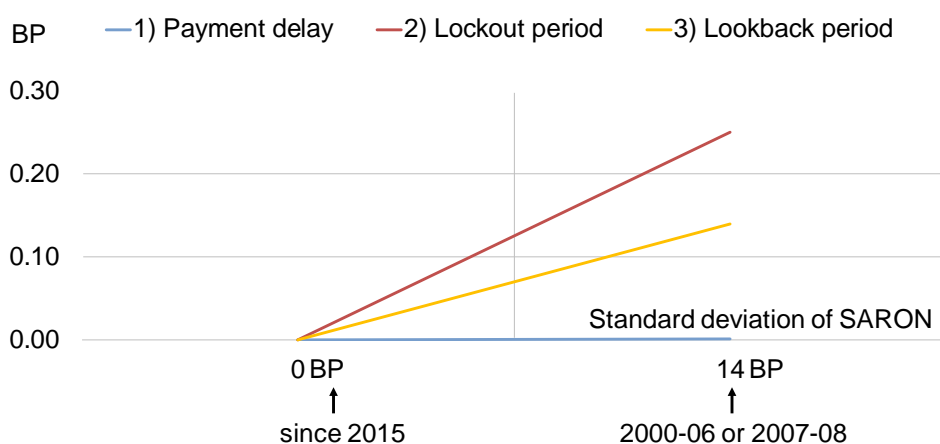


Figure 1 shows that 1) has no mismatch to the base case FRN regardless of the volatility of SARON.⁶ This is because 1) is based on the same observation period as the base case FRN. In contrast, 2) shows the highest mismatches, as during the lockout period the same SARON fixing is used. 3) exhibits a lower mismatch than 2) as five updated SARON fixings are used during the time lag. Using for the time lag several SARON fixings, as in 3), than just a single SARON fixing, as in 2), reduces the mismatch.

➔ Overall, the mismatches in interest rate payments between the approaches are rather small. Furthermore, in case of 3) the mismatch is close to zero when considering the lifetime of the FRN instead of each interest period individually. This is because a mismatch in one period offsets the mismatch in the next period and therefore the mismatches compared to a base case FRN are minimized (except for the last period).

Effect of different rate scenarios on total return: Different rate scenarios (e.g., hikes or cuts during the lifetime of the FRN) only affect the total return of approach 3). This holds true as long as SARON follows a staircase function and the rate changes do not occur during the lockout period. The effect of rate scenarios on the total return of 3) depends on the realisations of the SARON path. In a scenario of unchanged rates over the entire lifetime of the FRN, the total return of 3) equals the total return of the

⁴ Note that SARON is published on the same day after the market close, which means on the day the overnight transaction has started.

⁵ The simulations are based on a Monte Carlo Simulation with 10'000 iterations. This means that a sample for 10'000 FRNs was drawn by using a normal distribution for SARON with different standard deviations shown in figure 1.

⁶ Mismatches caused by interest on interest payments were omitted, as they are very small.

base case FRN. In an extreme scenario where we assume a 25 bp hike during each interest rate period over the five years, the total return of 3) is one bp p.a. lower compared to the base case FRN. This is as in 3) the last five days of the last observation period are missing and rates increase by 100 bps p.a. ($1 \text{ bps} = 5 \text{ days} / 360 \text{ days} * 4 * 25 \text{ bps}$).

➔ As a result, we conclude that the total return is not particularly sensitive with respect to the chosen approach.

2. Qualitative evaluation (based on the following criteria)

Uniformity of interest rate provisions for all interest rate periods. Interest rate provisions may differ in order to accommodate for e.g. the last coupon payment date to be in line with the notional repayment date, while having a payment offset for the previous interest rate periods. It may be complex to change IT systems to deal with non-uniform interest provisions. 1), 2), and 3) meet this criterion.

Consistency with other RFR FRN provisions. Different approaches have been adopted internationally expect for 1).

Consistency with SARON swap and preliminary cross currency swap conventions. 1) is the only approach consistent with swap conventions, whereas 3) deviates less than 2) from the standard.

Initial pricing process. The FRN pricing process is typically concluded before the start of the observation period and the determination of the margin is independent of the level of SARON. Therefore, 1), 2) and 3) are unlikely to add complexity to the existing pricing process.

Simplicity. Credit measurement-, collateral management- and other systems do not generally assume further cash flows after the notional repayment as with approach 1).

Conclusions

Approach 1) is superior from a quantitative perspective. However, diverging dates for notional repayment and the last interest rate payment (qualitative evaluation) pose a major drawback to this approach. Furthermore, 1) is not consistent with already existing RFR FRN in other currencies. Hence, 1) is not preferred.

The main drawback of approach 2) is related to the volatility of SARON or rate changes during the lockout period. These risks are complex to hedge, as it requires positions in a series of different instruments.

The main quantitative drawback of approach 3) is related to its sensitivity to the SARON path of over the lifetime of the product. With a rather short time lag (e.g., t-5) the risk is small and can be fairly hedged. In contrast to 2), the volatility of SARON has almost no impact on the interest rate.

The advantages of approach 3) “Lookback” thus outweigh its small inherent economic drawbacks.

Additional Aspects

Time Lag

A time lag between three to five days is deemed sufficient to deal with operational issues.

A time lag of five days seems appropriate, as it would be consistent with the corporate actions sequence for interest payments of one exchange (SIX).

Secondary Market

The accrued interest calculated by the exchanges shall be determined as specified in the interest provisions (appendix I).

For the settlement period, a time lag of two days is preferred in order to ensure consistency with CHF fixed rate bonds.

Appendix I: Preferred Interest Rate Provisions for SARON FRN, including Sample Fallback Language

(A) Provision governing the manner in which the interest rate is determined

The interest rate for each Interest Period (the “**Interest Rate**”) will be the SARON Compounded (as defined below) for such Interest Period, plus the Margin⁷.

“**SARON Compounded**” means, in respect of an Interest Period, the rate of return of a daily compound interest investment (with the daily overnight interest rate of the secured funding market for Swiss franc) as calculated by the Principal Paying Agent on the relevant Interest Determination Date in accordance with the following formula (and the resulting percentage will be rounded, if necessary, to the nearest one ten-thousandth of a percentage point, with 0.00005 being rounded upwards):

$$\left[\prod_{i=1}^{d_b} \left(1 + \frac{SARON_i \times n_i}{360} \right) - 1 \right] \times \frac{360}{d_c}$$

where:

“ **d_b** ” means the number of Zurich Banking Days in the relevant Observation Period⁸;

“ **d_c** ” means the number of calendar days in the relevant Observation Period;

“ **i** ” indexes a series of whole numbers from one to d_b , representing the Zurich Banking Days in the relevant Observation Period in chronological order from, and including, the first Zurich Banking Day in such Observation Period;

“ **n_i** ” means, in respect of any Zurich Banking Day i , the number of calendar days from, and including, the Zurich Banking Day i up to, but excluding, the first following Zurich Banking Day;

“**Observation Period**” means, in respect of an Interest Period, the period from, and including, the date falling [*five*]⁹ Zurich Banking Days prior to the first day of such Interest Period and ending on, but excluding, the date falling [*five*] Zurich Banking Days prior to the Interest Payment Date for such Interest Period;

“ **$SARON_i$** ” means, in respect of any Zurich Banking Day i ¹⁰, SARON for such Zurich Banking Day i .

“**SARON**” means, in respect of any Zurich Banking Day,

⁷ The margin itself will not be compounded.

⁸ Each Interest Period and its related Observation Period will by definition always include the same number of Zurich Banking Days (although they may include a different number of calendar days).

⁹ The number of days can differ from five. For example, three days could be chosen. However, consideration should always be given to how much time the relevant agent will need to perform the necessary calculations prior to the applicable Interest Payment Date and any timing concerns both in relation to processing payments and any applicable listing requirements.

¹⁰ By virtue of the definition of SARON Compounded, any such Zurich Banking Day will always be a Zurich Banking Day in the relevant Observation Period.

- (a) the Swiss Average Rate Overnight for such Zurich Banking Day published by the SARON Administrator on the SARON Administrator Website¹¹ at the Relevant Time on such Zurich Banking Day; or
- (b) if such rate does not so appear on the SARON Administrator Website or is not so published by the Relevant Time on such Zurich Banking Day and a SARON Index Cessation Event and a SARON Index Cessation Effective Date have not both occurred on or prior to such Zurich Banking Day, the Swiss Average Rate Overnight published by the SARON Administrator on the SARON Administrator Website for the first preceding Zurich Banking Day on which the Swiss Average Rate Overnight was published by the SARON Administrator on the SARON Administrator Website; or
- (c) if such rate does not so appear on the SARON Administrator Website or is not so published by the Relevant Time on such Zurich Banking Day and a SARON Index Cessation Event and a SARON Index Cessation Effective Date have both occurred on or prior to such Zurich Banking Day,
 - (i) the rate resulting from calculating SARON for such Zurich Banking Day in accordance with clause (a) above as if the reference to Swiss Average Rate Overnight in such definition were a reference to the Recommended Replacement Rate, giving effect to the Recommended Adjustment Spread, if any; or
 - (ii) if there is no Recommended Replacement Rate within one Zurich Banking Day of the SARON Index Cessation Effective Date, the policy rate of the Swiss National Bank (the “**SNB Policy Rate**”) for such Zurich Banking Day, giving effect to the SNB Adjustment Spread, if any¹²;

“**Relevant Time**” means, in respect of any Zurich Banking Day, close of trading on SIX Swiss Exchange on such Zurich Banking Day, which is expected to be on or around 6 p.m. (Zurich time);

“**SARON Administrator**” means SIX Swiss Exchange or any successor administrator of SARON;

“**SARON Administrator Website**” means the website of the SARON Administrator;

“**SIX Swiss Exchange**” means SIX Swiss Exchange AG and any successor thereto; and

“**Zurich Banking Day**” means a day on which banks are open in the City of Zurich for the settlement of payments and of foreign exchange transactions.

¹¹ C.f. https://www.six-group.com/exchanges/indices/data_centre/swiss_reference_rates/reference_rates_en.html

¹² Issuers may choose to also include a separate benchmark replacement rate provision that would apply in cases in which there is no SNB Policy Rate.

(B) Definitions used in and provisions related to sample fallback language¹³*Definitions of Recommended Replacement Rate, Recommended Adjustment Spread and SNB Adjustment Spread*

“**Recommended Replacement Rate**” means the rate that has been recommended as the replacement for the Swiss Average Rate Overnight by any working group or committee in Switzerland organized in the same or a similar manner as the National Working Group on Swiss Franc Reference Rates that was founded in 2013 for purposes of, among other things, considering proposals to reform reference interest rates in Switzerland (any such working group or committee, the “**Recommending Body**”).

“**Recommended Adjustment Spread**” means, with respect to any Recommended Replacement Rate, the spread (which may be positive, negative or zero), or formula or methodology for calculating such a spread,

- (a) that the Recommending Body has recommended be applied to such Recommended Replacement Rate in the case of fixed income securities with respect to which such Recommended Replacement Rate has replaced the Swiss Average Rate Overnight as the reference rate for purposes of determining the applicable rate of interest thereon; or
- (b) if the Recommending Body has not recommended such a spread, formula or methodology as described in clause (a) above, to be applied to such Recommended Replacement Rate in order to reduce or eliminate, to the extent reasonably practicable under the circumstances, any economic prejudice or benefit (as applicable) to Holders as a result of the replacement of the Swiss Average Rate Overnight with such Recommended Replacement Rate for purposes of determining SARON, which spread will be determined by the Principal Paying Agent, acting in good faith and a commercially reasonable manner, and be consistent with industry-accepted practices for fixed income securities with respect to which such Recommended Replacement Rate has replaced the Swiss Average Rate Overnight as the reference rate for purposes of determining the applicable rate of interest thereon.

“**SNB Adjustment Spread**” means, with respect to the SNB Policy Rate, the spread to be applied to the SNB Policy Rate in order to reduce or eliminate, to the extent reasonably practicable under the circumstances, any economic prejudice or benefit (as applicable) to Holders as a result of the replacement of the Swiss Average Rate Overnight with the SNB Policy Rate for purposes of determining SARON, which spread will be determined by the Principal Paying Agent, acting in good faith and a commercially reasonable manner, taking into account the historical median between the Swiss Average Rate Overnight and the SNB Policy Rate during the two year period ending on the date on which the SARON Index Cessation Event occurred (or, if more than one SARON Index Cessation Event has occurred, the date on which the first of such events occurred).

Amendments resulting from the use of a Recommended Replacement Rate or the SNB Policy Rate

If the Principal Paying Agent (i) is required to use a Recommended Replacement Rate or the SNB Policy Rate pursuant to clause (c)(i) or (c)(ii) of the definition of “SARON” for purposes of determining SARON for any Zurich Banking Day, and (ii) determines that any changes to the definitions of ¹⁴[Day Count Fraction, Interest Determination Date, Interest Payment Date, Interest Period, Observation Period, Relevant Time, SARON, SARON Administrator, SARON Administrator Website or Zurich Business

¹³ See clauses (b) and (c) of the definition of “SARON” in section (A) above.

¹⁴ Adjust list depending on the terms of the relevant Notes.

Day] are necessary in order to use such Recommend Replacement Rate (and any Recommended Adjustment Spread) or the SNB Policy Rate (and any SNB Adjustment Spread), as the case may be, for such purposes, such definitions shall be amended without the consent of the Holders and the Issuer shall promptly give notice to the Holders specifying the Recommended Replacement Rate and any Recommended Adjustment Spread or any SNB Adjustment Spread, as applicable, and any amendments described in clause (ii) above.

Definitions of SARON Index Cessation Event and SARON Index Cessation Effective Date

A “**SARON Index Cessation Event**” means the occurrence of one or more of the following events:

- (a) a public statement or publication of information by or on behalf of the SARON Administrator, or by any competent authority, announcing or confirming that the SARON Administrator has ceased or will cease to provide the Swiss Average Rate Overnight permanently or indefinitely, *provided* that, at the time of such statement or publication, there is no successor administrator that will continue to provide the Swiss Average Rate Overnight; or
- (b) a public statement or publication of information by the SARON Administrator or any competent authority announcing that (x) the Swiss Average Rate Overnight is no longer representative or will as of a certain date no longer be representative, or (y) the Swiss Average Rate Overnight may no longer be used after a certain date, which statement, in the case of subclause (y), is applicable to (but not necessarily limited to) fixed income securities and derivatives.

A “**SARON Index Cessation Effective Date**” means, in respect of a SARON Index Cessation Event, the earliest of:

- (a) (in the case of a SARON Index Cessation Event described in clause (a) of the definition thereof) the date on which the SARON Administrator of the Swiss Average Rate Overnight ceases to provide the Swiss Average Rate Overnight;
- (b) (in the case of a SARON Index Cessation Event described in clause (b)(x) of the definition thereof) the latest of
 - (i) the date of such statement or publication;
 - (ii) the date, if any, specified in such statement or publication as the date on which the Swiss Average Rate Overnight will no longer be representative; and
 - (iii) if a SARON Cessation Event described in clause (b)(y) of the definition of SARON Index Cessation Event has occurred on or prior to either or both dates specified in subclauses (i) and (ii) of this clause (b), the date as of which the Swiss Average Rate Overnight may no longer be used; and
- (c) (in the case of a SARON Index Cessation Event described in clause (b)(y) of the definition thereof) the date as of which the Swiss Average Rate Overnight may no longer be used.

(C) Other Applicable Definitions

“**Day Count Fraction**” means, in respect of the calculation of an amount of interest for any period of time, the actual number of days in such period divided by 360.

“**Interest Commencement Date**” means the Issue Date.

“**Interest Determination Date**” means, in respect of any Interest Period, the date falling on the [five]¹⁵ Zurich Banking Day prior to the end of such Interest Period.

“**Interest Payment Date**” means [•] in each year, commencing on [•], as adjusted in accordance with the Modified Following Business Day Convention.

“**Interest Period**” means each period beginning on (and excluding) an Interest Payment Date (or, in the case of the first Interest Period, the Interest Commencement Date) and ending on (and including) the next Interest Payment Date; *provided, however*, that, in the case of any Interest Period during which¹⁶[the Notes become due and payable on a date other than an Interest Payment Date]/¹⁷[any Notes become due and payable on a date other than an Interest Payment Date, in respect of such Notes that become due and payable only], such Interest Period will end on (and include) the relevant date on which [the][such] Notes have become due and payable.¹⁸

“**Maturity Date**” means the Interest Payment Date falling in or nearest to [*insert month and year*].

“**Modified Following Business Day Convention**” means, with respect to any Interest Payment Date [(i) for which there is no numerically corresponding day in the calendar month in which such Interest Payment Date should occur and (ii)]¹⁹ that would otherwise fall on a day that is not a ²⁰[Business Day], that such Interest Payment Date will be postponed to the first following [Business Day] unless that [Business Day] falls in the next calendar month in which case such Interest Payment Date will instead be brought forward to the last preceding [Business Day].

¹⁵ It is recommended that this be aligned with how the last day of the Observation Period is determined. For example, if the definition of Observation Period uses three Zurich Banking Days instead of five Zurich Banking Days for purposes of determining the first and last day of such period, the definition of Interest Determination Date should be the date falling on the third Zurich Business Day prior to the relevant Interest Payment Date.

¹⁶ Insert bracketed language if a partial early redemption is not possible under the terms of the Notes.

¹⁷ Insert bracketed language if a partial early redemption is permitted under the terms of the Notes.

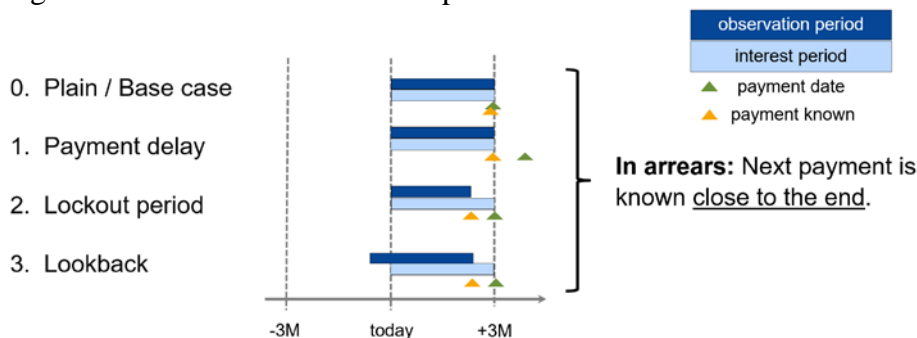
¹⁸ This definition contemplates a shortened Interest Period if the Notes become due (whether in whole or in part) on a date that is not an Interest Payment Date, so that SARON will be determinable on such date they become due.

¹⁹ Include bracketed language where it may be relevant.

²⁰ The defined term Business Day as used for the Business Day Convention (i.e., determining any adjustments to the Interest Payment Dates (and, thereby the length of each Interest Period)) should also be defined by reference to the City of Zurich (or, if appropriate, the term Zurich Banking Day could be used instead of the term Business Day). Note that the business day concept for purposes of payment or other non-interest-related mechanics may be different from both the term Zurich Banking Day and the term Business Day as used for purposes of this definition.

Appendix II: Description of approaches 1), 2), 3) and the base case²¹

Figure 2: interest and observation periods



0) *Base case:* In the base case, the observation period is identical to the interest period. The notional is paid at the start of the period and repaid on the last day of the contract period together with the last interest payment. A plain in arrears structure reflects the movement in interest rates over the full interest period and payment is made on the day that it would naturally be due, but given the publication of SARON at 6.p.m. one day before the loan is repaid (effectively after close of business), this has the disadvantage of requiring payment just one business day after the final payment amount is known.

1) *Payment delay:* In contrast to the base case, the interest payments are delayed by a certain number of days and are thus due a couple of days after the end of an interest period. The idea is to provide more time for operational cash flow management. In case of a lag of two days, the cash flow of the loan matches the cash flow of SARON swaps, allowing to perfectly hedge the loan. In the last interest period, the interest payment is due after the repayment of the notional, which leads to a mismatch of cash flows and may be difficult to handle from an operational and credit risk perspective.

2) *Lockout period:* In this option, the SARON is no longer updated (i.e. frozen) for a certain number of days prior to the end of an interest period (lockout period). During this time, the SARON of the day prior to the start of the lockout period is applied for the remaining days of the interest period. As a result, the averaged SARON can be calculated a couple of days before the end of the interest period. This option is predominantly used for SOFR floating rate notes (FRN) with a lockout period of typically four days. One side effect of the lockout period is that the calculation of the interest rate might be considered to be less transparent for clients and more complex for product providers to implement. In addition, the option involves interest rate risk that is difficult to hedge due to potential changes of SARON during the lockout period.

3) *Lookback:* In contrast to the base case, the observation period for the interest rate calculation starts and ends a certain number of days prior to the interest period. As a result, the interest payment can be calculated prior to the end of the interest period. This option is predominantly used for SONIA FRN with an offset period of five days. Note that there are two versions of the lookback. In the version used for SONIA FRN, only the rate itself is shifted but not the number of calendar days the rate applies (which is usually one). An offset period of five days reduces the effect of such unnatural weighting of calendar days. In the second version, which is used in this paper (appendix I), the rate itself and the number of calendar days is shifted. This version allows for a better hedge in case a time lag of less than five days is used. Figure 3 shows these two versions, whereby for a simple illustration a period of only five days and a shift of three days each is used.

²¹ Adapted from: Overnight Risk-Free Rates, A User's Guide; FSB, June 2019. C.f. <https://www.fsb.org/wp-content/uploads/P040619-1.pdf>

Figure 3: Simple illustration for the two Lookback versions

