



RBC Capital Markets

Companion Note to Preparing for Transition

*A Thoughtful Approach to a LIBOR Program
to Transition from LIBOR to Alternative
Reference Rates*

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BACKGROUND AND OVERVIEW

This Companion Note should be read in conjunction with the *Preparing for Transition: A thoughtful approach to a LIBOR Program to transition from LIBOR to alternative reference rates* report for an overview of the latest developments in IBOR reform and structuring of an IBOR Program to prepare for a transition from IBORs to their replacement RFRs¹.

There is emerging market consensus on the triggers for fallbacks to the relevant RFRs for derivatives and cash markets (FRNs, loans, securitization etc.) that reference LIBOR and certain IBORs. Market consensus in the OTC derivatives market has also developed for the methodologies to be used to make the term rate adjustments (a compounded in arrears rate) and credit spread

adjustments (a historical mean/median approach) to the relevant RFR fallbacks for derivatives referencing certain IBORs. The US and other cash markets continue to demand for forward-looking term rates as the primary fallback. The regulator-led working groups are publicly consulting on a forward-looking term rate based on futures and OIS markets. Whether such a forward-looking term rate will materialize and be adopted broadly in the market remains an open question.

The Companion Note is structured with first a focus on the developments in the derivatives markets and then on the US cash markets. The direction of the US cash markets could be a helpful precedent for the direction cash markets take in Canada.

¹ Hereinafter this document is referred to as the Companion Note.

OTC DERIVATIVES UPDATE

Consensus is emerging in the market on credit spread and term rate adjustments for ISDA documentation (over-the-counter derivatives)

In terms of contracts that reference IBORs by notional amount, the derivatives markets dwarf all the other asset classes. For instance, USD LIBOR is referenced by USD\$190 trillion in derivatives by notional amounts which represents ~95% of all USD LIBOR exposures². Therefore, it is no surprise that ISDA has taken a market leadership position in thinking through the challenges with respect to IBOR benchmark reform.

In 2018, ISDA conducted a comprehensive consultation on technical issues related to the new fallbacks to the relevant RFRs for OTC derivatives contracts that reference certain interbank offered rates: GBP LIBOR, CHF LIBOR, JPY LIBOR, TIBOR, Euroyen TIBOR, and the BBSW (the ISDA Consultation)³. ISDA sought feedback from the market on both the term rate and credit spread adjustments that need to be made to the relevant RFRs associated with the above noted IBORs for OTC derivative contracts that reference such IBORs. ISDA intends to do a follow-up consultation on CDOR, USD LIBOR and HIBOR in the next few months, although, it is anticipated that the methodology for adjusting the relevant RFR fallbacks for these rates will also be same as for those rates that were covered in the first ISDA Consultation.

ISDA anticipates that it will amend the 2006 ISDA Definitions by the end of 2019 to include the new RFR fallbacks for the IBORs included in their consultations, including the adjustments to the relevant RFRs discussed in this section. These new fallbacks will apply to OTC derivative transactions referencing one of the above IBORs that are entered into after the effective date of such amendments and which incorporate the terms of such Definitions.

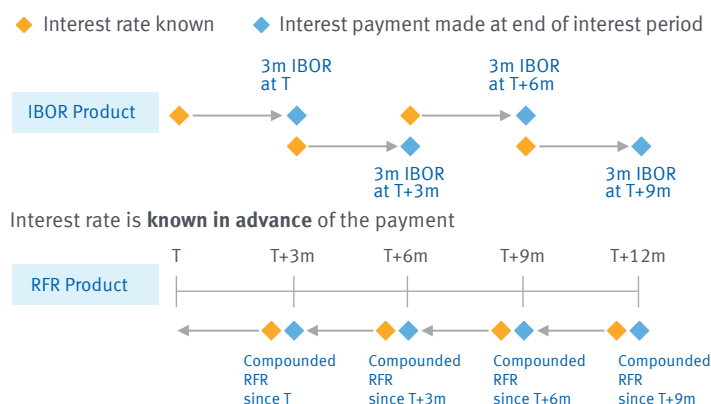
A compounded setting in arrears methodology will be used as the term rate in ISDA documentation; interest payments will not be known in advance

There is consensus emerging in the OTC derivatives market that a term rate for a RFR will be set using a compounded setting in arrears methodology. Under this methodology, the interest rate is observed over the relevant term (e.g. 3-months) and compounded daily during that period. At the end of the term, the interest rate is determined and then paid. Figure 1 shows the interest payments under a RFR product compared to an IBOR product.

Clients will note that there are a number of advantages of using a compounded setting in arrears approach. These are summarized in Figure 2.

Refer to Appendix A for the methodology for the term rate adjustment.

FIGURE 1: INTEREST PAYMENT STRUCTURE



If a compound setting in arrears methodology is used, the interest rate is **not known in advance** of the payment

FIGURE 2: COMPOUNDED SETTING IN ARREARS METHODOLOGY

Advantages	▪ The rate would reflect actual daily interest rate movements during the relevant period ▪ It is calculated as an average rate and therefore should be less volatile than the spot overnight rate ▪ The methodology should be understandable by most market participants ▪ The rate mirrors the structure of overnight index swaps (OIS) referencing the RFRs
Disadvantages	▪ The rate is not available at start of the relevant period and that the accrual interest rate movements may not reflect prior expectations

² ARRC, *Second Report (March 2018)*: <https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2018/ARRC-Second-report.com> at page 1. [Second ARRC Report]

³ The ISDA Consultation also solicited preliminary feedback from the market with respect to fallbacks for derivatives referencing USD LIBOR, EUR LIBOR, and EURIBOR.

A historical mean/median approach for credit spread is expected to be used in ISDA documentation

In addition to term rate adjustments, credit spread adjustments are also needed to make contracts that reference IBORs more economically equivalent once the fallback to RFRs are triggered. As noted earlier, LIBOR and most other IBORs have a credit spread baked into the rate to reflect the risk that the borrowing bank could default and a variety of other factors such as liquidity and fluctuations in supply and demand while RFRs do not. Figure 3 shows the RFR credit spread adjustments needed to make the interest rate similar to a LIBOR.

A majority of the respondents to the ISDA Consultation preferred a historical mean/median approach to set the credit spread. The historical mean/median approach methodology calculates the credit spread based on the mean/median spot spread between the relevant IBOR term and the term-adjusted RFR calculated over a significant, static lookback period prior to the fallback trigger. The advantages and disadvantages of such an approach is summarized below in Figure 4.

However, a number of issues remained unsettled. For example, should such an approach use a median or a mean difference between the IBOR and the relevant RFR⁴? Another open question is how long the lookback period (i.e. how far back we observe the

spread between IBOR and the RFR) to set the spread should be⁵? Finally, what steps can be taken to mitigate the impact of possible value transfer when the fallback is triggered? There are no easy answers to these questions – we understand that ISDA will be retaining independent advisors to consider the above-noted issues.

Refer to Appendix B for the methodology to make the credit spread adjustment.

Cleared Derivatives

Following a public consultation, LCH provided an updated approach on SOFR-based PAI and discounting. Prior to the public consultation, LCH considered a dual-approach to PAI discounting USD denominated cleared swaps where LCH’s customers would have had the option to select Fed Funds or SOFR to discount and calculate PAI. However, LCH concluded based on the public consultation that the market had a clear preference for a single-step approach and convert the PAI and the discounting on all LCH’s USD products from Fed Funds to SOFR on the same date rather than the LCH introducing a dual discounting environment. Additionally, based on market feedback, LCH will have a compensation scheme to reverse any value transfer taking place as a result of the change in the discount rate applied to USD portfolios. Finally, based on market feedback, LCH expects to transition from Fed Funds to SOFR discounting in the second half of 2020.

FIGURE 3: LIBOR DECONSTRUCTED – BANK CREDIT RISK AND TERM PREMIUM, AND RISK-FREE RATE

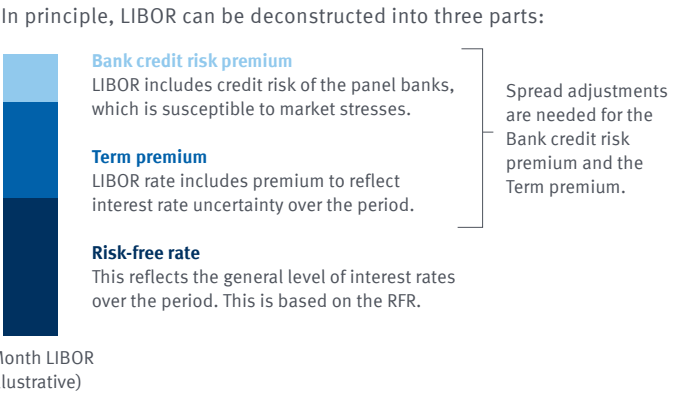


FIGURE 4: HISTORICAL/MEAN MEDIAN APPROACH METHODOLOGY

Advantages	▪ The market favoured this approach for its robustness, simplicity and resistance to distortion and manipulation
Disadvantages	▪ The main concern about the approach is the potential for value transfer when the fallback is triggered if the forward spread between the IBOR and the RFR is materially different than historical spreads

⁴ Supporters of the median method noted that it would remove the impact of outliers and provide certainty as to the credit spread much earlier than the mean. Supporters of the mean method argue that the mean would be a better reflection of the market and that a “trimmed” mean could mitigate the impact of outliers.

⁵ The market is considering a 5-year or a 10-year lookback period. Those market participants that preferred a 5-year period noted that it was sufficiently long to avoid manipulation while avoiding the “skewed data” from the financial crisis. Proponents of the 10-year period argued that it captured the full business cycle, including downturns, but were concerned about availability of data for some benchmarks going back that far.

CASH MARKETS UPDATE

The US market is developing market standard fallbacks for bilateral and syndicated loans, FRNs and securitization products; triggers and adjustments in cash markets could be different than derivatives

In the US, the ARRC is consulting on market standard language for fallback triggers and adjustments for cash markets for USD LIBOR to transition to SOFR. Asset classes under consultation include bilateral and syndicated loans, FRNs and securitization products. In Canada, the CARR is expected to launch similar public consultations for CDOR cash products in the latter half of 2019. In this section of the report, we focus on the developments in the cash markets in the US which will set a helpful precedent for the Canadian cash markets as well.

i. Loan Triggers – benchmark pre-cession triggers included

Under the fallback provisions proposed by ARRC in its market consultation, fallbacks in loan documentation may be triggered under five different scenarios. The first two triggers are intended to align with the ISDA documentation for derivatives. The trigger event is a public statement by the benchmark's administrator, the benchmark administrator's regulatory supervisor, or other entity with jurisdictional, insolvency or resolution authority over the benchmark administrator (e.g. the central bank, insolvency official, resolution authority or court), that the benchmark (e.g. USD LIBOR) will no longer be published. The next three trigger events are triggered before USD LIBOR is permanently discontinued: there is a non-temporary stop to the publishing of USD LIBOR that lasts for at least 5-days that is not the result of a temporary moratorium or disruption declared by the benchmark's administrator or the benchmark administrator's supervisor (trigger 3), a public statement or publication by the administrator of the benchmark that it has (or will) invoke, permanently or indefinitely, its insufficient submissions policy (trigger 4), or a statement by the regulator that USD LIBOR is no longer representative of unsecured interbank borrowing or may no longer be used for any reason (trigger 5). Please see Figure 5 for a comparison of fallback triggers for cash markets and derivatives.

Loans – hardwired or the amendment approach?

In the ARRC consultations for syndicated and bilateral business loans, two approaches are currently under consideration for fallbacks from USD LIBOR to SOFR in the US. The first is an “amendment approach” where upon a trigger event, the administrative agent together with the borrower may amend the contract to replace LIBOR with an alternative benchmark rate (e.g. term SOFR with a spread adjustment) considering market conventions at the time of the trigger event. The second is a “hardwired approach” where all the decisions are hardcoded at the origination of the loan documentation.

Amendment approach to select replacement rate prioritizes flexibility

To borrow an (American and Canadian) football term, the amendment approach punts the approach for fallbacks to a later date to accommodate settled market convention in the loan markets at that time. The amendment approach has been the market convention thus far as the process for USD LIBOR transition has been uncertain. However, this approach has also evolved in many respects.

Hardwired approach to select replacement rate prioritizes certainty

In contrast and to continue with the football analogy, the hardwired approach has a precise game script embedded in the documentation which, upon the occurrence of a benchmark replacement event, the parties are required to follow through a waterfall of replacement rates and spread adjustments. The waterfall flow for setting the replacement rate is as follows:

Step 1: Forward-looking term SOFR

Step 2: If a forward-looking term rate does not yet exist, then compounded SOFR

Step 3: If there is no compounded SOFR, then the amendment approach is followed⁶

Additionally, the hardwired approach adds a replacement benchmark spread to make SOFR more comparable with USD LIBOR to manage credit spread differences. This spread is either an adjustment identified by a regulator or if that is not available, then the adjustment as selected by ISDA.

⁶ Overnight SOFR is a possibility here although the market has steered away because the derivatives markets through the ISDA consultation, explicitly rejected overnight SOFR as a possible fallback.

ii. Floating Rate Notes and Securitizations

FRN and securitization triggers for fallbacks are consistent with the loan markets; an additional trigger is available for securitization products

Consistent with the loan markets in the US, FRNs and securitization markets are considering the same five mandatory triggers to transition these products from USD LIBOR to SOFR. The fallbacks will be “hardwired” into the documentation for FRNs and securitization products because making amendments in the future to FRNs or securitization products would be operationally difficult and could require noteholder consent to amend.

Securitization products are considering an additional trigger if the reference rate in the underlying assets change substantially

The securitizations market is also considering one additional pre-cessation trigger. The fallback would be triggered if: (i) a pre-set percentage of underlying assets transition from USD LIBOR reference to a SOFR reference; or (ii) the assets in the securitization vehicle are replaced from assets referencing USD LIBOR to SOFR. The goal for this trigger is to minimize the basis risk between the securitization and the underlying assets. This trigger is intended to be flexible and be tailored to the specifics of each particular securitization transaction

(for example, the threshold percentage, and assets that are counted towards the threshold percentage can all be negotiated between the parties).

Selection of a replacement rate will be hardwired in the FRN and securitization documentation

The waterfall to select a replacement rate for FRNs and securitization products is similar to the “hardwired” approach for loans with few additions.

- Step 1:** Forward-looking term SOFR
- Step 2:** If a forward-looking term rate does not yet exist, then compounded SOFR
- Step 3:** If there is no compounded SOFR, then SOFR
- Step 4:** If there is no SOFR, then the replacement rate recommended by a regulator
- Step 5:** If there is no replacement rate recommended by a regulator, then use ISDA definitions
- Step 6:** Failing all else, a replacement rate as determined by the issuer

In practise, we expect that the loan markets and FRNs and securitization markets will align as Steps 3 – 6 are likely the ultimate guardrail for the loan markets as well.

FIGURE 5: COMPARISON OF FALLBACK TRIGGERS BETWEEN CASH AND DERIVATIVES MARKETS

Fallback Triggers	Derivatives	Cash Products (FRNs, Loans and Securitization Products) ⁷
Triggers 1 and 2: a public statement from the benchmark administrator, the benchmark administrator’s regulatory supervisor or other entity with jurisdictional, insolvency or resolution authority over the administrator (e.g. the central bank, resolution authority, insolvency official, court, etc.) that a benchmark will no longer be published.	Yes	Yes
Trigger 3: the benchmark administrator fails to publish the benchmark for five consecutive business days and such failure is not the result of a temporary disruption.	No	Yes
Trigger 4: the benchmark administrator decides that because of reduced quality of the benchmark, the benchmark will not be published permanently or indefinitely (for instance there is a reduction in the number of submitting banks).	No	Yes
Trigger 5: a public statement from the regulator of the benchmark that the benchmark is no longer representative of interbank unsecured borrowing or may no longer be used.	No	Yes
Trigger 6: a pre-set percentage of underlying assets transition from an IBOR reference to a RFR reference or the assets in the securitization vehicle are substituted from assets referencing an IBOR to a RFR.	No	Yes (securitization products only)

⁷ Currently we are only referring to triggers under consideration in the US markets.

Cash flows from cash markets and their related hedges could diverge and will require thoughtful risk management

One emerging issue to be aware of is that the fallbacks for derivatives and cash markets may not be aligned. For one, as noted above, the triggers between a security in the cash markets (for example a corporate loan) and its related hedge (i.e. a derivatives contract) may not be triggered at the same time. Second, the methodology for calculating the term rate for a cash product, such as a bond, may also be different from the derivative as the bond contract may fallback to a forward-looking term rate while the derivative may fallback to a rate with a compounded setting in arrears methodology. While the two term rates should be nearly identical, there could be material differences particularly in periods of high market volatility.

SONIA and SOFR FRNs issued thus far use a backward-looking methodology to calculate coupon payments

While, there is a strong preference for a forward-looking term rate there have been a number of SONIA and SOFR FRN issuances in 2018 and 2019 that used a backward-looking methodology (i.e. compounding in arrears) to calculate the coupon payments. Issuers thus far have been largely regulated banks and supranational, sovereigns and agencies (SSAs).

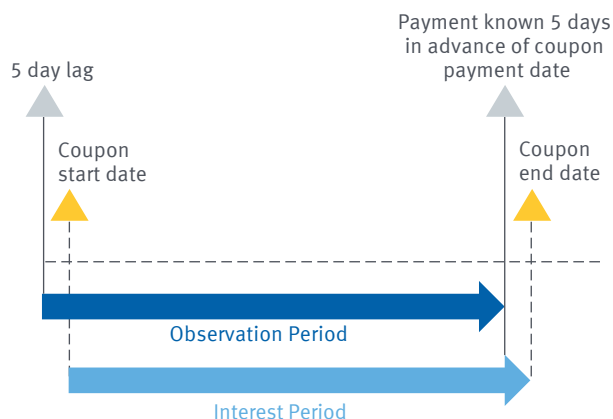
SONIA FRNs use a compounded methodology with a lag to calculate coupon payments; SOFR FRNs use an average methodology with a lag to calculate coupon payments

In a typical SONIA FRN, the coupon is paid every 3 months, based on a compounded daily SONIA Rate. Since such a calculation is backward-looking, in order to give a calculation agent sufficient time to calculate compounded rate and make payments to the bondholder, such coupon payments are delayed by a certain number of business days. A typical lag period is 5 business days and is referred to as the “Observation Period” in the documentation. This Observation Period is also helpful for the issuer of the FRN as they get a few business days to source the cash required to make the coupon payments. An example of this observation period lag is shown in Figure 6.

Refer to Appendix C for the methodology to calculate the coupon payment for a typical SONIA FRN issued thus far.

A significant difference between SONIA and SOFR FRNs issued thus far is that majority of SOFR issuances’ coupon payments are calculated using the *average* SOFR rate for the period. Please see Appendix D for the methodology to calculate the coupon payments for a typical SOFR FRN issued thus far.

FIGURE 6: EXAMPLE OF OBSERVATION PERIOD LAG IN CALCULATION OF TERM RATES (SIMPLIFIED FOR EASE OF READABILITY)



A forward-looking term rate similar to what exists today for IBORs may develop for RFRs but the outcome is uncertain at this time

As previously discussed, market participants in the cash markets in the US have stated a strong preference for a forward-looking term rate similar to what is currently available for LIBOR.

Development of a forward-looking term rate will require deep liquidity in futures and/or OIS markets; Considerable uncertainty whether such liquidity will develop for all RFRs

One way to build a forward-looking term rate is to use futures contracts and/or OIS swaps as a way to determine the market’s expectation for the RFR over the given term period. Regulator-led working groups in the US, Canada, EU and UK are exploring various methodologies to develop a forward-looking term rate. If these working groups are successful, we expect to see at least academic forward-looking term rates in the latter half of 2019 for certain RFRs. The main methodologies under consideration (as set out in the ESTER term rate consultation) to develop a term rate are as follows.

OIS methodology

The OIS methodology uses actual OIS transaction data to construct a term rate that represents the future market expectation for the RFR overnight rate. If actual transaction volumes are not robust, then certain regulator-led working-groups will consider supplementing the data with tradeable quotes where the dealer must be *able and willing* to transact at that quote.

Futures Methodology

The futures methodology uses a sequence of overlapping futures to extract the expected levels of RFR between key central bank monetary decision dates. However this methodology has been criticized as being too complex and would introduce model risk. This is because in order to find a specified term rate for a specific date, e.g. a 3-month rate for a coupon payment due August 5th, available futures contracts of nearby dates would be taken to bootstrap the required rate (CME 3-month

SOFR futures mature in March, June, September and December). Thus, the administrator of the term rate would have to make subjective adjustments to find the implied rate for the desired period.

There continues to be considerable uncertainty that a forward-looking term rate will materialize in most jurisdictions. The Euro RFR Working Group has identified the following helpful *pros* and *cons* of the methodologies under consideration⁸ – see Figure 7.

FIGURE 7: PROS AND CONS OF VARIOUS FORWARD-LOOKING TERM RATE CONSTRUCTION METHODOLOGIES

	Pros	Cons
OIS transactions-based methodology	▪ Least risk of manipulation if sufficient transactions and volumes are available ▪ Simple to understand	▪ Requires a sufficient volume of spot transactions and reliance on sufficient activity in the market in all monetary policy conditions
OIS quotes-based methodology	▪ Increases the pool of underlying data and this data comes from heavily regulated sources (i.e. electronic trading platforms such as Swap Execution Facilities in the US or the Multilateral Trading Facilities in EU)	▪ Not based on actual transactions ▪ Relies on dealers providing liquidity in electronic trading platforms with tight bid/ask spreads
Futures-based methodology	▪ Simple from a modelling perspective and can be directly reconstructed by market participants ▪ Transparent and robust ▪ Less open to manipulation	▪ Requires model calibration from an administrator that introduces subjectivity ▪ Requires liquid futures markets that may not materialize

⁸ Second public consultation by the working group on Euro risk-free rates on determining an ESTER-based term structure methodology as a fallback in EURIBOR-linked contracts ([available online](#)).

APPENDIX A – COMPOUNDED IN ARREARS METHODOLOGY

Under this methodology, the relevant RFR is observed over the relevant IBOR tenor and compounded daily during that period using the formula below⁹.

$$ARR_f(t) = \frac{1}{\delta_f} \left[\prod_{u=T}^{T+f1bd} (1 + \delta_u RFR_u) - 1 \right]$$

Where,

T	Start of the accrual period
f	Length of the IBOR term – could be 1 week, 1 month, 2 months, 3 months, 6 months or 12 months
$T + f$	The accrual end date; also, when the IBOR is paid
t	The setting date for IBOR; ISDA assumes t is 2 business days (bd) before the start of the accrual period or $t = T - 2bd$
$L_f(t)$	The spot IBOR of term f which sets at time $t = T - 2bd$ and accrues over the period from T to $T + f$
t_0	Calibration date set as the business day prior to the date on which it is announced that IBOR publication will be discontinued
t_1	Discontinuation date which is the first day on which IBOR will not be published
δ_f	Cash day count fraction for the accrual period
δ_u	The cash day count fraction for the overnight accrual period from u to $u + 1bd$

APPENDIX B – HISTORICAL MEAN/MEDIAN APPROACH

The spread adjustment for each existing IBOR tenor is based on the mean or median spot IBOR-adjusted RFR (i.e., compounded setting in arrears rate) spread calculated over a significant, static lookback period such as 5 years or 10 years. Note the formula below assumes a mean approach¹⁰.

$$CS_f(t_1) = \frac{1}{L} \int_{t_0-L}^{t_0} [L_f(t) - R_f(t)]$$

Where,

L	The lookback period (e.g. 5 years or 10 years) to the calibration date t_0
t_0	Same as above
$L_f(t)$	The spot IBOR rate for period of accrual period beginning in two business days
$R_f(t)$	The compounded setting in arrears rate over a period, f

⁹ ISDA: Fallbacks for Derivatives – Background and Role of A Vendor ([available online](#)).

¹⁰ Ibid.

APPENDIX C – SONIA COMPOUNDED COUPON PAYMENTS METHODOLOGY

$$\left[\prod_{i=1}^{d_o} \left(1 + \frac{\text{SONIA}_{i-5LBD} \times n_i}{365} \right) - 1 \right] \times \frac{365}{d_c}$$

Where,

d_o	For any Interest Period, it is the number of London Banking Days (<i>LBD</i>) in the relevant interest period
d_c	The number of calendar days in the interest period
<i>LBD</i>	Any day on which commercial banks are open for general business
SONIA_i	Sterling Overnight Index Average (SONIA) rate*
n_i	Number of calendar days from, and including, such day “ <i>i</i> ” up to, but excluding, the following <i>LBD</i>
d	Number of calendar days in the relevant Interest Period

In the above example, the observation period is 5 days.

APPENDIX D – SOFR AVERAGE COUPON METHODOLOGY

$$\left[\sum_{i=1}^{d_b} \frac{\text{SOFR}_i \times n_i}{360} \right] \times \frac{360}{d_c}$$

Where,

d_b	The number of business days in the interest period
d_c	The number of calendar days in the interest period
SOFR_i^*	Secured Overnight Funding Rate
n_i	The number of calendar days for which rate applies

* These examples have been simplified considerably for ease of readability. Please contact your RBC Relationship Manager for details.

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