Consultation Paper: CORRA-in-arrears calculation methodology and CDOR fallback language for Floating Rate Notes

Executive summary

- In March 2018, the Canadian Fixed Income Forum launched the Canadian Alternative Reference Rate working group (CARR) to review and enhance the existing Canadian overnight risk-free rate (RFR) benchmark. To complete its work, CARR formed a Transition subgroup, tasked with working to prepare the Canadian market to transition away from the Canadian Dollar Offered Rate (CDOR), with a Fallback language workstream, tasked with developing robust fallback language for cash products referencing CDOR. Fallback language describes what occurs to a contract or financial instrument referencing a benchmark rate if that benchmark rate stops being published.
- This consultative document describes a methodology for calculating CORRA-in-arrears[1] that CARR recommends for use in CORRA-linked floating rate notes (FRNs) and other relevant Canadian financial products, as well as draft fallback language that CARR recommends for use in FRNs referencing CDOR.
    - **CORRA-in-arrears methodology**: The term "in-arrears" refers to the calculation of interest over a period of time based on the compounding of a daily interest rate like CORRA published over that period of time.[2] This methodology would be used to create an index and compounded average rates over several different time periods (e.g. 1 month, 3 months), in order to make it easier for market participants to calculate interest and coupon payments based on CORRA-in-arrears. CARR strongly recommends the use of this methodology for financial products such as FRNs. Similar indices and compounded average rates have been developed in other jurisdictions such as the UK and US, since having a transparent calculation methodology that firms can rely upon can help support market liquidity by improving standardization. Firms are nonetheless free to use their own methodology if they so choose.
    - **Draft fallback language for FRNs referencing CDOR**: The draft fallback language can be found in Annex 1. This suggested language is intended to help promote the development of a market convention for fallback language.

[1] CORRA is the Canadian Overnight Repo Rate Average.

[2] In contrast, a "forward-looking" rate like CDOR is determined at the start of this period of time and therefore payments are known in advance.

Firms are free to modify the suggested fallback language or to draft their own language. This language could be voluntarily included in the documentation of newly-issued FRNs. Firms seeking to use this fallback language for legacy contracts would need to negotiate its use with their counterparties.

- One of the fallbacks included in the draft CDOR FRN fallback language is a rate based on CORRA-in-arrears.

- This suggested fallback language would be applicable if CDOR was entirely discontinued as a reference rate. While there is no immediate expectation that this will happen, the global experience with benchmark transition, particularly LIBOR's "tough legacy" problem,[3] suggests a need to prepare early for any eventuality.

Objectives of this Consultation

This consultation aims to solicit views on CARR's proposed methodology for calculating CORRA-in-arrears and on suggested fallback language for FRNs. The target audience is all firms that use financial instruments referencing either CORRA or CDOR, and particularly firms that issue or own FRNs referencing CDOR.

The consultation paper details the CORRA-in-arrears calculation methodology that CARR recommends for use in Canadian financial products based on CORRA. It describes fallback language that CARR recommends be used in FRNs referencing CDOR. Both general feedback and feedback on specific aspects of the in-arrears calculation methodology and CDOR FRN fallback "waterfall" is sought. After completion of the consultation, CARR will review and adjust the in-arrears calculation methodology and draft fallback language taking into consideration the feedback received. Suggested fallback language for cash products other than FRNs is not covered in this consultation paper.

Instructions

Please submit your responses to the consultation questions below, along with any other comments to CARR-TARCOM-Consultation@bank-banque-canada.ca by December 22nd, 2020. A consultation response template can be found here. A summary of consultation responses will be made publicly available.

Background

Global context

Interest rate benchmarks are a cornerstone of the global financial system and are used by market participants to price a wide range and large volume of financial products and contracts. Thus, confidence in and the effectiveness of those benchmarks are essential to maintaining the efficiency, stability and fairness of the global financial system.

In 2012, vulnerabilities in several survey-based interbank offer rates (IBORs) were exposed. At the request of the G20, the Financial Stability Board (FSB) established the Official Sector Steering Group in 2013 to advise the FSB on recommendations to (i) strengthen existing IBORs,

[3] Contracts without robust fallbacks that could prove unable to amend ahead of LIBOR's discontinuation.

and (ii) promote the development of alternative RFRs that could be used, especially for derivative contracts. The primary focus of this work was on the three most referenced global interest rate benchmarks: LIBOR, TIBOR and Euribor.

In July 2017, the United Kingdom's Financial Conduct Authority (FCA) announced that it would no longer use its powers to compel LIBOR panel member banks to submit London Interbank Offered Rate (LIBOR) quotes after the end of 2021. With this condition gone, the UK FCA expects contributing banks to begin leaving the LIBOR panel, and that LIBOR will cease being published sometime after the end of 2021. This announcement reinforced a global push for robust RFRs to be in place to ensure that (i) market participants have a suitable alternative reference rate against which to benchmark new contracts, and (ii) appropriate fallback reference rates exist for legacy LIBOR-linked contracts to be priced against. The FCA reiterated in April 2020 that, while some interim deadlines may shift as a result of COVID-19, it should still be expected that LIBOR will cease being published after the end of 2021. In November 2020, LIBOR's administrator, ICE Benchmark Administration, launched a consultation on its intent to cease the publication of GBP, EUR, CHF and JPY LIBOR at the end of 2021. Discussions involving IBA, the FCA, other official sector bodies and the panel banks are continuing regarding the future of USD LIBOR. The FCA has also launched a related consultation on some proposed new powers for benchmarks that it deems critical.

Domestic context

CARR was launched by the Canadian Fixed-Income Forum in March 2018. CARR is focused on promoting the use of CORRA as a key interest rate benchmark in Canada. To complete its work, CARR formed a Transition subgroup to prepare the Canadian market for a transition to CORRA, with a Fallback language workstream to develop robust fallback language for cash products referencing CDOR. CARR and its subgroups include market participants representing buy-side and sell-side firms, as well as representatives from the legal community. CARR is co-chaired by senior representatives from the Bank of Canada and CIBC.

While there are global efforts to transition activity toward overnight RFR benchmarks, CARR's work differs somewhat from some of its peer working groups since CARR is not preparing for an imminent discontinuation of CDOR.[4]

LIBOR's discontinuation was not anticipated and, as a result, there is a large stock of existing contracts and financial instruments that reference LIBOR but do not include appropriate fallback language. Renegotiating these contracts and financial instruments is costly, time-consuming, and may not be completed by the time of LIBOR's discontinuation. This is colloquially referred to as LIBOR's "tough legacy" problem. One of CARR's goals in developing fallback language for CDOR is to pre-empt a Canadian "tough legacy" problem from developing should CDOR cease to be published at some point in the future.

Overview of differences between CDOR and CORRA

CORRA is a measure of the cost of overnight funding in Canadian dollars using Government of Canada treasury bills and bonds as collateral for general collateral repurchase transactions

[4] Refinitiv, CDOR's administrator, has announced that the calculation and publication of the 6-month and 12-month CDOR tenors will cease from May 17th, 2021 (see also ISDA's guidance on this tenor cessation).

(repos).[5] CORRA is based on transaction-level repo data obtained by the Bank of Canada, which has administered the rate since June 15, 2020. Since the repo transactions used to calculate CORRA are overnight (i.e. very short term) and secured by Government of Canada collateral (i.e. no credit risk), CORRA is considered a "risk-free" rate (RFR). Indeed, in July 2018, CARR identified CORRA as best meeting its criteria for a domestic RFR.

CDOR is a measure of the rate at which Canadian banks are willing to lend funds to clients with existing credit agreements, funded by the primary market issuance of banker's acceptances (a type of debt instrument). CDOR is based on a daily survey of six Canadian banks by CDOR's administrator, Refinitiv.[6] Since CDOR is the rate at which banks are willing to lend, it in part reflects the cost at which banks are able to fund the loan (i.e. CDOR in part reflects the credit risk of the bank). CDOR is currently calculated for loans made at 1, 2, 3, 6 and 12-month terms: CDOR therefore also reflects term risk.

Overall, CORRA is a transaction-based overnight risk-free rate, while CDOR is a survey-based term rate that reflects bank credit risk. CDOR is therefore likely to be higher than CORRA, particularly during periods of financial stress. This is an important consideration because, where CORRA is used as a replacement rate for CDOR, adjustments need to be made to reflect term and credit risks.

Consistency across fallback provisions

One of CARR's goals in developing suggested fallback language is to promote consistency in fallbacks across asset classes. Firms often have exposures to CDOR that span across multiple financial instruments. For example, a firm might have a loan based on CDOR which it has hedged via a derivative into a fixed rate loan. If the fallback language in these instruments differs, they may behave differently in the event that CDOR ceases as a benchmark. This would leave the firm exposed to risks it may not expect or be able to effectively manage. Consistent fallback language across different instruments can also be more efficient, since it allows financial intermediaries to more effectively hedge their risk exposures.

Reflecting these benefits to consistency, CARR is seeking to establish similar fallback language across derivative and cash products. CARR has provided feedback to ISDA on its recently published fallback language for the derivatives market and has taken into consideration ISDA's approach in developing its proposed fallback language.

Finally, CARR recognizes that despite these benefits to consistency, some individual market participants may benefit from customized fallback language. CARR's proposed fallback language is suggested language and are in no way binding for market participants.

Overview of proposed methodology for CORRA-in-arrears

CORRA is based on transactions initiated the day of, and published on the following business day. To use CORRA in financial instruments such as loans or bonds, where interest is calculated over a longer period of time, CORRA's daily values are compounded. This compounding of CORRA's daily values is referred to as "compounding in arrears". If different sides of a contract

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[5] CORRA is calculated as the daily trimmed volume-weighted median of eligible repo transactions (i.e. interdealer, interbank and dealer-client repo transactions between unaffiliated counterparties). More information on the calculation methodology and governance of CORRA can be found on the Bank of Canada website.

[6] More information on the calculation methodology and governance of CDOR can be found on the Refinitiv website.

make different mathematical assumptions when compounding in arrears, they could produce different results, leading to a conflict about how much is owed.

Since it is valuable to have a consistent calculation methodology across financial products, CARR has developed this methodology and recommends its use. Indeed, to promote consistency in calculation methodology, authorities in some jurisdictions have begun to publish historical compounded average rates over various tenors (e.g. 1 month, 3 months). They also typically publish an index, which allows for the easy calculation of interest given a specific start and end date.

The proposed definitions are aligned with ISDA's methodology for compounding overnight rates in swap contracts. They are broadly in line with the calculation methodologies used by the Montreal Exchange and those found in other relevant jurisdictions such as the US and the UK.

The proposed compounded average rates would be published to five decimal places (X.XXXXX%), while the index would be published to eight decimal places (X.XXXXXXXX%). The indices and compounded average rates would be published to the Bank of Canada's website alongside CORRA, and subject to the same revision policies.

Compounding methodology

Both the proposed CORRA compounded average rates and index would employ daily compounding. Interest would only compound on business days that is days when Schedule I banks under the Bank Act (Canada) are open for business in Toronto, Ontario Canada (i.e. days when CORRA was published), on an actual/365 (fixed) basis. The CORRA value published on the following business day will apply to weekends and holidays. In other words, the value of CORRA published on Monday (which reflects trades made on Friday) would be applicable to the previous Friday, Saturday and Sunday (reflecting the functioning of repo markets). An example of the business day count can be found below in the *Examples* section.

CORRA Compounded Average Rates

CARR proposes publishing up to three compounded average rates for CORRA that differ by the term over which they are calculated: 1 month; 2 months; 3 months. These terms match those of CDOR.[7]

The start dates for calculating the CORRA compounded average rates would be determined as exactly 1, 2, or 3 months prior the start of publication. For example, the 1-month CORRA Compounded average rate published on 1 September would have a start date of 1 August. If the start date falls on a non-Toronto business day, then the CORRA rate published from the preceding business day will be applied and pro-rated between the start date and the first business day of the period. If the start date falls on a date which is not a calendar date (e.g. 31 September), the start date will be moved to the last calendar day of the month (e.g. 30 September).

These compounded average rates would be published at the same time as or slightly later than CORRA.

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[7] See footnote 4.

$$CORRA\ Compounded\ Average = \left(\prod_{i=1}^{d_b}\left(1 + \frac{CORRA_i \times n_i}{365}\right) - 1\right) \times \frac{365}{d_c}$$

Where:

- $CORRA_i$ = CORRA for business day i, which is published on business day i+1
- n_i = number of calendar days for which $CORRA_i$ is compounded
- d_c = number of calendar days in the calculation period
- d_b = number of business days in the calculation period
- i = series of ordinal numbers from 1 to the number of business days in the calculation period

CORRA Compounded Index

The CORRA Compounded Index would be used by firms to calculate CORRA compounded between any two dates (i.e. it would allow for more non-standard compounding periods than the CORRA compounded average rates). The CORRA Compounded Index would do this by serving as a measure of the cumulative impact of CORRA compounding over time, starting from a base value of 1 on the first day of the series, June 12, 2020. Each day, the CORRA index would be set as follows:

$$CORRA\ Compounded\ Index_i = CORRA\ Compounded\ Index_{i-1} \times \left(1 + \frac{CORRA_{i-1} \times d_{n,i-1}}{365}\right)$$

Where:

- CORRA Compounded $Index_i$ = the CORRA Compounded Index on day i
- $CORRA_{i-1}$ = CORRA for business day i-1, which is published on business day i
- $d_{n,i-1}$ = number of calendar days for which $CORRA_{i-1}$ is compounded
- i = series of ordinal numbers since the base date

If a contract accumulated interest between two dates, x and y, parties to the contract could apply the following formula to get the aggregate compounding between these dates:

$$\left(\frac{CORRA\ Compounded\ Index_y}{CORRA\ Compounded\ Index_x} - 1\right) \times \left(\frac{365}{d}\right)$$

Where:

- CORRA Compounded $Index_x$ = CORRA Index on start date of calculation period
- CORRA Compounded $Index_y$ = CORRA Index on end date of calculation period
- d = number of calendar days in the calculation period

Examples

Illustrative example of the compounding methodology:

CORRA publi-cation date, valuation date for averages and index	CORRA value date	CORRA	Calendar days applica-ble	Compounding methodology
Monday 9 Sep 2019	Friday 6 Sep 2019	N/A	N/A	1
Tuesday 10 Sep 2019	Monday 9 Sep 2019	a	1	(1) (1+(a x 1 / 365))
Wednesday 11 Sep 2019	Tuesday 10 Sep 2019	b	1	(1) (1+(a x 1 / 365)) (1+(b x 1 / 365))
Thursday 12 Sep 2019	Wednesday 11 Sep 2019	c	1	(1) (1+(a x 1 / 365)) (1+(b x 1 / 365)) (1+(c x 1 / 365))
Friday 13 Sep 2019	Thursday 12 Sep 2019	d	1	(1) (1+(a x 1 / 365)) (1+(b x 1 / 365)) (1+(c x 1 / 365)) (1+(d x 1 / 365))
Monday 16 Sep 2019	Friday 13 Sep 2019	e	3	(1) (1+(a x 1 / 365)) (1+(b x 1 / 365)) (1+(c x 1 / 365)) (1+(d x 1 / 365)) (1+(e x 3 / 365))

Sample use of CORRA Compounded Index:

Start date	CORRA Compounded Index	End date	CORRA Compounded Index	Compounded CORRA rate for the period
12 Aug 2019	1.03743470	3 Sep 2019	1.03852950	$\left(\frac{1.03852950}{1.03743470}-1\right)\times\left(\frac{365}{22}\right)=1.75084\%$
25 Jun 2019	1.03504692	10 Dec 2019	1.04341899	$\left(\frac{1.04341899}{1.03504692}-1\right)\times\left(\frac{365}{168}\right)=1.75734\%$

Note: Values for CORRA Compounded Index are hypothetical.

Question 1) Do you agree with the proposed calculation methodologies for the CORRA compounded average rates and the CORRA Compounded Index, including the level of decimal precision and the tenors for the CORRA compounded average rates?

Question 2) Do you see value in publishing the CORRA compounded average rates or, given its flexibility and precision, would the index be sufficient? If so, should all 3 averages be published, or are some more useful than others?

Question 3) Are there any changes to the compounded average rates or index that would make them more useful? If so, how?

Overview of proposed fallback language for FRNs

Scope

CARR's proposed fallback language is meant to apply to floating rate notes that reference CDOR. It is suggested that this language is included in the documentation for new floating rate notes referencing CDOR. Firms are also encouraged to include it in previous-issued FRNs, subject to negotiation with their counterparties.

Trigger

The proposed fallback language can become effective (i.e. triggered) in two instances: if CDOR is discontinued as a result of a public statement or because it has ceased being published for an extended period of time. These are referred to in the fallback language as "benchmark discontinuation events". Any disruptions to the publication of CDOR short of these two events would not initiate the fallback language.

1) Discontinuation resulting from a public statement

In this instance, CDOR's administrator would make a public statement or otherwise publish an announcement that it has ceased (or will cease) to provide CDOR, on a permanent basis. Further, no successor administrator that would continue the provision of CDOR can have been identified at the time of the administrator's announcement for this to be considered a benchmark discontinuation event.

2) Discontinuation resulting from a failure to publish

In this instance, the fallback language would be triggered if (a) CDOR was not published by its administrator for five consecutive business days and this was not due to any kind of temporary disruption declared by CDOR's administrator or its regulator, and (b) the benchmark cannot be determined through an interpolation between other tenors of the benchmark. Alternatively, the fallback language can be triggered if the administrator has published the previous day's CDOR rate for five consecutive business days as a result of receiving no quotes or other contributions from banks that normally submit to the benchmark.

3) Other potential triggers

The two triggers discussed above are the only ones included in CARR's draft fallback language. Pre-cessation triggers—triggers that instigate the fallback process before a benchmark ceases publication—were considered but ultimately not included. While pre-cessation triggers are included in the fallback language provided by some other national working groups on benchmark reform, they were not thought to be appropriate for Canada.

Question 4) Do you agree with the two proposed fallback triggers? Are there additional criteria that should be included in these two triggers?

Question 5) Do you agree that pre-cessation triggers should not be included in the proposed fallback language? Please explain your response.

Replacement rates

If the fallback language is triggered, references to CDOR in contracts containing the fallback language would be replaced with references to another benchmark. The draft language includes a prioritized "waterfall" of potential successor rates.

The waterfall is ordered to reflect how economically similar the fallbacks are to CDOR (i.e. the rates which best reflect the same risks as CDOR are placed earlier in the waterfall). Since no rates exist that are identical to CDOR, a "Replacement Benchmark Spread" is added on to account for the economic difference between the replacement rates and CDOR (this spread is described in the next section). This spread is a static add-on that would help account for the economic difference between the fallback rate and CDOR by looking at the historic difference between these rates. As a static spread, it would not dynamically reflect economic developments (i.e. the Replacement Benchmark Spread would remain constant after the fallback was triggered, even if the term or credit risk premium changed significantly). The ordering of the waterfall is therefore meant to leave users with the rate that minimizes the economic impact on counterparties.

	Proposed Replacement Rate Waterfall
Step 1	A rate determined by a committee endorsed or convened by the Bank of Canada, plus spread
Step 2	Term CORRA plus spread
Step 3	ISDA's "CAD-CORRA-OIS-COMPOUND" rate plus spread
Step 4	The Bank of Canada policy rate, compounded daily and paid in arrears, plus spread

The first step in the waterfall is a rate determined by a committee officially endorsed or convened by the Bank of Canada, plus a Replacement Benchmark Spread. Including this as the first option recognizes that the landscape of financial benchmarks continues to change, both domestically and globally. LIBOR's cessation was unthinkable in the recent past, but it is now expected to disappear. This may happen to other rates. Conversely, new benchmarks may also be created that may be better suited as a fallback rate for CDOR. These changes cannot be anticipated, but they can be addressed through a flexible mechanism like a committee endorsed or convened by the Bank of Canada. The static Replacement Benchmark Spread would keep economic benefits from accruing to one side of the transaction, and could be positive, negative or zero, depending on the endorsed rate.

If the Bank of Canada does not convene or endorse a committee, or they do and the committee cannot agree upon a successor rate, the fallback language moves to its second step: term CORRA plus the Replacement Benchmark Spread. Term CORRA does not currently exist, nor is there a commitment by a private or public sector entity to provide such a rate. If a term CORRA were developed, it could dynamically reflect both the risk-free rate (i.e. the cost of collateralized overnight lending) and some term risk premium. The static Replacement Benchmark Spread would be added to this to adjust for other economic factors (e.g. credit risk).

If term CORRA does not exist, the fallback language moves to its third step: the "CAD-CORRA-OIS-COMPOUND" rate included in ISDA's definitions plus the Replacement Benchmark Spread. CAD-CORRA-OIS-COMPOUND is defined as overnight CORRA compounded-in-arrears according to ISDA's conventions (e.g. for day count). Overnight CORRA only reflects the market's risk-free rate.

Finally, if CAD-CORRA-OIS-COMPOUND is not available, the fallback language moves to its final step: the Bank of Canada's policy interest rate, compounded daily and paid in arrears, plus the Replacement Benchmark Spread. Since the Bank of Canada does not frequently change its policy rate, and the Replacement Benchmark Spread is static, the resulting rate would be relatively constant.

Question 6) Do you agree with the rates included in the proposed replacement rate waterfall? If not, how should they change?

Question 7) Do you agree with the ordering of the proposed replacement rate waterfall? If not, how would you change the order?

Question 8) Do you believe any additional rates should be included in the waterfall? Please describe why they should be included and how would you order the resulting waterfall.

Replacement benchmark spread

The "Replacement Benchmark Spread" is a static spread adjustment that would be added to a replacement rate to mitigate the differences between the fallback rate and CDOR. The rate would be calculated by looking at the historical differences between the fallback rate and CDOR. In the proposed fallback language, a waterfall of two alternative spreads is suggested.

	Proposed Replacement Benchmark Spread Waterfall
Step 1	A spread determined by a committee endorsed or convened by the Bank of Canada
Step 2	ISDA's fallback adjustment

The first alternative looks to a committee officially endorsed or convened by the Bank of Canada to determine the spread adjustment. Similar to the first step in the "waterfall" described above, this is meant to reflect the changing nature of financial benchmarks and uncertainty about what will be the most appropriate Replacement Benchmark Spread in the future.

If the Bank of Canada does not convene or endorse a committee, or they do and the committee cannot agree upon a successor rate, the fallback language moves to its second step: the ISDA Fallback Adjustment. ISDA's fallback adjustment reflects several consultations of derivatives market participants and includes an historical median approach over a five-year lookback period (i.e. it looks at the median spread over the five years prior to the fallback being triggered).

Question 9) Do you agree with the two proposed Replacement Benchmark Spreads? Are there details that should be included in the fallback language describing the spreads?

Question 10) Are there any other spreads you believe should be added to the waterfall? If so, please describe them and your rationale.

General feedback on CDOR FRN fallbacks

Question 11) Are there any market conventions (e.g. for the fallback rates or Replacement Benchmark Spreads) that should be explicitly outlined in the fallback language, or should the language remain broad enough to allow for different interpretations? Please be specific.

Question 12) Would any aspect of this proposal significantly impact your ability to issue or purchase FRNs? If so, please explain how.

Question 13) Please provide any additional feedback on the proposed fallback language.

Annex 1: Draft CDOR fallback language for FRNs

PREAMBLE

There are 3 main components to the fallback language:

(1) The trigger that forced the discontinuance of the original interest rate, in this case CDOR;
(2) The replacement interest rate that will used; and
(3) Any adjustment that must be made to ensure an equitable move from the discontinued interest rate to the new rate of interest.

Effect of Benchmark Discontinuance Event

If a Benchmark Discontinuance Event shall have occurred prior to the Reference Time for any determination of the Benchmark, the Benchmark shall be replaced by the Replacement Benchmark.

"Benchmark" means, initially, CDOR; provided that if a Benchmark Discontinuance Event and its related Benchmark Replacement Date have occurred with respect to CDOR or the then-current Benchmark, then "Benchmark" means the applicable Replacement Benchmark.

"Benchmark Discontinuance Event" means the occurrence of one or more of the following events with respect to a Benchmark:

1. a public statement or publication of information by or on behalf of the administrator of such Benchmark announcing that such administrator has ceased or will cease to provide such Benchmark, permanently or indefinitely, provided that, at the time of the statement or publication, there is no successor administrator that will continue to provide such Benchmark; or
2. a Benchmark rate is not published by the administrator of such Benchmark for five consecutive business days and such failure is not the result of a temporary moratorium, embargo or disruption declared by the administrator of such Benchmark or by the regulatory supervisor for the administrator of such Benchmark and the Benchmark cannot be determined by reference to an Interpolated Period, or the administrator has published the previous day's Benchmark Rate for five consecutive business days or the administrator has published the previous day's Benchmark Rate for five consecutive business days as a result of receiving no quotes or other contributions from financial institutions that routinely provide such quotes or other contributions to allow the administrator to calculate a Benchmark Rate for the applicable business day.

"Benchmark Replacement Date" means:

1. for purposes of clause (1) of the definition of "Benchmark Discontinuance Event," the later of (a) the date of such public statement or publication of information and (b) the date on which the administrator of the relevant Benchmark permanently or indefinitely ceases to provide such Benchmark; and
2. for purposes of clause (2) of the definition of "Benchmark Discontinuance Event," the first business day following such five consecutive business days.

If a Benchmark Discontinuance Event occurs on the same day as, but earlier than, the Reference Time for any determination, the Benchmark Replacement Date will be deemed to

have occurred prior to the Reference Time for such determination and such determination will be made using the applicable Replacement Benchmark.

"CDOR" means the Canadian Dollar Offered Rate, as published by Refinitiv Benchmark Services Limited or any successor thereto as administrator.

"CORRA" means the Canadian Overnight Repo Rate Average, as published by The Bank of Canada or any successor thereto as administrator.

"Corresponding Period" with respect to a Replacement Benchmark means a period or maturity (including overnight) having approximately the same length (disregarding business day adjustments) as the term period for CDOR.

"Interpolated Period" with respect to a Benchmark means the period determined by interpolating on a linear basis between: (1) such Benchmark for the longest period (for which such Benchmark is available) that is shorter than the Corresponding Period and (2) such Benchmark for the shortest period (for which such Benchmark is available) that is longer than the Corresponding Period.

"ISDA" means the International Swaps and Derivatives Association, Inc. or any successor thereto.

"ISDA Fallback Adjustment" means the spread adjustment (which may be a positive or negative value or zero) that would apply for derivatives transactions referencing the ISDA Definitions to be determined upon the occurrence of an index cessation event with respect to the Benchmark for the applicable tenor.

"ISDA Definitions" means the 2006 ISDA Definitions published by ISDA, as amended or supplemented from time to time, or any successor definitional booklet for interest rate derivatives published by ISDA from time to time.

"Policy Interest Rate" means The Bank of Canada's target for the interest rate at which major financial institutions borrow and lend one-day funds among themselves, which is located on the Bank of Canada's website at: https://www.bankofcanada.ca/core-functions/monetary-policy/key-interest-rate/.

"Reference Time" with respect to any determination of a Benchmark means the time as set out by the methodology of the administrator.

"Replacement Benchmark" means the first of the below alternative possible rate replacements that can be determined as of the Benchmark Replacement Date:

1. the rate as determined by a committee officially endorsed or convened by the Bank of Canada, plus the Replacement Benchmark Spread;
2. Term CORRA plus the Replacement Benchmark Spread;
3. the rate that is applicable under "CAD-CORRA-OIS-COMPOUND" (as such term is defined in the ISDA Definitions), plus the Replacement Benchmark Spread; or
4. the Policy Interest Rate, compounded in arrears daily, plus the Replacement Benchmark Spread.

"Replacement Benchmark Spread" with respect to any Replacement Benchmark, means the first of the below alternative possible spread adjustments that can be determined as of the Benchmark Replacement Date:

1. the spread adjustment (which may be positive, negative or zero) that shall have been selected, endorsed or recommended by a committee officially endorsed or convened by the Bank of Canada for the applicable Unadjusted Replacement Benchmark; or
2. the ISDA Fallback Adjustment.

"Term CORRA" means the forward-looking term rate for the applicable Corresponding Period (or, if there is no Corresponding Period, such rate for the Interpolated Period) based on CORRA that has been selected or recommended by a committee officially endorsed or convened by the Bank of Canada.

"Unadjusted Replacement Benchmark" means the Replacement Benchmark excluding the applicable Replacement Benchmark Spread.