

Preparing for transition:
Update on LIBOR and
a possible shift to
alternative reference
rates

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BANK



RBC Capital Markets

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INTRODUCTION

Interest rate benchmark reform will become increasingly important to our clients in the coming years. These reforms will affect many of our clients that do business with us across nearly all asset classes, including derivatives, bonds, loans and other financial instruments.

There are millions of contracts valued in the trillions which reference interbank offered rates, or IBORs, with the London Interbank Offered Rate (LIBOR) being the most widely used IBOR. However, as a result of significantly reduced volumes of interbank unsecured term borrowing and an increasing reliance on expert judgment to set the IBORs, there is a regulator-led push to transition the market from IBORs to alternative (nearly) risk-free reference rates (RFRs) that are based on actual overnight secured transactions.

The main accelerator for the recent flurry of work has been the UK's Financial Conduct Authority (FCA) statement last year that after 2021, the FCA will no longer persuade or compel panel banks to submit the rates required to calculate LIBOR. This does not mean that LIBOR will necessarily cease to exist after 2021 as panel banks may choose to voluntarily submit the relevant data to

calculate LIBOR despite there being no legal compulsion to do so. It does mean, however, that our clients should take active steps to understand the transition challenges of moving from IBORs to RFRs.

The challenges to a successful transition from the IBORs to RFRs are many. First, the scale of the transition is massive as the total outstanding notional exposure to IBORs is estimated at over USD\$370 trillion¹. Second, broad market adoption of RFRs (beyond derivatives) as the new benchmarks require robust liquidity in the derivatives market and the development of term rates based on the alternative RFRs. Third, a plan to transition legacy contracts that reference IBORs to RFRs must be developed to minimize the valuation impact to these contracts and their related hedges. There are several more challenges which will be further explored in this report.

RBC has mobilized an Interest Rate Benchmark Reform Program whose mandate is to prepare RBC and our clients for the industry and regulatory changes related to IBOR reform. We look forward to engaging with you in these efforts.

TOTAL OUTSTANDING NOTIONAL
OF FINANCIAL CONTRACTS THAT
REFERENCE IBORS IS ESTIMATED
AT USD\$370 TRILLION.

¹ International Swaps and Derivatives Association (ISDA), The \$370 Trillion Benchmark Challenge (February 2018): <https://www.isda.org/2018/02/05/the-370-trillion-benchmark-challenge/>.

WHAT IS AN INTERBANK OFFERED RATE?

IBORs are interest rates at which banks can borrow in the interbank market from overnight to 12 months. The most widely used IBOR that many of our clients will be familiar with is LIBOR, which is the IBOR for the London interbank market and is quoted in British Pound Sterling (GBP), US Dollar (USD), Euro (EUR), Swiss Franc (CHF) and Japanese Yen (JPY)². The 3-month LIBOR maturity followed by the 6-month LIBOR maturity are the most widely referenced rates in all currencies by volume³. LIBOR

quotes provide an indication of the average interest rate at which banks can borrow on an unsecured basis in the London interbank market⁴. Notably, IBORs include a credit spread reflecting the credit risk of lending to banks. The credit spread compensates the lending bank for the risk it takes of the borrowing bank defaulting.

RBC is among a few global banks on the panel of contributing banks for USD LIBOR, GBP LIBOR and EUR LIBOR.

THE MOST WIDELY USED IBOR THAT
MANY OF OUR CLIENTS WILL BE
FAMILIAR WITH IS LIBOR (LONDON
INTERBANK OFFERED RATE).

² In addition to LIBOR, other IBORs include: the Tokyo Interbank Offered Rate (TIBOR), the rate offered in the Japan interbank market and the EUR Interbank Offered Rate (EURIBOR), the rate offered in the EUR interbank market.

³ ISDA et al, IBOR Global Benchmark Survey 2018 Transition Roadmap (February 2018): <https://www.isda.org/a/g2hEE/IBOR-Global-Transition-Roadmap-2018.pdf> at page 8. [IBOR Transition Roadmap]

⁴ ICE Benchmark Administration maintains a reference panel of banks of between 11 and 18 for each currency. Under the calculation methodology, each bank is required to submit the rates at which it could obtain unsecured funding in each maturity (i.e. from overnight to 12 months) for the relevant currency (i.e. GBP, USD, EUR, CHF and JPY). LIBOR rates are calculated using a trimmed arithmetic mean where the highest and lowest quartile of submissions are excluded from the calculation.

HOW ARE IBORS USED?

IBORs are broadly used by market participants in a wide range of product types. Lenders use IBORs as the benchmark reference for determining interest rates for various debt instruments such as corporate loans and mortgages. In the US, USD LIBOR is used

as a benchmark reference for retail products such as credit cards and student loans. Corporations use IBORs as a reference rate for corporate finance transaction such as the issuance of floating rate notes (FRNs). See Figure 1 for uses of USD LIBOR by asset class.

FIGURE 1: USD LIBOR MARKET FOOTPRINT BY ASSET CLASS⁵

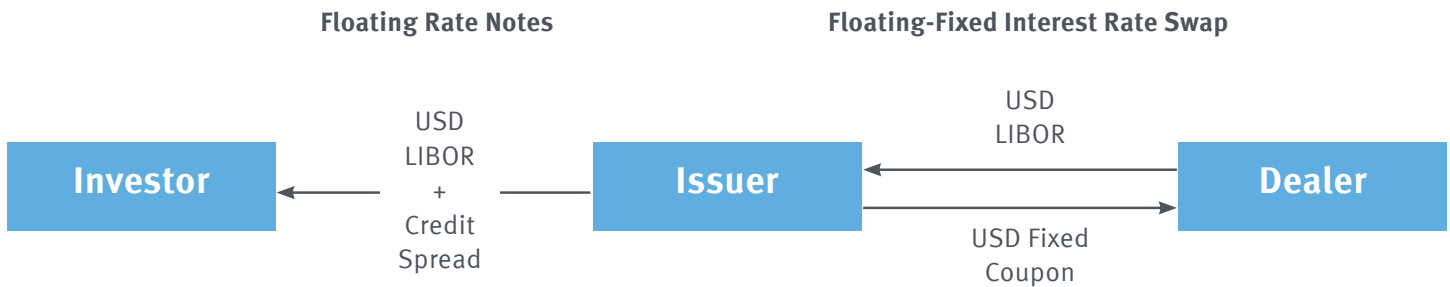
		Volume (Trillions USD)	Percentage of Contracts Expiring by:		Percentage of Contracts Remaining:	
			End 2021	End 2025	End 2030	End 2040
Over-the-Counter Derivatives	Interest rate swaps	81	66%	88%	7%	5%
	Forward rate agreements	34	100%	100%	0%	0%
	Interest rate options	12	65%	68%	5%	5%
	Cross currency swaps	18	88%	93%	2%	0%
Exchange Traded Derivatives	Interest rate options	34	99%	100%	0%	0%
	Interest rate futures	11	99%	100%	0%	0%
Business Loans	Syndicated loans	1.5	83%	100%	0%	0%
	Non-syndicated business loans	0.8	86%	97%	1%	0%
	Non-syndicated CRE/commercial mortgages	1.1	83%	94%	4%	2%
Consumer Loans	Retail mortgages	1.2	57%	82%	7%	1%
	Other consumer loans	0.1	-	-	-	-
Bonds	Floating/variable rate notes	1.8	84%	93%	6%	3%
Securitizations	Mortgage-backed securities	1.0	57%	81%	7%	1%
	Collateralized loan obligations	0.4	26%	72%	5%	0%
	Asset-backed securities	0.2	55%	78%	10%	2%
	Collateralized debt obligations	0.2	48%	73%	10%	2%
Total USD LIBOR Exposure:		199	82%	92%	4%	2%

⁵ Alternative Reference Rate Committee (ARRC), Second Report of the Alternative Reference Rate Committee (March 2018): <https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2018/ARRC-Second-report>. [Second ARRC Report]

Thus, IBORs play a central role in financial markets and permeate through the life cycle of transactions. For instance, issuers of FRNs for corporate financing may choose to hedge the risk of USD LIBOR increasing with interest rate derivatives, such as interest rate swaps that also reference USD LIBOR. For the hedge to be effective, the benchmark reference rate in the underlying debt (such as corporate loans or bonds) must be the same benchmark reference rate used in the hedge (i.e. the interest rate swap). Figure 2 provides an illustration.

Consider a transaction where a corporate issuer issues a FRN linked to USD LIBOR. The issuer is exposed to floating rate risk because if USD LIBOR increases by 50bps (as an example), the issuer’s interest expense will also increase by 50bps. The issuer does not want to take a position on the direction of the interest rates and wants to fix its payment obligations. The issuer can do so by entering into an interest rate swap with a dealer.

FIGURE 2: US DOLLAR FLOATING-FIXED INTEREST RATE SWAP



AS MARKET SOLUTIONS TO THE TRANSITION CHALLENGES ARE BEING DEVELOPED, THERE NEEDS TO BE CONSIDERATION OF CROSS PRODUCTS IMPACT.

If LIBOR is discontinued and the market is required to transition to RFRs, the reference rates used in a FRN must be the same as the reference rate in an interest rate swap otherwise the cash flows that the issuer pays to the investors may be different than the cash flows it receives from the dealer.

Therefore, as market solutions to the transition challenges are being developed, there needs to be consideration of cross products impact as well. Figure 3 provides an overview of the scope of the transition from the IBORs to the RFRs.

FIGURE 3: SCOPE OF TRANSITIONING TO RFRs⁶

Benchmark by Currency	Products	Product Examples	Selected Market Participants
<ul style="list-style-type: none"> ▪ Canadian Dollar Offered Rate (CDOR) ▪ USD LIBOR ▪ GBP LIBOR ▪ EUR LIBOR, EURIBOR ▪ CHF LIBOR ▪ JPY LIBOR, JPY Tokyo Interbank Offered Rate (TIBOR), EUROyen TIBOR 	Over-the-counter (OTC) derivatives	Interest rate swaps, forward rate agreements (FRAs), cross-currency swaps	<ul style="list-style-type: none"> ▪ Governments ▪ Asset managers ▪ Pension funds ▪ Hedge funds ▪ Regulated funds ▪ Insurance/reinsurance companies ▪ Investment banks ▪ Corporations
	Exchange-traded derivatives (ETDs)	Interest rate options, interest rate futures	<ul style="list-style-type: none"> ▪ Exchanges ▪ Central counterparties (CCPs) ▪ Investment banks
	Loans	Syndicated loans, business loans, mortgages, credit cards, auto loans, consumer loans, student loans	<ul style="list-style-type: none"> ▪ Corporations ▪ Investment banks ▪ SSA issuers
	Bonds and floating rate notes (FRNs)	Corporate, financial institution, SSA (Sovereign, Supranational, Agency) bonds, leases, trade finance	<ul style="list-style-type: none"> ▪ Investment banks ▪ Corporations ▪ Governments
	Short-term instruments	Repos, reverse repos, time deposits, credit default swaps (CDS), commercial paper	<ul style="list-style-type: none"> ▪ Asset managers ▪ Pension funds ▪ Hedge funds ▪ Investment banks
	Securitized products	Mortgage-backed securities (MBS), asset-backed securities (ABS), commercial mortgage-backed securities (CMBS), collateralized loan obligation (CLO), collateralized mortgage obligation (CMO)	<ul style="list-style-type: none"> ▪ Asset managers ▪ Pension funds ▪ Hedge funds ▪ Investment banks

⁶ IBOR Transition Roadmap, page 7.

WHAT ARE THE RELEVANT BENCHMARKS USED IN CANADA?

There are two benchmarks in Canada that are used in a number of financial instruments: the Canadian Dollar Offered Rate (CDOR) and the Canadian Overnight Repo Rate Average (CORRA).

CDOR is referenced by several financial and derivatives contracts including interest rate swaps, forward rate agreements, basis swaps, FRNs, bankers' acceptance (BAs) and BA futures. Unlike LIBOR and most other IBORs, CDOR is the average rate at which banks are willing to *lend* funds against issuance of BAs. (As noted previously, LIBOR is the rate at which banks can *borrow* in the interbank market). Thus, unlike many global interbank benchmarks, CDOR is a committed (i.e. executable) lending rate and is used by RBC and other Canadian banks as the reference

rate for lending facilities for BAs. (RBC is a submitter bank for CDOR). CDOR is referenced in over CDN\$10 trillion worth of financial products. The largest usage of CDOR as a reference rate is for interest rate swaps which represent more than 85% of all instruments that reference CDOR⁷.

CORRA measures the average cost of overnight collateralized funding and is used as a reference for overnight indexed swaps and related futures. Thomson Reuters is the official administrator and calculator of both CDOR and CORRA. The Bank of Canada would like to see a complementary term risk-free reference rate such as CORRA for the Canadian market that would operate alongside CDOR.

THE TWO BENCHMARKS IN CANADA REFERENCED IN A NUMBER OF FINANCIAL INSTRUMENTS ARE CDOR AND CORRA.

⁷ Thomas Thorn and Harri Vikstedt, Bank of Canada, Reforming Financial Benchmarks: An International Perspective (June 2014): <https://www.bankofcanada.ca/wp-content/uploads/2014/06/fsr-june2014-thorn.pdf> at page 51.

WHY IS THERE A MOVE FROM IBORS TO RFRS?

There has been significant decline in the interbank unsecured funding markets in the last decade. Much of this decline can be attributed to changes in the regulatory framework that have made it far less attractive for banks to lend to other banks through short-term unsecured markets. For instance, Basel Committee on Banking Supervision's (BCBS)⁸ liquidity rules such as the Liquidity Coverage Ratio (LCR)⁹ and the Net Stable Funding Ratio (NSFR)¹⁰ require banks to be funded by long-term debt (rather than short-term debt) and thus further reducing activity in the short-term interbank market.

To illustrate the above point, in the US, for three-month funding (the most heavily referenced LIBOR tenor), the median transaction volume is less than USD\$1 billion per day. These transactions underpin more than USD\$100 trillion in outstanding volumes of USD LIBOR contracts¹¹. In contrast, the alternative reference rate selected in the US, the Secured Overnight Funding Rate (SOFR) is estimated to be underpinned by approximately USD\$750 billion in daily volumes (we will provide an overview of SOFR and other alternative RFRs later on in this report). Since there is limited activity in the unsecured interbank market, the submissions from panel banks are largely based on expert judgment (as opposed to actual transactions).

To improve the durability and robustness of interest rate benchmarks, reform of major interest rate benchmarks became a late addition to the post-financial crisis package of regulations. These reforms were advanced through two main reports: the International Organization of Securities Commission's (IOSCO) *Final Report: Principles for Financial Benchmarks*¹² and the Financial Stability Board's (FSB) *Reforming Major Interest Rate Benchmarks*¹³.

However, the main accelerator for the work on benchmark reform was Andrew Bailey's (the Chief Executive of UK's FCA) speech on July 27, 2017 where he said that the FCA would not use its influence or legal powers to persuade or compel panel banks to make LIBOR submissions after the end of 2021¹⁴. As a result, many market participants are of the view that LIBOR will be discontinued at the end of 2021 as LIBOR panel members will no longer be compelled to contribute to setting LIBOR. More recently the US Alternative Reference Rate Committee (ARRC) released a second report on its recommended alternative from USD LIBOR to SOFR and enhancing ARRC's transition plan seeking to promote the use of SOFR on a voluntary basis¹⁵. Figure 4 on page 10 provides an overview of a timeline of IBOR reforms globally.

⁸ BCBS is a committee of banking supervisory authorities that was established by the central bank governors of the Group of Ten countries in 1974. Its mandate is to improve the quality of banking supervision worldwide.

⁹ LCR promotes short-term resilience of the liquidity risk profile of banks. It requires banks to hold an adequate stock of high-quality liquid assets that can be converted easily and immediately to meet a bank's liquidity needs for a 30 calendar day stress scenario.

¹⁰ NSFR introduces a new liquidity standard that will require banks to hold more stable and longer term funding sources against their least liquid assets. The implementation of NSFR in Canada has been delayed to Q1 2020.

¹¹ Jerome Powell, Federal Reserve Board, Introductory Remarks (November 2017): <https://www.federalreserve.gov/newsevents/speech/powell20171102a.htm>.

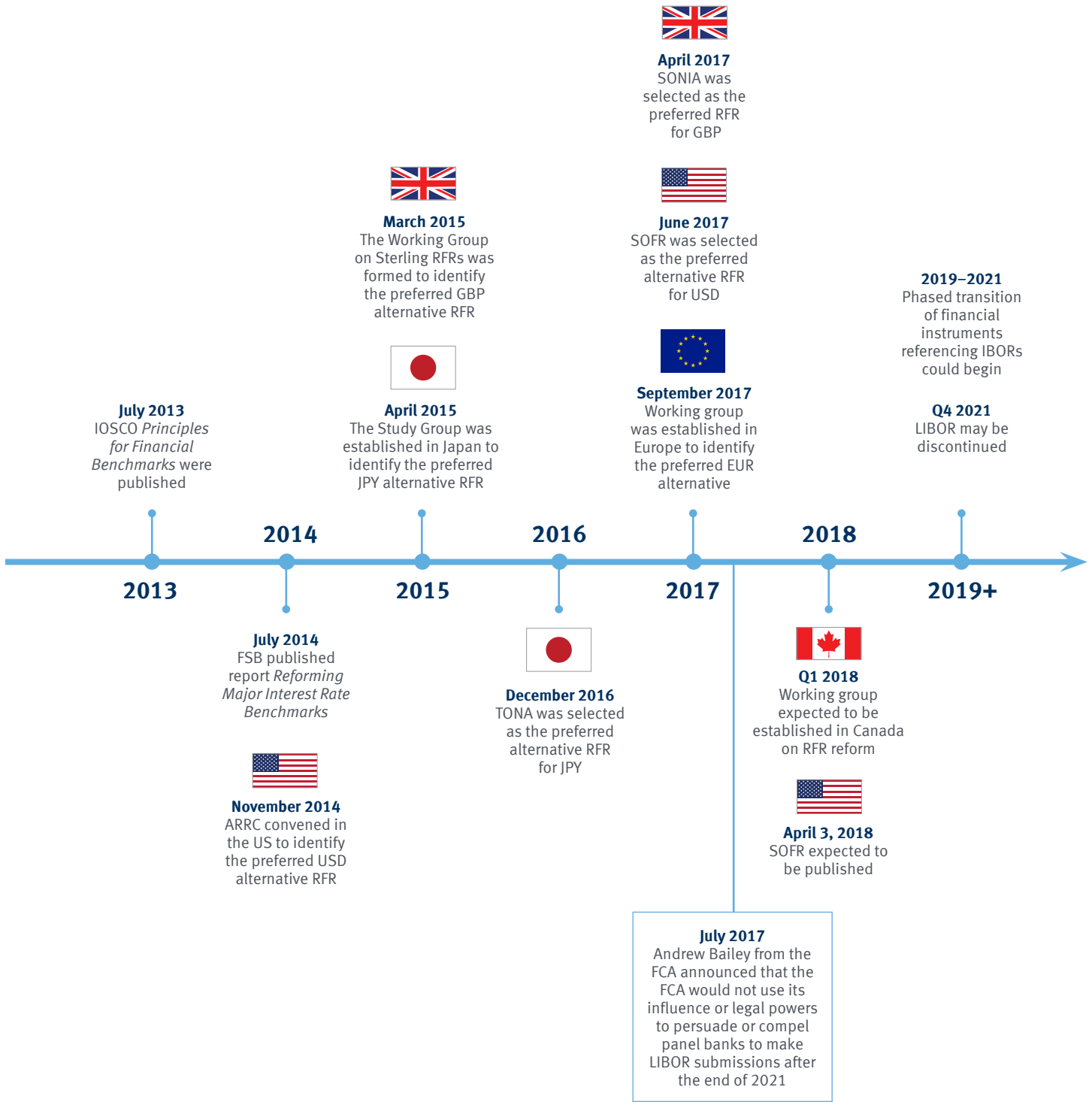
¹² IOSCO, Final Report: Principles for Financial Benchmarks (July 2013): <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD415.pdf>.

¹³ FSB, Reforming major interest rate benchmarks (October 2017): <http://www.fsb.org/wp-content/uploads/P101017.pdf>. RBC was a contributor to the annex on GBP Market Participants Group on Reforming Interest Rate Benchmarks Final Report which was the precursor to the FSB Report. MPG, Reforming Interest Rate Benchmarks Final Report (March 2014): http://www.fsb.org/wp-content/uploads/r_140722b.pdf.

¹⁴ Andrew Bailey, Financial Conduct Authority, The future of LIBOR (July 2017): <https://www.fca.org.uk/news/speeches/the-future-of-libor>.

¹⁵ Second ARRC Report.

FIGURE 4: INTEREST BENCHMARK REFORM IN CANADA, US, EUROPE, UK AND JAPAN









WHAT ARE RFRS?

In July 2013, IOSCO published its *Final Report: Principles for Financial Benchmarks*, a set of global best practices for financial benchmarks, including IBORs. The IOSCO principles strongly favour the use of transactional data or executable quotes (i.e. actual market transactions rather than judgment from banks).

Consistent with IOSCO principles, global regulators have recommended robust, alternative RFRs to transition away from existing IBORs. These alternative RFR benchmarks are based on actual overnight transactions in contrast to IBORs where there has been increasing reliance on the expert judgment of banks.

Despite similarities, there are significant differences between the RFRs across jurisdictions. Some of the RFRs are secured (i.e. collateralized and/or based on rates from the repo markets) such as the US SOFR while others are unsecured such as the UK Sterling Overnight Index Rate (SONIA). See Figure 5 for RFRs selected in the various jurisdictions and the regulator led working groups considering the transition challenges from IBORs to RFRs.

FIGURE 5: RISK-FREE RATES IN VARIOUS JURISDICTIONS

Jurisdiction	Working Group	Alternative RFR	Regulator	Anticipated Publication Date	Description of RFR
	TBD	Expected to be the Canadian Overnight Repo Rate Average (CORRA)	Bank of Canada	Currently being published	<ul style="list-style-type: none"> ▪ CORRA is secured, overnight and transaction based. It is a measure of the average cost of overnight collateralized funding and covers the overnight repo market. ▪ RBC has been asked to participate in the upcoming working group.
	Alternative Reference Rate Committee	Secured Overnight Financing Rate (SOFR)	Federal Reserve Bank of New York	April 3, 2018	<ul style="list-style-type: none"> ▪ SOFR is secured, overnight, and transaction-based. It is expected to be published on April 3, 2018. ▪ SOFR encompasses multiple repo market segments.
	Working Group on Sterling Risk-free Reference Rate	Reformed Sterling Overnight Index Average (SONIA)	Bank of England	April 23, 2018	<ul style="list-style-type: none"> ▪ Reformed SONIA is unsecured, overnight, and transactions-based. It is expected to be published on April 23, 2018. ▪ RBC participates in the working group's Term Rate and Bonds focus groups.
	Working Group on Euro Risk-free Rates	TBD ¹⁶	European Central Bank (ECB), the Financial Services and Markets Authority (FSMA), the European Securities and Markets Authority (ESMA) and the European Commission	TBD	<ul style="list-style-type: none"> ▪ As of the publishing of this report, the Working Group on Euro Risk-free Rates had yet to begin its work to select a risk-free rate.
	The National Working Group on CHF Reference Rates	Swiss Average Rate Overnight (SARON)	Swiss National Bank	Currently being published	<ul style="list-style-type: none"> ▪ SARON is a secured overnight rate that reflects interest paid on interbank overnight repo transactions. ▪ The entire CHF Tomorrow Overnight Indexed Swap (TOIS) market was transitioned to SARON on December 29, 2017 upon the TOIS rate's discontinuation.
	Study Group on Risk-free Reference Rates	Tokyo Overnight Average Rate (TONA)	Bank of Japan	Currently being published	<ul style="list-style-type: none"> ▪ TONA is unsecured, overnight and transaction-based. It reflects the uncollateralized overnight call rate market.

¹⁶ There are a number of rates under consideration for the EUR RFR, including the Euro Overnight Index Average (EONIA). ECB and the European Money Markets Institute (EMMI) are also developing alternative EUR RFRs.

WHAT ARE THE TRANSITION CHALLENGES OF MOVING FROM IBORS TO RFRS?

The biggest challenge is the sheer Herculean task for the market to transition away from ~USD\$370 trillion in exposures from the IBORs to the RFRs across wide ranging asset classes and financial instruments. For benchmark reform to be successful, there will need to be broad market adoption of the alternative RFRs such as SOFR, SONIA and others. Liquidity in the derivatives markets referencing the alternative RFRs will be the key factor in broad market adoption because over-the-counter and exchange traded derivatives account for over 80% of total notional outstanding volumes of IBOR linked contracts¹⁷.

As our clients are thinking through these challenges, we wish to highlight a few issues for your consideration:

- Understand exposures to LIBORs and other IBORs in your portfolio, including exposures to derivatives, loans, bonds and other financial contracts.

- Prepare for contract amendments of legacy contracts that will exist beyond the end of 2021 (the earliest date LIBOR may be discontinued).
- Related, tax and accounting (including hedge accounting) issues should be considered, particularly if valuation changes to contracts as a result of the transition from IBORs to RFRs are anticipated (see Credit Spread and Term Rate discussion on page 14).
- Lastly, investments to infrastructure, including technology and data infrastructure may also be needed¹⁸.

LIQUIDITY IN THE DERIVATIVES MARKETS

REFERENCING THE ALTERNATIVE RFRS WILL BE

THE KEY FACTOR IN BROAD MARKET ADOPTION

OF THE RFRS AS THE FINANCIAL BENCHMARK.

¹⁷ Market Participants Group on Reforming Interest Rate Benchmarks, Final Report (March 2014): http://www.fsb.org/wp-content/uploads/r_140722b.pdf at page 19.

¹⁸ For further details on these challenges, please review section 5 of the IBOR Transition Roadmap at pages 26 – 30.

Documentation Challenge – Derivatives

Focusing on derivatives for a moment, there is market concern that LIBOR may discontinue at the end of 2021. Thus, the question is what will happen to all the derivatives contracts whose terms extend beyond 2021 and that currently refer to LIBOR as the reference rate. For instance, ~34% of interest rate swaps that reference USD LIBOR will continue to exist after 2021¹⁹.

Many of the current fallback provisions (i.e. contractual language in the event LIBOR is discontinued) are appropriate for short-term disruptions to LIBOR, but are not practical if LIBOR is permanently discontinued. As an example, under the 2006 International Swaps and Derivatives Association (ISDA) Definitions (which typically apply to OTC interest rate swaps), if the specified rate source for USD LIBOR is unavailable, the “calculation agent” must solicit USD LIBOR quotes from four banks in the London interbank market. If fewer than two quotes are provided, the contract requires the calculation agent to get quotes from major New York City banks. Once LIBOR is permanently discontinued, it is impractical to continuously approach banks for quotes for the remaining life of the contract. In addition, the current 2006 ISDA Definitions do not have another fallback in the event of a failure to obtain bank quotes. If existing fallbacks to the IBORs fail to provide parties with a rate and the parties fail to agree to an alternative rate, there is a risk that contracts may be frustrated, resulting in the possible termination of the contract, or that a court may intervene in order to imply a rate.

ISDA has established a number of working groups to identify and implement new fallback provisions for certain IBORs, including LIBOR, to address the above risks and reliance on quotes from banks. ISDA is planning to amend the 2006 ISDA Definitions to add selected fallbacks that would apply to new trades upon any permanent discontinuation of certain IBORs. ISDA is also developing a protocol mechanism to facilitate equivalent amendments to legacy trades (i.e. existing trades) referencing certain IBORs on a multilateral basis. ISDA's goal is to implement the amended 2006 Definitions by the end of 2018.

Documentation Challenge – Other Asset Classes

Other asset classes and financial instruments have their own unique challenges because of the structure of the contracts, particularly where the agreements are bespoke and thus a protocol mechanism would not be available.

For example, bonds' terms and conditions are not entirely consistent across different issues. If LIBOR is discontinued and legacy contracts are not amended, many of the legacy bonds could revert to a fixed rate (being the last available floating rate) for the remaining term of the bonds²⁰. This is clearly not the outcome either the issuers or the bond holders would want. Amendments to bond terms and conditions are difficult, costly, and time consuming for issuers and bond holders and with an uncertain outcome.

Similar challenges exist for loan documentation as most loans only contain fallback provisions for temporary disruptions to IBOR rates. In certain instances, existing IBOR loans could become base rate/prime rate loans, which again reflect different economic terms than what parties thought they had negotiated. Collateralized Loan Obligation indentures are a particularly difficult set of contracts to amend as many such indentures require the 100% vote of each class and majority of equity holders.

Please see Appendix A for some of the more prevalent fallback mechanisms in several asset classes.

Possible Changes to Economics of Transactions

Setting aside the administrative and legal task of amending millions of existing contracts and changing boilerplate language for future contracts, the industry and regulators are grappling with the challenge of minimizing valuation impact on contracts that currently reference IBORs as a result of transitioning the market from IBORs to RFRs.

Because of structural differences between the two rates (e.g. overnight RFRs vs. term IBORs, secured vs. unsecured etc.) there are significant differences in how they are set. For example, GBP 3M LIBOR on average is 30 bps higher than a computed forward-looking 3M SONIA rate. However, in periods of financial stress, the spread between GBP 3M LIBOR and 3M SONIA rate jumped to as high as 398 bps²¹.

¹⁹ See Figure 1 on page 5.

²⁰ Because of the interconnected nature of the derivatives and bond markets, many of the bond contracts refer to similar fallbacks as derivatives if LIBOR is discontinued (i.e. conducting a survey of UK and US banks).

²¹ Oliver Wyman, Changing the World's Most Important Number, available at: <http://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2018/February/LIBOR-transition-POV-FINAL.pdf>.

In connection with the previous page, market participants and regulators are carefully looking at the differences between the liquidity of the IBORs and the new reference rates (i.e. RFRs) as well as grappling with credit spread and term rate issues (all of which will be further discussed below).

Liquidity

A smooth transition for the market from IBORs to alternative RFRs will depend heavily on liquidity. Of most importance, there must be deep liquidity in the derivatives markets as derivatives markets referencing alternative RFRs will be key to broad market adoption. As the expression goes, “liquidity begets liquidity”.

Market participants will be closely observing the liquidity in derivatives referencing SOFRs once SOFR begins publishing in Q2 2018. If deep pools of liquidity referencing SOFR emerge, we expect the transition from USD LIBOR to SOFR will be easier and could lead to a large segment of the market transitioning to SOFR successfully.

Credit Spread

One of the main outstanding issues in interest rate benchmark reform work is the application of a credit spread to the RFRs for legacy contracts. As noted earlier, LIBOR and other IBORs have a credit spread baked into the rate to reflect the risk that the borrowing bank could default. RFRs on the other hand do not have this risk²². Complexity in developing such a methodology is exacerbated because some of RFRs are secured (e.g. SOFR, CORRA, SARON) while others are unsecured (e.g. SONIA and TONA).

There is no industry consensus yet on credit spread methodology for broad market adoption. However, the methodologies under consideration are evaluated against a number of principles.

Such principles include:

- (i) elimination of or minimization of value transfer of the contract at the time IBOR is transitioned to an alternative RFR;
- (ii) elimination or minimization of any potential for manipulation - structuring the methodology to avoid the use of easily predictable or easily influenced data points;

- (iii) mitigation of and minimization of regulatory and legal risks (including litigation risks); and
- (iv) minimization of market disruption for all market participants.

There is some market consensus emerging that the credit spread should be fixed as of the date of an announcement of an IBOR being discontinued, regardless of whether that is prior to, or simultaneous with, the actual discontinuation of an IBOR.

The credit spread methodology ultimately selected may largely depend on the liquidity of the relevant RFR along the curve. If there is deep liquidity along the curve, the spread methodology would be relatively simple as the spread could be observed. However, if the RFR is illiquid or parts of the curve are illiquid, more thought on the spread methodology will be needed.

Term Rate

Equally complex as the selection of a credit spread methodology is developing a term rate for RFRs. While the IBOR rates are traded with tenors of one, three, six and 12 months, the RFRs are traded overnight. One early approach to develop the term rate was to observe and compound the overnight RFR over the tenor of the relevant IBOR. However, there is concern that the backward looking term rate based on compounded RFRs could have a negative impact on market participants that rely on forward-looking term fixing structure for cash flow management purposes. Other alternatives have not fully emerged or have been evaluated yet but several alternatives are being considered by various regulator-led working groups and industry trade associations. Despite these difficulties, ARRC is targeting end of 2021 as the date for a creation of a term reference rate based on SOFR derivatives²³.

Industry working groups, including ISDA's Benchmark Fallbacks Spread Calculation and Term Fixing Working Group, are actively working towards a solution to these issues. RBC is contributing towards these efforts along with other large market participants.

²² It should be noted that this issue only exists for existing contracts as the credit spread for contracts entered into after LIBOR and other IBORs are discontinued will be bilaterally negotiated among the parties.

²³ Second ARRC Report, page 17.

EUROPEAN UNION (EU) BENCHMARKS REGULATION

Related to but not to be confused with IBOR reform work is the EU Benchmarks Regulation (BMR). The BMR's goal is to improve governance on benchmark indices used in financial instruments, financial contracts and measurement of investment funds.

The BMR applies to “critical” benchmarks across products, including IBORs and alternative RFRs, when used within the

European Union. A benchmark is considered to be “critical” when the value of contracts underlying the benchmark is at least EUR500 billion or if a benchmark has been designated as critical in a Member State. LIBOR and EURIBOR have been designated as critical benchmarks. For further information on the BMR, please see Appendix B.

WHAT ARE THE NEXT STEPS?

2018 will be a busy year for interest rate benchmark reform work – the agenda is ambitious. Market solutions to transition legacy financial instruments, particularly, those with long terms (such as interest rate swaps with 30+ years terms) from referencing IBORs to RFRs are needed. Development of a credit spread methodology and a term rate for RFRs will also occupy many participants. RBC will continue to provide thought leadership and contribute to market solutions.

Our clients may wish to examine the IBOR exposures in their own portfolio, including existing fallback languages in their derivatives, loans, securitization and other financial contracts. ISDA has begun a survey to better understand usage of IBORs, the extent of the market's readiness to engage with the transition process across

various products, and better understand any additional challenges and possible solutions. We encourage our clients to participate in this survey and engage with us in these efforts.

SOFR will also begin being published on April 3, 2018 and could become the bellwether for determining if financial instruments referencing IBORs will be successfully transitioned to alternative RFRs. Already, the Chicago Mercantile Exchange (CME) has committed to launching monthly and quarterly SOFR futures in May. Market participants will be closely observing the liquidity in SOFR and derivatives that reference SOFR once they are published. Under a phased transition plan, trading in futures and/or bilateral, uncleared, overnight index swaps that reference SOFR is expected to begin in the second half of 2018.

APPENDIX A

SAMPLE OF EXISTING FALLBACK PROVISIONS FOR VARIOUS ASSET CLASSES²⁴

Product Type	Sample of Existing Fallback Provisions – In the event the reference rate was discontinued ²⁵
DERIVATIVES	<ul style="list-style-type: none"> Under the 2006 ISDA Definitions, if the specified rate source for USD LIBOR is not available, the calculation agent will request quotes from four banks in the London interbank market. If less than two quotes are given, the calculation agent will solicit quotes from major New York-based banks. The rate will be the arithmetic mean of the quotes given.
MORTGAGES AND CONSUMER LOANS	<ul style="list-style-type: none"> For mortgages, the mortgagee typically has ultimate authority to name a successor rate. Consumer loans are more varied, but provide similar flexibility to the lender.
FLOATING RATE NOTES (FRN)	<ul style="list-style-type: none"> Calculation agent appointed under the documentation must first poll a sample of banks for a fallback rate (first the European banks, and if no quotes are available, followed by the US banks). If quotes are not received, the note will convert to fixed-rate at the last published value of LIBOR. Most FRNs require unanimous consent of the noteholders to adjust these terms.
SECURITIZATIONS	<ul style="list-style-type: none"> Fallback provisions typically require a poll of banks for a fallback rate. If quotes are not received, then security will convert to fixed-rate at the last published value of LIBOR or the prime rate.
Agency Mortgage Backed Security (AMBS)	<ul style="list-style-type: none"> Agencies have the contractual right to name a successor rate.
Commercial Mortgage Backed Security (CMBS)	<ul style="list-style-type: none"> The CMBS can revert to the prime rate, but this could present basis risk. Changes to the reference rate require unanimous consent from investors.
Collateralized Loan Obligation (CLO)	<ul style="list-style-type: none"> CLO indentures are a particularly difficult set of contracts to amend as many such indentures require 100% vote of each class and majority of equity holders.
CORPORATE LOANS	
Bilateral Loans	<ul style="list-style-type: none"> Bilateral loans have the flexibility to be renegotiated by the borrower and the lender to include fallback provisions in case of permanent discontinuation of LIBOR.
Syndicated Loans	<ul style="list-style-type: none"> Syndicated loans typically require unanimous lender consent to amend their RATS (rate, amortization, term, and security/collateral) terms. However, syndicated loans are amended frequently and they are expected to have an easier transition than CLOs to the RFR.

²⁴ Please note that the above fallback provisions are provided for illustrative purposes only and are not comprehensive of all the possibilities in legal documentation. Please review your own documentation to fully understand your legal position if LIBOR and other IBORs are permanently discontinued.

²⁵ These provisions take effect in the event the reference rate was discontinued. Much of this information was taken from ARRC's analysis of fallback provisions, as presented at the November 2, 2017 ARRC roundtable. Materials are available at: <https://www.newyorkfed.org/arrc/meetings>.

APPENDIX B

EUROPEAN BENCHMARK REGULATION

Objectives	Scope	Categories of Benchmarks
<ul style="list-style-type: none"> ▪ Improve governance and controls over the benchmark process, in particular to ensure that administrators avoid and manage conflicts of interest. ▪ Improve the quality of input data and methodologies used by benchmark administrator. ▪ Ensuring adequate controls over benchmark contributors and the data they provide, in particular to avoid conflicts of interest. ▪ Protect consumers and investors through greater transparency and adequate rights of redress. 	<ul style="list-style-type: none"> ▪ Benchmark Administrators – the providers of indices that are used in financial instruments, mortgages, consumer credit agreements or investment funds. ▪ Supervised Contributors – the providers of input data for the purpose of benchmark determination. ▪ Benchmark Users – the providers of financial instruments, mortgages, consumer credit agreements or investment funds that reference an index. 	<ul style="list-style-type: none"> ▪ Critical Benchmarks – where the value of contracts underlying the benchmark is at least EUR500bn, or where a benchmark has been recognized as critical in an EU Member State. Note: both LIBOR and EURIBOR have been classified as critical benchmarks. ▪ Significant Benchmarks – where the value of contracts underlying the benchmark is at least EUR50bn, or where there are no or very few market-led substitutes and there would be an impact on financial stability if the benchmark ceased to be produced. ▪ Interest Rate Benchmarks – where the benchmark is determined on the basis of the rate at which banks may lend to or borrow from other banks or agents in the money markets. ▪ Other Benchmark Categories – Commodity Benchmarks, Regulated Data Benchmarks, Non-Significant Benchmarks.

GLOSSARY

Alternate Reference Rate Committee (ARRC)	ARRC is a US Federal Reserve led working group whose mandate includes preparing the US market to transition from USD LIBOR to SOFR.
Basel Committee on Banking Supervision (BCBS)	A forum for regulatory cooperation on banking supervisory matters. Its objective is to enhance understanding of key supervisory issues and improve the quality of banking supervision worldwide.
Bank of Canada	The central bank of Canada; its role is to formulate the country's monetary policy and to promote the economic and financial well-being of Canada.
Bank of England	The central bank of the United Kingdom (UK); its role is to regulate and supervise financial firms in the UK, as well as set monetary policy and maintain financial stability.
Canadian Dollar Offered Rate (CDOR)	CDOR, published by Thomson Reuters, is the average rate at which banks are willing to lend funds against issuance of bankers' acceptances (BAs) in the Canadian market. CDOR is a committed (i.e. executable) lending rate.
Canadian Overnight Repo Rate Average (CORRA)	CORRA is a secured, overnight and transaction-based rate. CORRA is a measure of the average cost of overnight collateralized funding.
Chicago Mercantile Exchange (CME)	CME is the largest financial and commodity derivatives exchange in the US.
Euro Interbank Offered Rate (EURIBOR)	EURIBOR, published by the European Money Markets Institute, is the reference rate based on the average interest rate at which banks can borrow on an unsecured basis in the Euro interbank market. EURIBOR is quoted in eight maturities ranging from one week to 12 months.
Financial Conduct Authority (FCA)	The financial conduct regulator in the UK; it regulates financial firms that provide services to consumers, including banks, mutual societies and financial advisers.
Financial Stability Board (FSB)	An international body that monitors and makes recommendations about the global financial system. Its mandate is to promote international financial stability.
Interbank Offered Rates (IBORs)	IBORs are interest rates at which banks can borrow in the interbank market. IBORs have a term rate ranging from overnight to 12 months. IBOR rates are determined based on quotes submitted by a panel of banks. The major IBORs include CDOR, LIBOR, EURIBOR and TIBOR.
International Organization of Securities Commissions (IOSCO)	The international body that brings together the world's securities regulators and is recognized as the global standard setter for the securities sector. IOSCO develops, implements and promotes adherence to internationally recognized standards for securities regulation.
International Swaps and Derivatives Association (ISDA)	A trade organization that represents participants in the market for over-the-counter derivatives. It represents over 875 members from 68 countries. ISDA's membership comprises a broad range of derivatives market participants that include banks, corporations, investment managers and governments.

London Interbank Offered Rate (LIBOR)	LIBOR, published by the ICE Benchmark Administration, is the reference rate based on the average interest rate at which banks can borrow on an unsecured basis in the London interbank market. LIBOR is the most widely used IBOR. LIBOR is quoted in five currencies: British Pound Sterling (GBP), US Dollar (USD), Euro (EUR), Swiss Franc (CHF) and Japanese Yen (JPY). LIBOR is quoted in fifteen maturities ranging from overnight to 12 months.
Risk Free Rates (RFRs)	The RFRs are alternative interest rate benchmarks that have been selected to replace IBORs. These rates are based on actual transaction data, instead of quotes from a panel of banks. The characteristics of individual RFRs vary from jurisdiction to jurisdiction.
Secured Overnight Financing Rate (SOFR)	The RFR selected by the US to replace USD LIBOR. SOFR is a secured, overnight, and transaction-based rate. SOFR encompasses multiple repo market segments. It is expected to be published starting on April 3, 2018.
Sterling Overnight Index Average (SONIA)	The RFR selected by the UK to replace GBP LIBOR. SONIA is an unsecured, overnight, and transaction-based rate. It is expected to be published starting in April 2018.
Swiss Average Rate Overnight (SARON)	The RFR selected by Switzerland to replace CHF LIBOR. SARON is a secured, overnight, and transaction-based rate. It reflects interest paid on interbank overnight repo transactions.
Tokyo Interbank Offered Rate (TIBOR)	TIBOR, published by the Japanese Bankers Association, is the reference rate based on the average interest rate at which banks can borrow on an unsecured basis in the Japan interbank market. TIBOR is quoted in six maturities ranging from one week to 12 months. There are two forms of TIBOR rates: Japanese Yen TIBOR rate (reflecting rates in unsecured call market) and Euroyen TIBOR rate (reflecting rates in offshore market).
Tokyo Overnight Average Rate (TONA)	The RFR selected by Japan to replace TIBOR and JPY LIBOR. TONA is an unsecured, overnight and transaction-based rate. It reflects the uncollateralized overnight call rate market.

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