The LIBORious Transition to SOFR

A year after Andrew Bailey's 2017 speech, he reiterated that firms should treat the discontinuation of LIBOR as an event that *will* happen and that they should be preparing for it. For my part, that's also the message I would ask you to take away today. You can think of this as a call to arms or as a threat or as simply a warning. What's important is that you act on it. – *Michael Held, Executive Vice President and General Counsel, New York Federal Reserve Board, Remarks at the SIFMA C&L Society February Luncheon* https://www.newyorkfed.org/newsevents/speeches/2019/hel190226

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The purpose of this publication is to provide a high-level overview of the transition from London Interbank Offered Rates to alternative reference rates, including a discussion on what the industry is doing and challenges the industry is facing. In addition, this publication will provide information on BMO resources that can help you through this transition. For more information please contact BMO's IBOR Transition Office at IBOR.TransitionOffice@bmo.com.

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Executive Summary

The transition from London Interbank Offered Rates (LIBORs) to alternative, nearly risk-free rates (RFRs) poses an unprecedented challenge for the entire financial services industry. Working groups across the globe have spent the last few years conducting extensive analysis to identify, adopt, and publish RFRs.

The work effort gained traction in July 2017 when the U.K. Financial Conduct Authority (FCA) announced it would no longer compel banks to contribute to LIBOR after 2021. With the end of 2021 now less than three years away, it has become increasingly clear that the transition from industry reliance on LIBOR is inevitable.

LIBORs serve as the benchmark for over US$370 trillion in financial transactions worldwide; as such the transition from LIBORs to RFRs is more far reaching than other major regulatory changes in the financial industry. There are many challenges to a transition of this magnitude. Besides the sheer number of transactions that need to be transitioned, major challenges include:

- significant differences between LIBORs and RFRs make the transition especially complicated;
- most financial firms will need to switch to the new rates across multiple products, requiring coordination with customers and vendors;
- market liquidity in the new RFRs needs to grow before the industry can confidently rely on them; and
- regulators are trying to collaborate with the industry instead of mandating the transition.

Given the degree of uncertainty and complexity, the LIBOR transition will be one of the (if not the) biggest transformations undertaken by the financial services industry.

Interest rate benchmark reform and the transition away from LIBORs to RFRs will impact BMO's clients across many asset classes, including derivatives, mortgages, loans (commercial and consumer), floating rate notes, securitizations, bonds, and repurchase agreements. BMO has established an IBOR Transition Office to manage the transition work effort and to prepare BMO and our clients for the industry and regulatory changes that will follow.

The purpose of this publication is to provide the most up-to-date information as the industry transitions from LIBORs to RFRs and to ensure BMO's clients stay informed of the industry transition efforts. While this publication focuses on the transition from LIBORs to RFRs, it also discusses other Interbank Offered Rates.

Background

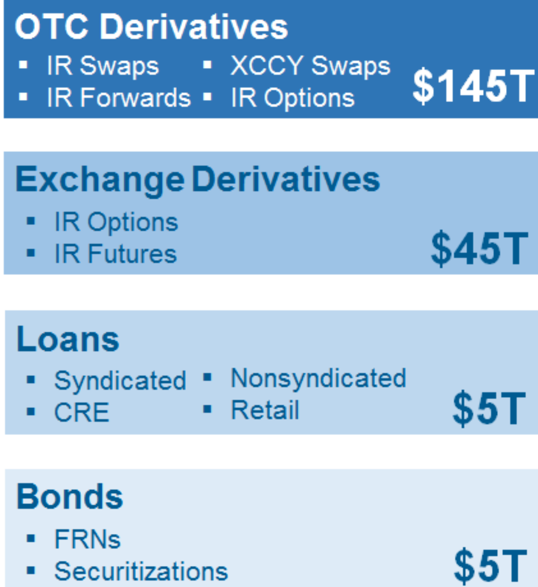
What is the London Interbank Offered Rate?

LIBOR, often referred to as the "world's most important number," is the interest rate at which banks can borrow in the interbank market on an unsecured basis. It is the most widely-used and most well-known interest rate benchmark, and is calculated based on submissions from individual panel banks.[1] LIBOR is published daily in five currencies (British Pound Sterling (GBP), U.S. Dollar (USD), Euro (EUR), Swiss Franc (CHF) and Japanese Yen (JPY)) and seven maturities (overnight, one week, one month, two months, three months, six months, and one year). While the main focus of this publication is on LIBOR, we will also touch on other benchmarks impacted by the transition, including: the Tokyo Interbank Offered Rate (TIBOR), the EUR Interbank Offered Rate (EURIBOR), and the Canadian Dollar Offered Rate (CDOR).

How Pervasive is LIBOR?

LIBOR, first published in 1986, has become embedded in financial products from derivatives, bonds and mortgages to consumer and commercial loans. In addition to serving as the benchmark for financial products worldwide, LIBOR is used in risk management, valuation models, accounting, and as a benchmark in funding costs. *See Figure 1 for additional information on the estimated USD LIBOR market footprint as published by the Federal Reserve's Alternative Reference Rates Committee (ARRC).*

Figure 1: USD LIBOR Footprint



Why is LIBOR going away?

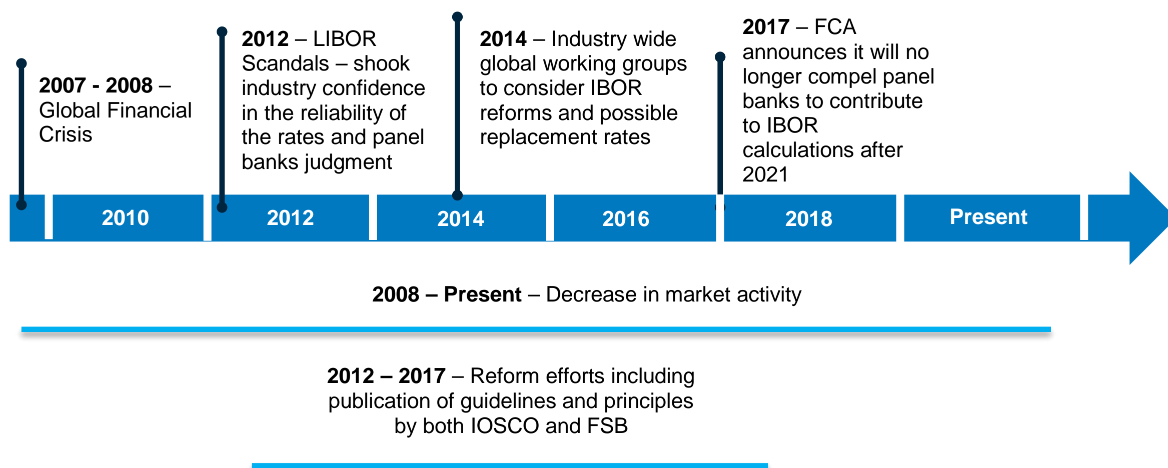
LIBOR's sustainability and integrity have increasingly been called into question for two reasons: (1) a decline in the interbank unsecured funding market has led to a lack of actual transaction data upon which to calculate the rates; and (2) the ease with which it has been manipulated, most notably during the 2012 LIBOR scandals, has led to a deterioration of the confidence in the rate setting process.

Unsecured wholesale borrowing by banks has been steadily declining since the 2008 financial crisis. Much of this decline can be attributed to changes in the regulatory landscape, specifically regulations which require banks to be funded by long-term debt instead of short-term debt (typically seen in the interbank unsecured funding markets). As a result, LIBOR is increasingly based on the expert judgment of panel banks instead of actual transaction data, contributing to the ease with which the rate has been manipulated.

[1] Panel banks are the banks that contribute data for the daily calculation of IBOR benchmarks.

In 2012, several large panel banks colluded to manipulate LIBOR for their own benefit. The LIBOR scandals prompted global regulatory reform to rebuild the public's trust in these rates. Between 2012 and 2017, LIBOR and other benchmarks, have been subjected to numerous reform efforts to improve their reliability and robustness, including through the incorporation of more transactional data into the rate setting. Despite these reform efforts, the absence of activity in the underlying markets raised serious questions about the sustainability of these benchmarks.

FIGURE 2: Key Factors Contributing to LIBOR's Demise



When is LIBOR going away?

The FCA likely sealed the fate of the once-dominant benchmark with Andrew Bailey's announcement on July 27, 2017 that the FCA would no longer compel panel banks to submit quotes for LIBOR after the end of 2021. This declaration by the FCA made it clear that reliance on LIBOR could no longer be assured beyond this date. The exact date of LIBOR's demise, however, is not yet known. While regulators have made it clear banks need to start transitioning and treat this as a certainty not a possibility, the transition and timeline are not set out in legislation.

> ***"If you find yourself in a hole, stop digging.***
>
> ***What market participants must do right now is stop writing new contracts on LIBOR and start using SOFR or at least another robust alternative."***
>
> Michael Held, Executive Vice President and General Counsel, Fed NY.

There are several scenarios under which the end of LIBOR may occur. One obvious scenario would be a definitive announcement from the FCA that LIBOR will be discontinued. This could potentially lead to an abrupt discontinuance of LIBOR and may leave some firms scrambling to find alternatives.

In addition to being discontinued, LIBOR may continue to be referenced in legacy contracts but no longer supported (often referred to as "Zombie LIBOR"). This particular scenario has been the subject of many regulatory conversations and public speeches by industry officials. Zombie LIBOR would exist where LIBOR remains available but is rendered unstable, potentially forcing the transition away from LIBOR before the much discussed deadline of the end of 2021.

In a speech at the 2018 Financial Stability Conference, CFTC Chairman J. Christopher Giancarlo emphasized the importance of transitioning not just new derivatives and securities from LIBOR but also legacy trades. Similarly, in a speech earlier this year, Michael Held, executive Vice President and General Counsel of the Federal Reserve Bank of New York, raised the question "what if LIBOR was nominally available, but the UK FCA used its supervisory power to declare that LIBOR is unrepresentative of the

underlying market?"[3] He continued by urging market participants to consider all situations in which LIBOR would cease to exist and be prepared rather than get caught in the eye of the storm. Held emphasized the need for firms to consider fallback language and fallback triggers in their contracts.[4]

In the same vein, the FCA's Megan Butler, in a speech at the Investment Association in London, highlighted many reasons why firms may seek to transition to the new RFRs whose availability can be assured. In her speech, she emphasized "that liquidity in LIBOR markets may not be sustained".[5]

"Legacy trades can continue to reference LIBOR – what is already being called 'Zombie LIBOR' – but imagine the havoc that will be caused in the marketplace if exchanges de-list their contracts, if CCPs cannot accept new swaps for clearing – the whole ecosystem developed to support efficient risk transfer in our global markets will be in disarray. Hence, it is critical that legacy positions too move from LIBOR.

CFTC Chairman J. Christopher Giancarlo before 2019 Financial Stability Conference, Federal Reserve Bank of Cleveland, Office of Financial Research, Washington, D.C. – *November 29, 2018*

[3] Michael Held, Remarks at the SIFMA C&L Society February Luncheon, New York City; February 26, 2019 - https://www.newyorkfed.org/newsevents/speeches/2019/hel190226

[4] Fallbacks are contractual provisions that describe alternative ways to determine the benchmark rate for financial products between parties if LIBOR were to be discontinued. In legacy contracts, for instance, alternative language exists which is intended to address any temporary unavailability of LIBOR (e.g. computer glitch). As a complete LIBOR cessation is expected, industry groups are working to amend the fallback language to explicitly contemplate the permanent discontinuance of LIBOR.

[5] Megan Butler, Speech delivered at the Investment Association, London; February 21, 2019 - https://www.fca.org.uk/news/speeches/ending-reliance-libor-overview-progress-made-transition-overnight-risk-free-rates-and-what-remains

What's Next? Alternative Risk-Free Rates

Regulators, together with market participants, recognizing the broad legal, accounting, and marketing challenges, have channeled their efforts into three main pillars that will facilitate the migration away from LIBOR. Their efforts have focused on 1) devising robust and nearly risk-free reference rates that will act as fallbacks in different scenarios of LIBOR discontinuation, 2) enhancing the fallback language for new contracts, and 3) determining appropriate conventions on handling legacy contracts. Regulators and global industry working groups have spent the last few years focusing on identifying RFRs derived from transactional data to serve as eventual LIBOR replacements. Jurisdictions around the globe have since selected RFRs based on transactions in overnight funding markets. This publication will focus on the U.S. alternative rate, the Secured Overnight Financing Rate (SOFR) and work efforts in Canada to enhance the Canadian Overnight Repo Rate Average (CORRA). *See Figure 3 for a full list of RFRs by jurisdiction; see also Appendix E for information on the other RFRs.*

Figure 3: RFRs by Jurisdiction

Jurisdiction	Existing IBOR	RFR	Secured/ Unsecured	Underlying Transactions
CAN	CDOR[6]	Enhanced CORRA	Secured	Repos
U.S.	USD LIBOR	SOFR	Secured	Repos
EU	EURIBOR, EONIA, EUR LIBOR	ESTER	Unsecured	Money Markets
SUI	CHF LIBOR	SARON	Secured	Repos
JPN	JPY LIBOR	TONAR	Unsecured	Money Markets
UK	GBP LIBOR	Reformed SONIA	Unsecured	Money Markets

U.S. – Secured Overnight Financing Rate

The Federal Reserve Board and the Federal Reserve Bank of New York jointly convened the ARRC in 2014 to address the risks related to USD LIBOR and identify a risk-free alternative rate. In June 2017, the ARRC identified SOFR as the replacement benchmark rate for USD LIBOR. SOFR, which was first published by the New York Fed on April 3, 2018, measures the cost of overnight borrowings through repo transactions collateralized by U.S. Treasury securities. It is a volume-weighted median of three types of repo transactions: (1) tri-party GC repo, (2) GCF repo, and (3) FICC-cleared bilateral repo (all transactions with rates below the 25th volume-weighted percentile rate within this data set will be removed, to reduce the impact of exceptions or abnormal trading activity on SOFR).

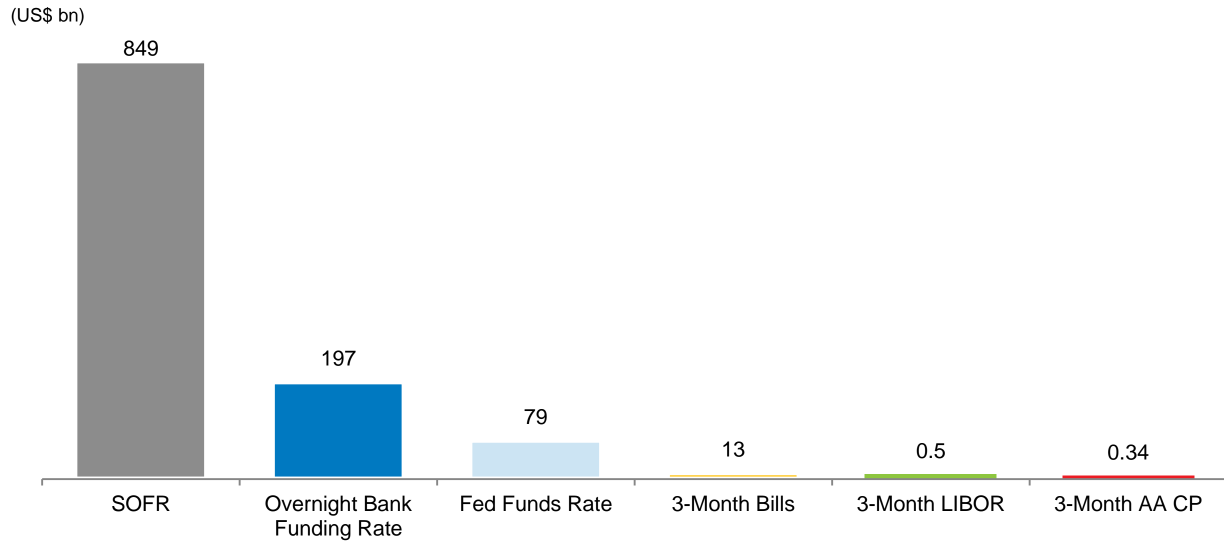
ARRC's decision to select SOFR was underpinned by the rate's compliance with the International Organization of Securities Commissions' (IOSCO) benchmark principles, but more importantly by its liquidity and resilience to manipulation and market uncertainties. SOFR is a very liquid rate with over $840 billion of daily repo transactions underpinning it - dwarfing the current volumes underlying LIBOR.[7] *See Figure 4 for more information on comparative daily volumes.* In addition, SOFR's clear and robust composition makes it a transparent rate that is representative of the market across a broad range of market participants and protects it from attempts at manipulation.[8] As the U.S. Treasury repo market is large and well established, SOFR is well-grounded and is not at risk of disappearing.

[6] CDOR is unlike IBORs in other jurisdictions as it is not quotation-based. There currently is no timeline for its cessation.

[7] Second Report of the Alternative Reference Rates Committee, https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2018/ARRC-Second-report

[8] ARRC Website https://www.newyorkfed.org/arrc/sofr-transition

Figure 4: Average Daily Volumes in U.S. Money Markets



Source: Federal Reserve, FINRA, DTCC Solutions, SOFR is from Inception to May 31, 2019

The ARRC, upon selecting SOFR as the replacement for USD LIBOR, published a "Paced Transition Plan"[9] which provides structure and timelines around the transition efforts. Key developments to date on the SOFR front include:

- SOFR futures are now traded on Chicago Mercantile Exchange (CME) and Intercontinental Exchange (ICE)
- CME and LCH have begun to clear SOFR swaps
- SOFR issuances have been strong in the front end of the curve with Government Sponsored Enterprise (GSE) like the Federal Home Loan Bank and Federal Home Loan Mortgage Corporation leading the way

[9] ARRC, Transition from LIBOR – https://www.newyorkfed.org/arrc/sofr-transition#pacedtransition

SOFR Issuances

Since the Federal Reserve Bank of New York began publishing SOFR in April 2018 there have been 115 SOFR-linked notes issued. The current outstanding notional is US$ 94 bn. Reiterating the market's faith in SOFR, floating rate note (FRN) issuances have been strong, with a recent trend of longer-dated notes being issued by entities like the Federal Home Loan Banks (2Y) and L-Bank (3Y). BMO has been actively contributing to SOFR issuances with two deals so far this year. In February, BMO underwrote a US$50 mm SOFR MTN for the African Development Bank (reopening) and in March BMO was the joint-lead on the longest SOFR-linked note issued to date, a US$500 mm 3Y L-Bank FRN. Sovereigns, Supranationals and agencies (SSAs) represent US$79 bn of the total and the Federal Home Loan Banks (FHLB) has been the most active issuer with US $47 bn of SOFR-linked issuances. Spreads have varied depending on the issuer type, with financials being on the high end and GSE issuers on the low end. *Figure 5 shows SOFR issuances to date by month and issuer type.*

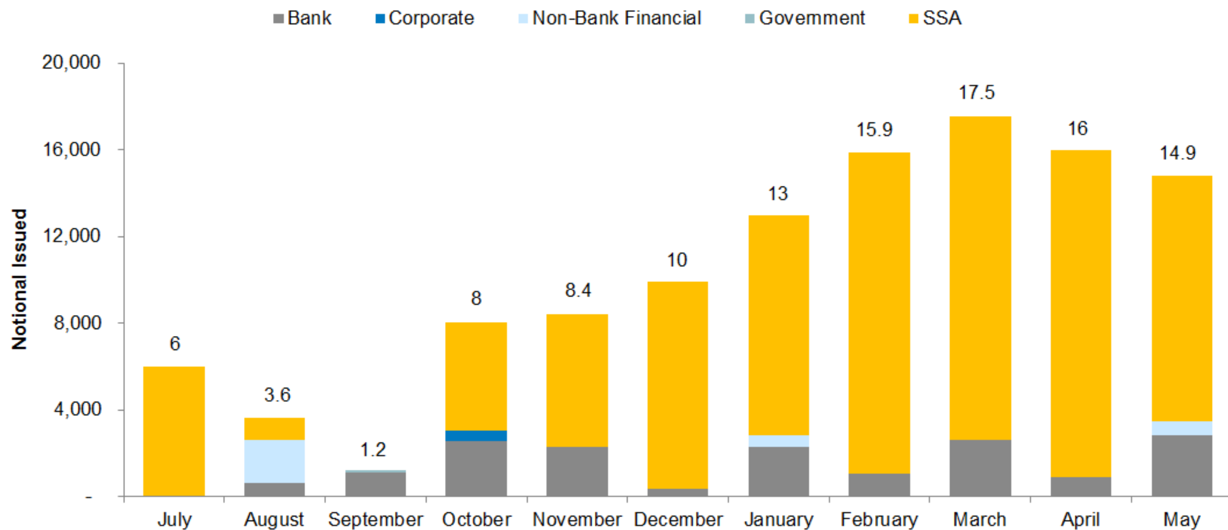
BMO SOFR ISSUANCES

11 February 2019 – BMO underwrote a US$50 mm SOFR MTN for the African Development Bank

5 March 2019 – BMO was the joint-lead on the longest SOFR-linked note issued to date – a US$ 500 mm 3Y L-Bank FRN

Figure 5: SOFR Issuance

US$ bn as at 31 May 2019



Difference between SOFR and LIBOR

One major challenge that cannot be overlooked is the differences between SOFR and LIBOR. SOFR, should not be considered a direct substitute of LIBOR as it will not be exactly equivalent. Understanding the fundamental differences between the two is important. Key differences that will need to be addressed before the industry can fully transition to SOFR include the lack of a SOFR term structure and the need to add a credit adjustment mechanism. In addition, there are differences between each jurisdiction's chosen RFR that might prohibit organic development of markets in tandem. *See Figure 6 for a list of key differences.*

Figure 6: Key Differences Between LIBOR and SOFR

	LIBOR	SOFR
Transparency	Lack transparency	Transparent
Calculation	Consensus – based; based on expert judgment	Based on real transactional data
Liquidity	Low liquidity	High liquidity
Structure	Forward-looking rate with a term structure already in place	Backward-looking rate with term structures in progress
Credit. Component	Built-in credit component	Historical credit adjustment will need to be added
Jurisdictional Consistency	Easy to understand and compare with other jurisdictions	Not easy to compare with RFRs in other jurisdictions
Inception Date	LIBOR has been available since the 1980s	SOFR has been available since 3 April 2018

Canada – Enhanced CORRA

In Canada, there are currently two benchmarks referenced in a majority of financial instruments: (1) the Canadian Dollar Offered Rate (CDOR) and (2) the Canadian Overnight Repo Rate Average (CORRA). CDOR is the average rate at which banks are willing to lend funds against the issuance of bankers' acceptances (BAs). Currently it is referenced by several financial and derivative contracts including: interest rate swaps (IRS), floating rate agreements (FRAs), basis swaps, floating rate notes (FRNs), BAs, and BA futures. CDOR differs from other global interbank benchmarks in that it is the rate at which banks are willing to **lend** funds against issuance of BAs. IBORs, on the other hand, are the rate at which banks are willing to **borrow** funds in the interbank market.

CORRA is the volume-weighted average rate of overnight repo transactions conducted on-screen through designated inter-dealer brokers and involving general Government of Canada collateral. CORRA broadly reflects overnight funding rates but is based on a relatively small number of general collateral repo transactions conducted through inter-dealer brokers.[10]

In March 2018, the Canadian Alternative Reference Rate (CARR) working group was launched by the Canadian Fixed-Income Forum. CARR was tasked with enhancing CORRA and evaluating whether there was a need to develop a Canadian dollar term RFR benchmark. CARR tasked the Alternative Rates Subgroup with reviewing available options and making a formal recommendation. In July 2018, the Alternative Rates Subgroup recommended that the focus should be on enhancing the current CORRA benchmark, specifically focusing on creating a larger set of transactions upon which to base CORRA's daily calculation. CARR agreed with the subgroup's recommendation and further recommended that enhanced CORRA be based on all available overnight repo transactions that use Government of Canada bonds and treasury bills as collateral, including both inter-dealer and dealer-to-client trades, but excluding inter-affiliated trades. In addition, CARR recommended enhanced CORRA be based on the trimmed median repo rate of daily transactions, computed after removing the lower volume-weighted 25% of transactions by repo rate.

[10] Bank of Canada, Consultation Paper – Enhancements to CORRA, https://www.bankofcanada.ca/wp-content/uploads/2019/02/consultation-paper-proposed-enhancements-to-corra.pdf

Challenges

While considerable progress has been made in laying the groundwork for adopting SOFR and other RFRs, it is clear that many challenges remain. In addition to the challenges that exist due to the differences between SOFR and LIBOR highlighted above, the industry is facing a number of additional obstacles and must consider how to address these before the transition can be complete. Challenges include, but are not limited to:

(1) identifying and addressing legacy contracts extending beyond 2021;
(2) updating standard contract language to account for the change in rates and new fallback language;
(3) hedging implications due to a lack of consistency in fallback language referencing different or new rates;
(4) potential accounting issues;
(5) significant impacts to risk functions including models and validation processes; and
(6) operations and technology issues that may result from required system enhancements.

See Appendix B for additional details around the challenges the industry faces.

Industry Work Effort

Industry associations and working groups have taken solid steps to facilitate the transition and address the numerous challenges the industry faces. Several groups, including ISDA, ARRC and CARR, have sought input from market participants through consultations and have published proposed solutions. The consultations have attempted to address issues around fallback rates, calculation methodologies, and fallback language. In particular, ISDA plans to incorporate fallback provisions into its 2006 Definitions and ARRC has published fallback language for floating rate notes, syndicated loans, securitization, and bi-lateral loans.

In addition, industry financial boards, including FASB[11] and IASB[12], are looking at how to address accounting standards to accommodate the new rates. FASB now includes SOFR OIS rate as a benchmark interest rate for hedge accounting purposes and IASB is seeking public comment on proposed changes to the old and new financial instrument standards.

Cash Market is Key

The cash market is key to this transition. While participants in the derivatives markets have substantial experience with overnight index swaps (OIS) referencing overnight rates such as the effective federal funds rate (EFFR), making the transition from LIBOR to SOFR in new interest rate derivatives relatively straightforward, the transition for cash products will prove more challenging. Transitioning cash products referencing LIBOR will require new SOFR term rates tied to liquid markets. 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 SOFR over the given term period. The ARRC is currently exploring various methodologies to develop a forward-looking term rate.[13] In the event that term rates are not available, cash products will likely fallback to an overnight rate (SOFR) in the event LIBOR is discontinued, a concept that is completely new to cash market participants. In addition to needing new term rates, cash products will face the challenge of identifying and incorporating updated fallback language into all impacted contracts.

[11] FASB - https://www.fasb.org/jsp/FASB/FASBContent_C/NewsPage&cid=1176171490795

[12] IASB - https://www.ifrs.org/projects/work-plan/ibor-reform-and-the-effects-on-financial-reporting/

[13] Federal Reserve, Indicative Forward-Looking SOFR Term Rates, https://www.federalreserve.gov/econres/notes/feds-notes/indicative-forward-looking-sofr-term-rates-20190419.htm

Conclusion

BMO is positioned to lead our clients through the transition to a post-IBOR environment. BMO established an IBOR Transition Office to lead and coordinate transition efforts for the bank, and ensure BMO stays engaged with various industry work efforts.

BMO is working alongside industry groups and participating in all relevant consultations but many issues remain unresolved. To date, BMO has participated in eleven industry consultations and has responded to two industry surveys. BMO will continue to participate in applicable consultations as they become available. *See Appendix C for a summary of consultations.*

Clients are urged to evaluate their portfolios for IBOR exposure across the various financial products and contracts that they currently hold. They should be prepared to amend contracts that will exist beyond 2021. Clients must consider tax and accounting issues, particularly as they relate to valuation changes.

While the breadth of the change is wide-reaching, by working in collaboration with our clients, BMO expects that we will be able to successfully move forward together. Should clients have questions about whether the positions and product mix they currently hold will continue to achieve their objectives in the reformed rate environment, they are encouraged to engage with their BMO contact to discuss the best approach going forward.

BMO has developed educational resources to prepare for the transition. Resources include:

- Materials on new alternative reference rates
  - SOFR – the IBOR Transition Office, in coordination with the BMO FICC Macro Strategy team, has compiled several pieces on SOFR, including in-depth information on the various calculation methodologies
  - SONIA and ESTER – overview of the UK and European alternative reference rates, compiled by the IBOR Transition Office
- Frequently Asked Questions – high-level and detailed answers to some of the most common IBOR transition questions
- BMO FICC Macro Strategy Team's SOFR Publications – a new SOFR piece is published every two weeks. To date, the following pieces have been published
  - ISDA Adjustment Methodology for IBOR – overview of the ISDA Fallback Methodology Consultation and description of the calculation methodology applied to SOFR
  - Do Lookout Periods Matter for SOFR Floaters? – discussion of the trend in FRN issuance for a lockout period to handle the compound setting in arrears
  - SOFR Bank Yield Index – overview of the introduction of the ICE Bank Yield Index, a proposed alternative to SOFR

Please reach out to your BMO contact or BMO's IBOR Transition Office (IBOR.TransitionOffice@bmo.com) for more information.

Further guidance and updates will be provided as industry accord emerges and next steps come into focus.

Appendices

Appendix A – Estimated USD LIBOR Market Footprint by Asset Class[14]

		Volume (Trillions US$)	Percentage Maturing By:			
			End 2021	End 2022	After 2030	After 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 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 (incl. CMOs)	1	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%**

[14] Second Report of the Alternative Reference Rates Committee (March 2018): https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2018/ARRC-Second-report

Appendix B – Key Challenges and Considerations

Challenges	Considerations
Identifying and managing legacy contracts with IBOR exposure	• Current fallback provisions only address the temporary unavailability of LIBOR • ISDA and other industry working groups are drafting updated fallback language • Renegotiation of each contract and legal agreement referencing LIBOR may be required along with amendments to reference RFRs and updated fallback language • Industry flexibility in amending interest rate determination provisions will be needed
Negotiating new contracts and financing	• Structural differences between the two rates and how they are set (e.g. overnight RFR v. term IBORs; secured v. unsecured); minimizing the valuation impact on the contracts will be important • New benchmark rate has not been set, so firms can't specify the use of future RFRs
Funding and liquidity management- need broad adoption from market	• Issuances have begun to slowly increase – new issuances have incorporated revised fallback language, and there has been expressed interest for issuances pegged to SOFR and SONIA • Fund transfer pricing assumption may need to be revised (i.e. transfer pricing methodology may use 1 month LIBOR or CDOR)
Additional credit spread	• IBORs have a credit spread embedded into the rate to reflect the risk that the borrowing bank could default (RFRs do not have this risk) • Developing methodology is complex because some RFRs are secured while others are unsecured • Market participants will now get a rate, plus basis points, plus a credit spread
Term structure for RFRs	• LIBOR traded with tenors of 1, 3, 6 and 12 months while RFRs are traded overnight • The market is looking for term structure in the new rates • Methodology will take time to develop and term rates may not be available until 2021
Hedge effectiveness	• Lack of consistency in defining a LIBOR cessation and fallback will likely lead to gaps in hedging portfolios
Hedge accounting	• Rate substitution in a derivatives contract at time of IBOR cessation could be interpreted from current accounting standards as "de-designation", essentially disqualifying from use of hedge accounting • FASB board in October 2018 updated hedge accounting guidance to allow SOFR to be considered a benchmark rate to qualify for hedge accounting • Proposed amendments to accounting standards would provide relief to companies • Finalized amendments are expected to be published at the end of 2019
Debt modification	• U.S. GAAP principles dictate that upon modification, loan or debt arrangements are subject to 10 percent test; comparing cash flows of the existing arrangement with the cash flows of the new arrangement • If cash flows are within 10 percent of each other, it is considered as a modification of an existing arrangement; otherwise treated as a new arrangement • Given LIBOR is so pervasive, its end could mean analyzing millions of loan agreements to determine if successor benchmarks alter terms significantly enough to constitute a new arrangement
Differences in RFRs pose challenges to cross-currency swaps market	• Differences in methodologies on how RFRs are calculated (i.e. secured vs unsecured) could create additional basis risks • Timing differences between the development of RFR-based derivatives markets in various currencies could have additional implications for cross-currency positions • The structural requirements of each new RFR must evolve, including term structure, liquidity and underlying product growth
Operations and technology	• Various system changes will be required to enable systems to incorporate new interest curves, volatility surfaces, as well as adjustments to the valuation methods • Increased operational risk management will be required to ensure there is heightened sensitivity for errors through controls/validation mechanisms

Appendix C: Summary of Industry Consultations

Consultation	Purpose	Majority Response[15]	Industry Group's Plan
ISDA Consultation on Fallbacks	Solicit market feedback on adjustments that could be made to a number of major currency RFRs so that they could serve as suitable fallbacks for certain IBORs referenced in derivatives contracts.	A majority of market participants preferred the compounded setting in arrears approach to creating an adjusted RFR and the historical mean/median approach to replicate the bank credit spreads implied in the IBORs.	ISDA plans to incorporate these fallback provisions into its 2006 Definitions and will likely sponsor a protocol process for amending legacy transactions.
ARRC FRN Consultation	Solicit market feedback on proposed fallback language for new LIBOR issuances of FRNs including fixed-to-floating rate notes during the floating rate period.	Market participants preferred the inclusion of some pre-cessation triggers, but expressed concern about misalignment between terms of FRN and derivative documents.	ARRC has recommended fallback language (triggers, waterfall) to be used when LIBOR permanently ceases or is no longer representative.
ARRC Syndicated Loan Consultation	Solicit market feedback on fallbacks language for Syndicated Loan agreements.	Market participants preferred a hardwired approach, noting the difficulty in implementing the amendment approach. A forward-looking term rate was also preferred.	ARRC has recommended fallback language that offers two approaches: 1. Amendment Approach – allowing for periodic change and flexibility to agreements as language and benchmarks become more defined. 2. Hardwired Approach – provides certainty up front and the benchmark rate is explicitly defined.
ARRC Securitization Consultation	Solicit market feedback on proposed fallback language for new LIBOR-based securities issued in connection with securitizations (including collateralized loan obligations).	Market participants preferred inclusion of all four triggers: (1) unannounced stop to LIBOR; (2) change in the quality of LIBOR; (3) LIBOR is no longer representative; and (4) Asset Replacement Percentage is greater than 50%.	ARRC has recommended fallback language (triggers and waterfall) to be used when LIBOR permanently ceases or is no longer representative.
ARRC Bi-lateral Loan Consultation	Solicit market feedback on two proposed approaches to develop bilateral loan fallback language: the amendment approach and the hardwired approach.	A majority of market participants preferred the amendment approach at this time but would choose a hardwired approach because it allows orderly transition once SOFR-based rates are developed.	ARRC has recommended fallback language similar to syndicated loans with the addition of a third approach, the Hedged Loan Approach, which mirrors the ISDA 2006 definitions.
Working-Group on Euro RFRs	Solicit market feedback on determining ESTER-based term structure methodology as a fallback in EURIBOR-linked contracts.	Preliminary results indicate a majority of market participants favored a forward-looking term rate methodology as a fallback for EURIBOR, but considered OIS quotes-based methodology to be challenging yet feasible.	The working group has not yet made its final recommendations.
CARR Consultation on CORRA	Solicit market feedback on proposed, enhancements to CORRA.	The consultation has closed for comments.	CARR has not yet published the final results from this consultation.

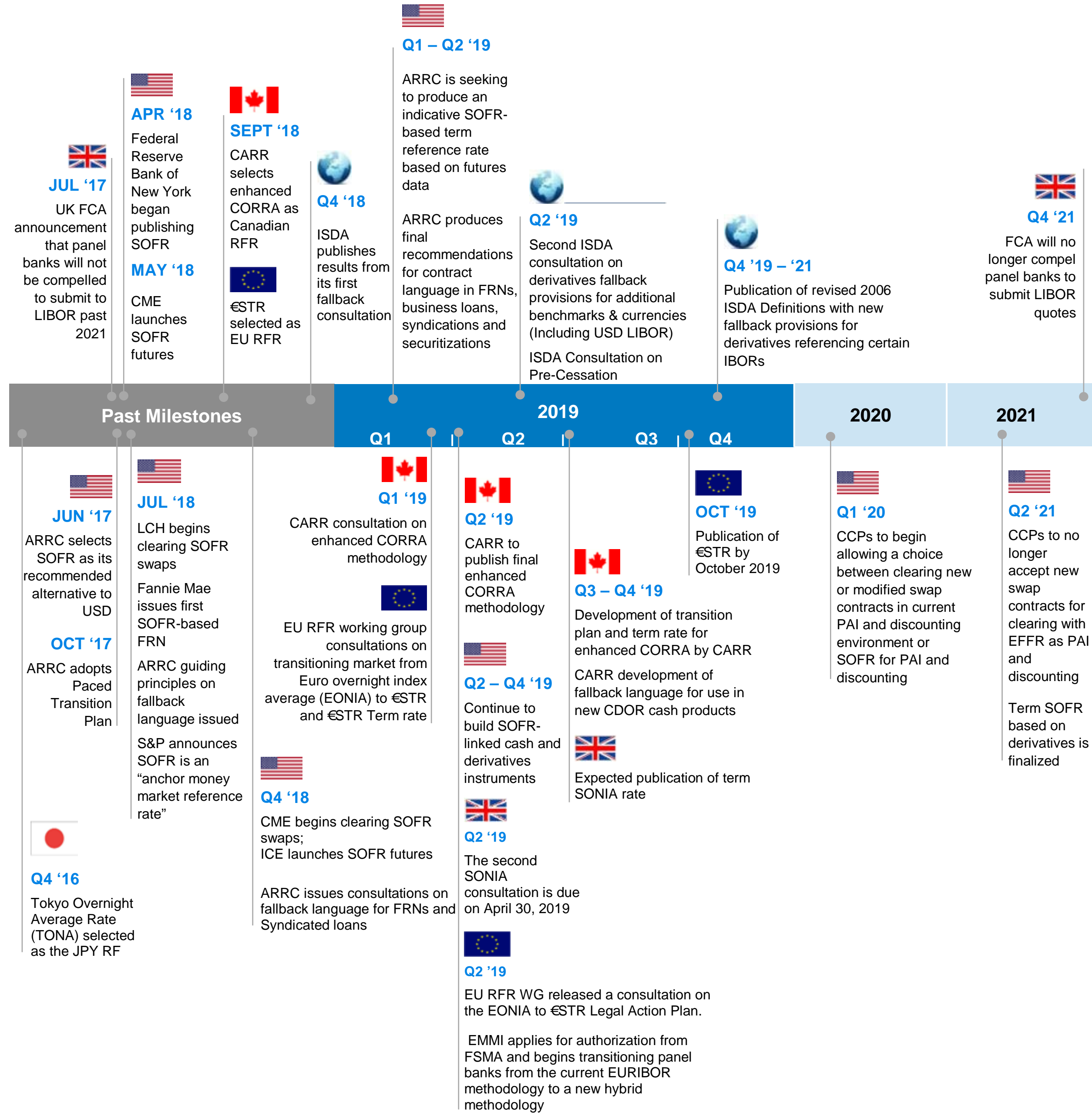
[15] These are industry participants' views as observed by BMO. More details can be found at:

ARRC - https://www.newyorkfed.org/arrc/fallbacks-contract-language

ISDA - http://assets.isda.org/media/04d213b6/db0b0fd7-pdf/

CARR - https://www.bankofcanada.ca/wp-content/uploads/2019/02/consultation-paper-proposed-enhancements-to-corra.pdf

APPENDIX D – Timeline of Past and Future IBOR Reform Milestones



APPENDIX E – Other Alternative Reference Rates

UK – Sterling Overnight Index Averages

The Bank of England's Working Group on Sterling Risk-Free Reference Rates selected the Reformed Sterling Overnight Index Average (SONIA) as the UK's alternative to Sterling LIBOR. SONIA is calculated as the weighted average rate of all unsecured overnight sterling transactions brokered in London by the Wholesale Markets Brokers' Association (WMBA). It has been in existence for some time and is more developed than SOFR. Daily volumes underpinning SONIA between July 2016 and March 2017 averaged GBP £40bn per day. In addition, SONIA has a well-established Overnight Indexed Swap (OIS) market with a daily average notional turnover of GBP £60bn as of Q1 2018.[16]

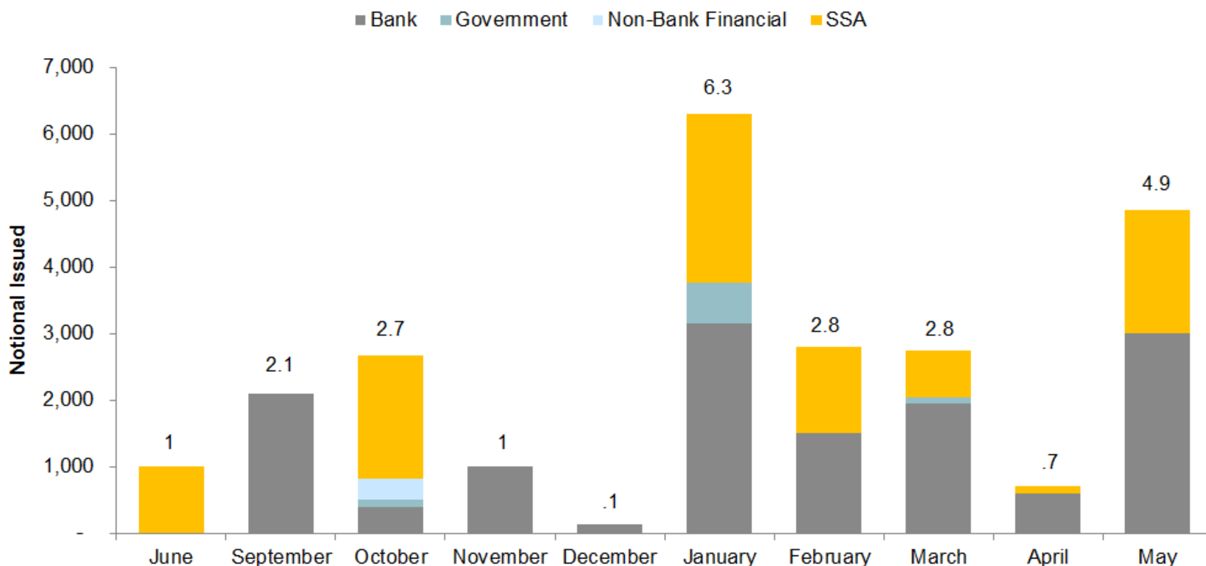
Key developments on the SONIA front to date:

- SONIA futures are traded on CME, ICE Europe, CurveGlobal and LCH
- SONIA bilateral and cleared swaps are actively traded on LCH
- SONIA linked notes continue to be issued as the cash market develops further. Issuers have included EIB, World Bank, Asian Development Bank, and Lloyds

As of May 31, 2019, the total SONIA issuances outstanding totaled GBP £ 24.6B. The most common tenors for SONIA issuances are 3Y and 5Y. Banks and SSAs continue to be the largest issuers of SONIA-linked notes, with banks comprising 54% of the total notional issued. See Figure 6 for additional information around SONIA issuances from June 29, 2018 through May 31, 2019.

Figure 6: SONIA Issuance

US$ bn as at 31 May 2019



Source: Bloomberg

[16] See Consultation on Term SONIA Reference Rates, July 2018.

Europe – EONIA & ESTER

Europe is a bit further behind in its progress to transition away from EURIBOR and EONIA. The European Central Bank (ECB), in September 2018, selected the Euro Short-Term Rate (ESTER) to replace EONIA and serve as the fallback rate for products linked to EONIA, EURIBOR and EUR LIBOR. ESTER will be a fully transaction-based rate, reflecting the wholesale euro unsecured overnight borrowing costs of euro area banks. The ECB has stated it will begin publishing ESTER by October 2019. However, in the interim the ECB has published “Pre-Ester” data back to March 2017.

Switzerland and Japan

Similarly, alternative reference rates have been identified for Swiss and Japanese markets that are based on actual transactions. In October 2017, the National Working Group on Swiss Franc Reference rates recommended the Swiss Average Rate Overnight (SARON) as the alternative rate. SARON is an overnight secured rate based on transactions in the Swiss Franc repo market. In Japan, the Study Group on Risk-Free Reference Rates identified the Tokyo Overnight Average Rate (TONAR) as its alternative rate. TONAR which was suggested in December 2016 is similar to SONIA in that it is an unsecured overnight rate.

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