IBOR Transition Overview

BMO IBOR Transition Office

Updated as of December 16, 2020

Background

Global Reform

- The Interbank Offered Rates (IBORs) have been a crucial element of the global financial services industry for more than 40 years.
- Transition working groups have been established in all major jurisdictions with each group selecting their own preferred alternative to their currency's IBOR (some jurisdictions are moving faster than others).
- The Financial Conduct Authority (FCA) plays a key international role as the regulator of ICE Benchmark Administrator which in turn is LIBOR's administrator.
- All IBORs under FCA's purview are slated to be replaced by RFRs; local benchmarks like CDOR and EURIBOR are also poised to be reformed to comply with the International Organization of Securities Commissions (IOSCO) benchmark standards and will exist in parallel with their respective RFRs until further notice.

Alternative Risk-Free Rates by Jurisdiction

Jurisdiction	Old Benchmark	RFR	Secured/ Unsecured	Underlying Asset	Publication Date
UK	GBP LIBOR	SONIA	Unsecured	Money Markets/Deposits	April 2016 (Reformed as of April 23, 2018)
US	USD LIBOR	SOFR	Secured	Repos	Published as of April 3, 2018
Euro Area	EURIBOR, EONIA, EUR LIBOR	€STR	Unsecured	Money Markets/Deposits	Published as of October 2, 2019
SUI	CHF LIBOR	SARON	Secured	Repos	Published as of August 25, 2009
JPN	JPY LIBOR	TONAR	Unsecured	Money Markets	Published late 2016
CAN	CDOR	Enhanced CORRA	Secured	Repos	Published as of June 15, 2020

Why is this Different than other Regulatory Reforms?

- Unlike other regulatory changes with defined rulemaking – IBOR transition is about changes to market structure and liquidity.
- Regulators are asking the market to adapt to the transition before any rules or guidelines are available.
- Jurisdictional nuance – some jurisdictions are multi-rate and RFRs will vary by jurisdiction; different administrators and different timelines for cessation.

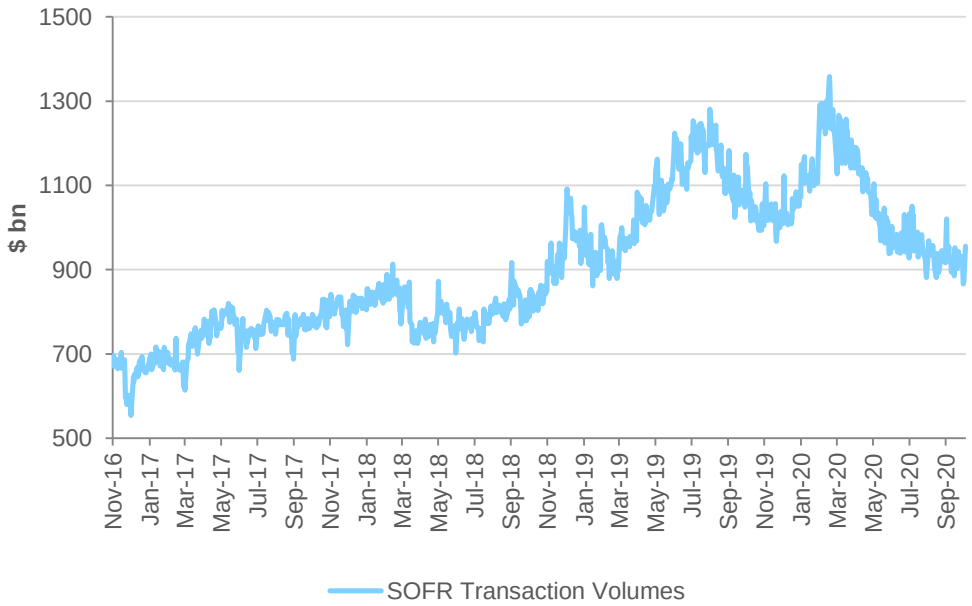
SOFR Introduction

The Secured Overnight Financing Rate (SOFR) is an overnight, secured reference rate administered by the New York Fed that broadly measures the cost of borrowing cash overnight with U.S. Treasuries as collateral – *i.e. the U.S. Treasury Repo Market*.

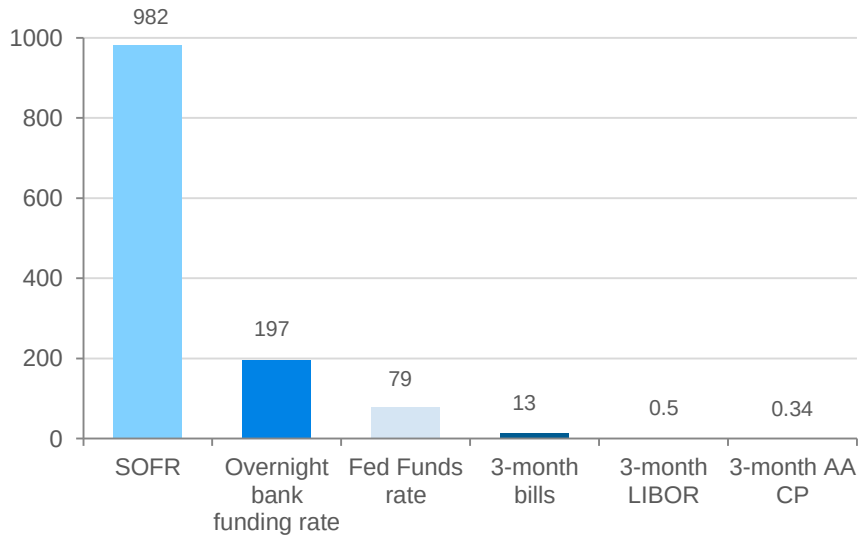
- 2014 – The Federal Reserve convened the Alternative Reference Rate Committee (ARRC) to identify alternative reference rates to replace USD LIBOR.
- June 22, 2017 – The ARRC chose the Secured Overnight Financing Rate (SOFR) as its preferred alternative.
- April 2018 – The Federal Reserve began publishing SOFR.
- SOFR is a volume-weighted median of three types of repo transactions collateralized by U.S. Treasuries: (1) Tri-Party GC Repo; (2) GCF Repo; and (3) Cleared bilateral repo.

- According to the Federal Reserve Bank of New York, over $750 billion of daily transactions are executed in the U.S. Treasury overnight repo market, dwarfing the current volumes underlying LIBOR.
- Volumes underlying SOFR are larger than in any other U.S. money market.
- SOFR is transaction-based and reflects the cost of secured financing across a variety of market participants. Trading volumes remain strong in times of stress.
- Bottom 25% of transactions trimmed to omit specials.

SOFR Transaction Volume
(USD$ in bn as at Nov. 2, 2020)
Source: FRBNY



Average Daily Volumes in U.S. Money Markets
(USD$ in bn) Source: Federal Reserve, FINRA, DTCC Solutions, SOFR is from Inception to Nov. 2, 2020

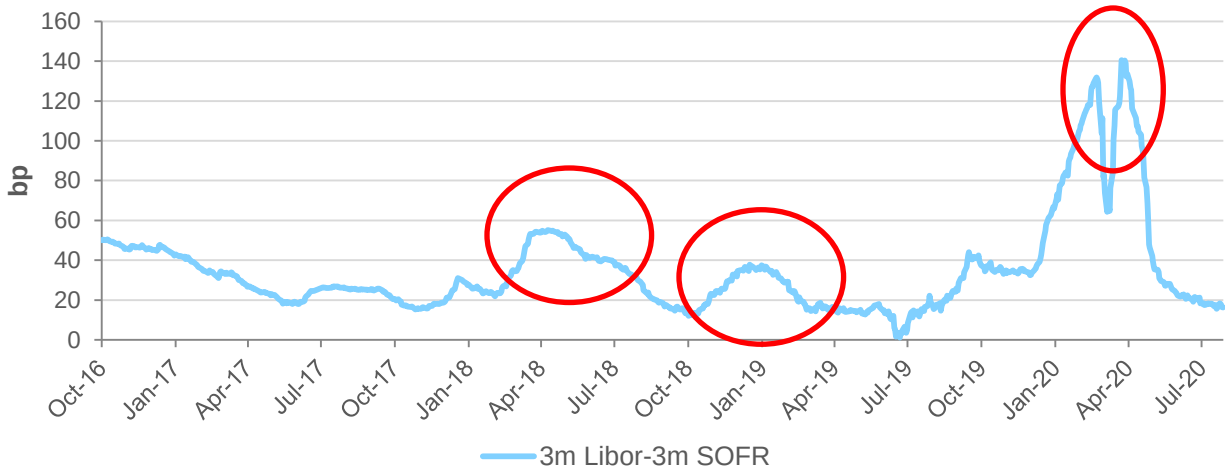


SOFR and LIBOR Comparison

USD LIBOR	VS	SOFR
▪ Unsecured ▪ Interbank funding market participants (panel banks) ▪ Consensus-based; depends on expert judgements ▪ Prone to the risk of manipulation. ▪ Forward-looking rate with a term structure ▪ Built-in credit component based on credit conditions amongst panel banks ▪ $500 million underlying transactions* **Note this is for 3-month USD LIBOR as it the most widely used.*		▪ Secured ▪ Broad array of market participants (multiple industries) ▪ Fully transaction-based ▪ Not subject to same risks of manipulation ▪ Backward-looking overnight rate ▪ Dynamic credit adjustment relative to LIBOR needs to be added ▪ $850 billion underlying daily transactions

LIBOR vs SOFR During Stress

Source: Bloomberg as at November 2, 2020



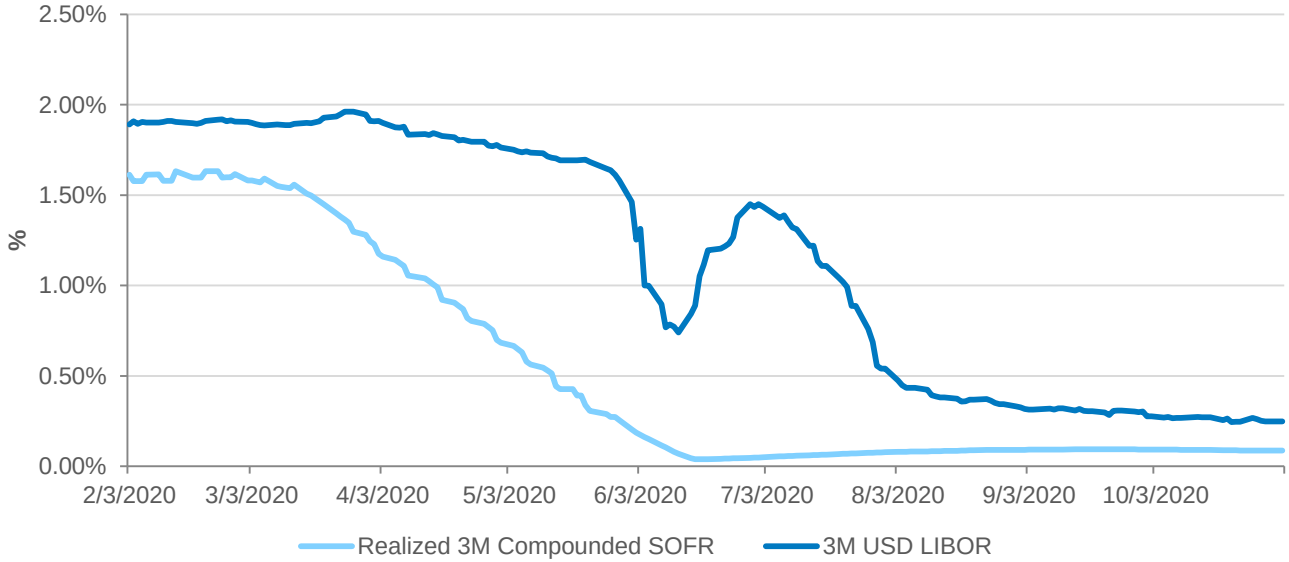
- LIBOR typically is not durable during stressed market conditions
- Historically, SOFR is durable during stressed market conditions

SOFR Market Volatility & Impact of COVID-19

- Despite impacts of COVID-19, regulators continue to expect transition from IBORs to ARRs by the end of 2021
- Some transition milestones have been impacted (i.e. LCH delay in the switch from EONIA to €STR)
- Federal Reserve took unprecedented actions to increase liquidity in the financial system
- Increases in the Fed's overnight and term repurchase operations kept SOFR stable and very close to EFFR
- LIBOR exhibited a sharp increase, reflecting high bank credit risk and constrained borrowing liquidity

3M USD Libor vs. 3M Compounded SOFR (Illustrative)

(SOFR as at November 2, 2020; Libor as at August 3, 2020)



- *Prior to March 2020, the spread between SOFR and LIBOR was relatively consistent*
- *Since March 2020, the spread has become more volatile as outlined in the graph*

Enhanced CORRA Overview

The enhanced Canadian Overnight Repo Rate Average (enhanced CORRA) is a proposed overnight, secured reference rate that is intended to broadly measure the cost of borrowing cash overnight with Government of Canada bonds and treasury bills as collateral.

- March 2018 – the Bank of Canada launched the Canadian Alternative Reference Rate Working Group (CARR) to review CORRA and assess the need to develop a term RFR benchmark in Canada.
- July, 2018 – The CARR agreed on the current enhanced CORRA benchmark as the Canadian ARR. Enhancements would focus on increasing the rate's transaction base and ensuring its compliance with benchmark principles published by the International Organization of Securities Commissions (IOSCO).
- Canada is considered a "multi-rate" jurisdiction, having both CDOR and CORRA as existing benchmarks. The Bank of Canada anticipates CORRA will become the predominant reference rate used in financial markets.
- As CDOR is based on lending transactions using Bankers' Acceptance (BA) facilities, there have not been reports of problems with CDOR similar to those with LIBOR[1], which is largely judgment-based.
- Enhanced CORRA is a trimmed median repo rate comprised of both inter-dealer and dealer-to-client trades where data can be obtained.
- The lower volume-weighted 25th percentile is trimmed with the intent to exclude "specials" and just include general collateral.
- The new framework harmonizes enhanced CORRA with SOFR which uses a similar methodology.

Comparing CDOR and Enhanced CORRA

CDOR	VS	Enhanced CORRA
Unsecured rate at which banks are willing to **lend**		Secured **borrowing** rate (nearly risk-free)
Canadian BA market participants		Broad array of market participants (multiple industries)
Based on submissions solely from major Canadian banks		Fully based on repo transactions
Forward-looking rate with term rates		Currently a backward-looking overnight rate
Built-in credit component based on credit conditions in the Canadian BA market		No credit component; comparing relative value will need an adjustment
Monthly volume of CAD$ 200 – 250 billion[2]		Expected to be based on CAD$10-20 billion of underlying **daily** transactions[3]

Outlook

- BMO has participated in two CARR-organized and two CBA (Canadian Bankers Association)-organized working groups:
  - (i) The Transition Subgroup
  - (ii) The Term Rate Subgroup
  - (iii) The CBA Benchmark Transition Specialists Group
  - (iv) The CBA Treasury Subgroup
- Effective June 15, 2020, The Bank of Canada started calculating and publishing Enhanced CORRA.
- On November 12, 2020, Refinitiv, CDOR's administrator announced that effective May 17, 2021, it would stop publishing the 6 and 12 month CDOR tenors.
- Refinitiv confirmed in its announcement that there is no current intention to cease publishing the 1, 2, or 3 month CDOR tenors.

1. OSFI, http://www.osfi-bsif.gc.ca/eng/docs/e20_gias.pdf
2,3. Bank of Canada

Transition Challenges and Opportunities

Challenges

Derivatives Markets	• Developing a term structure and curve that goes beyond LIBOR cessation. • Lack of global coordination, regulatory guidance, and clarity as to the direction in which the transition is going. • Dependency on the transition efforts of other businesses (i.e. hedging loans). • Potential for reputational and litigation risk if the transition negatively impacts clients. • Client education and outreach is critical to a seamless transition.
Cash Markets	• Developing a forward looking term rate. • Developing an industry approach for a credit sensitive spread. • Amending legacy contracts that reference LIBOR to incorporate evolving fallback language. • High potential for reputational and litigation risk if the transition negatively impacts clients. • Client education and outreach is critical to a seamless transition.
Risk	• Models will need to be maintained in parallel during the transition. • Limited historical data for most RFRs. • Coordinated approach needed to reconstruct RFR-based transaction data. • Divergent approaches for different currencies removes what previously was a 'one size fits all' approach for valuation and risk modelling.
Legal	• Identifying and managing legacy contracts with IBOR exposure. • Existing IBOR fallbacks were not written in contemplation of a permanent cessation of IBOR. • Renegotiation and/or amendments of impacted contracts based on product-specific market conventions. • Client education and outreach is critical to a seamless transition.
Technology and Ops	• Impacted systems must support pricing, risk, and P & L model updates. • Impacted systems will need to accommodate overnight rates in all stages of the trade/product lifecycle. • Payments, settlements and collateral management processes will face updates. • Dependencies exist on vendors, clients, and market infrastructure to be ready to transition.
Finance and Corporate Treasury	• Large stress impact in P&L and liquidity by transitioning to RFRs from credit-sensitive rates. • Hedge accounting processes will need to accommodate the shift in hedging activities from IBORs to RFRs. • The FTP framework will need to accommodate the transition from IBORs to RFRs. • Issuance and securitization programs will need to plan for IBOR cessation and its impact on legacy notes and funding activities.

Opportunities

- Create efficient risk management processes by centralizing risk and exposures.
- Support lines of business in their efforts to realize strategic opportunities.
- Build stronger relationships with clients with educational resources, expertise and support throughout the transition.
- Leverage technology infrastructure across the bank and establish AI-enabled contract management system.

USD LIBOR Fallbacks for Derivatives and Cash

ISDA Triggers

Permanent Cessation

1) Benchmark has or will cease to be provided

Pre-Cessation

2) Benchmark is non-representative (i.e. no longer capable of being representative)

ARRC Triggers

Permanent Cessation

1) Benchmark has or will cease to be provided

Pre-Cessation

2) Regulator: the benchmark is no longer representative.
3) The Asset Replacement Percentage (ARP)*

Early "Opt-in" Trigger

4) Administrative agent or Required Lenders: decide to incorporate a new benchmark.

ISDA Fallback

Compounded SOFR in arrears + Spread Adjustment

- **Compounding in arrears** (term adjustment) and **historical median** (credit adjustment)
- Historical median approach over a five-year lookback period
- The ISDA IBOR Fallbacks Supplement to the 2006 ISDA Definitions and the ISDA 2020 IBOR Fallbacks Protocol launched on **October 23, 2020.**

Consideration

- Term rates will not reflect future expectations and will be unavailable until the end of the accrual period.

ARRC Fallbacks

Hardwired (proactive language written into an agreement)

1) Term SOFR + Adjustment
2) Compounded SOFR + Adjustment

   Daily Simple SOFR + Adjustment
3) Relevant Governmental Body Selected Rate + Adjustment

   Borrower and Administrative Agent Selected Rate + Adjustment

   Lender Selected Rate + Adjustment
4) ISDA Fallback Rate + Adjustment
5) Transaction-specific Fallback Rate (optional) + Adjustment

Hedged Loan Approach

Replication of ISDA triggers and fallback language.

Dark Red – found in securitizations and FRNs language; the ARP trigger is only in securitization
Blue – found in syndicated loans language
Green – found in bilateral loans language

ARRC Fallback Updates for Loans

- Updated Hardwired Fallback language for syndicated loans published on June 30, 2020
- Amendment Approach was removed
- Early opt-in trigger broadened
- Updated fallback language for bilateral loans published on August 27, 2020

Updated Hardwired Fallback Language (Syndicated and Bilateral Loans)

- **Waterfall** - the (updated) order:
  1. Term SOFR + Adjustment
  2. Daily Simple SOFR + Adjustment
  3. Borrower and Administrative Agent Selected Rate + Adjustment
  - Compounding in Arrears may still be used, but this would stray from standard market conventions
- **Opt-in trigger** defined in more detail to be more flexible
  - Threshold set for early opt-in trigger
  - No longer limited to Term SOFR; applies to any type of SOFR loan
  - For Syndicated loans, the borrower and/or agent can trigger the opt-in, giving the lender 5 days to raise written objection
  - For Bilateral loans, the lender can trigger the opt-in, giving the borrower given 5 days to raise written objection
  - Negative consent applies
- **Benchmark replacement Spread Adjustment -** Determined according to a waterfall:
  1. ARRC Selected Adjustment
  2. ISDA Fallback Adjustment
  3. Borrower and Administrative Agent Selected Adjustment
  - Spread adjustments selected at beginning of an interest period
- **Floors**: both the SOFR rate + Spread Adjustment are considered as a replacement for LIBOR floor; floors continue to apply

Industry Update

LIBOR Endgame Becomes Clearer… and goes into Overtime

- The ICE Benchmark Administration (IBA), the administrator of LIBOR, has announced that it will consult in early December on its intention to cease the publication of:
  - of the euro, sterling, Swiss franc and yen LIBOR panel, as well as the one-week and two-month USD LIBOR settings immediately following the LIBOR publication on **December 31, 2021**, and
  - the overnight and one-, three-, six- and 12-month USD LIBOR settings immediately following the LIBOR publication on **June 30, 2023**.
- This announcement should not be interpreted to mean that access to new USD LIBOR-linked products will continue after 2021.
- UK and U.S. regulators have issued statements that the June 30, 2023 cessation date is only intended to allow time for "legacy contracts" mature and that banks are not to enter into new contracts that use USD LIBOR as a reference rate after December 31, 2021.

Upcoming Key Industry Milestones

ISDA Protocol

January 25, 2021 - IBOR Fallbacks Supplement to the 2006 ISDA Definitions and the ISDA 2020 IBOR Fallbacks Protocol will take effect. The Protocol launched on October 23, 2020.

Sterling LIBOR-linked Loan

End of Q1 2021 – all new issuance of sterling LIBOR-referencing loan products that expire after the end of 2021 should cease.

Term SOFR

H1 2021 – Anticipated publication of a forward-looking term SOFR rate to be available in the first half of 2021.

BMO's Approach

BMO is taking a proactive approach to the IBOR transition with an emphasis on identifying opportunities and coordinating efforts to ensure efficiency and a positive client experience.

One BMO

BMO's IBOR Transition Office

- ✓ Created a robust communication and client engagement strategy.
- ✓ Established a project plan for both the enterprise and capital markets.
- ✓ Formed project Work Streams such as Legal, Corporate Treasury, T&O, Commercial Banking and Risk.
- ✓ Enterprise governance structure in place with the Steering Committee and Operating Committee operationalized.

CLIENT FOCUS

- ✓ Client outreach to assess interest and operational readiness to trade SOFR.
- ✓ Client feedback is addressed through personalized client meetings.
- ✓ One-on-one teach-ins hosted by BMO's IBOR Transition Office and FICC Strategy team.
- ✓ Dedicated research articles published bi-weekly by the BMO FICC Strategy team.

EDUCATIONAL RESOURCES

- ✓ BMO has developed educational resources to better prepare our employees and clients for the transition (including in-depth information on SOFR).
- ✓ Clients and BMO employees can contact the IBOR Transition Office at IBOR.TransitionOffice@bmo.com for more information.

INDUSTRY LEADERSHIP AND ENGAGEMENT

- ✓ BMO is actively participating in major industry forums, working groups, and consultations.
- ✓ BMO is actively engaged in the emerging SOFR market:
  - ❖ BMO underwrote 15 deals totaling USD $8B
  - ❖ BMO also issued USD $5.1B of SOFR and SONIA funding YTD; USD $8.7B since inception

BMO's Communication & Client Engagement Strategy

Communication, education and client engagement are key to a smooth and successful transition. To ensure BMO and its clients are well educated and informed of all aspects of the transition from IBOR to ARRs, BMO has established a communication and client engagement strategy that includes: timely updates, education pieces and monthly newsletters etc.

Client Education Materials

The IBOR Transition Office has developed and distributed the following client education pieces:

- SOFR 101
- SOFR Calculations
- Historical Credit Spread Adjustment
- IBOR Transition Whitepaper – "*The LIBORious Transition to SOFR*"
- Introduction to SONIA and €STR
- Enhanced CORRA
- External Monthly Newsletters
- IBOR Transition Program Set-up and Checklist
- ARRC Fallback Language for Syndicated Loans, Bilateral Loans, Securitization and FRNs
- SOFR FRN Conventions

IBOR Transition Website

The IBOR Transition Office launched an external website for clients in June 2020. The website provides the following:

- Transition Overview
- Industry News (links to BMO's Monthly Newsletter)
- Available Resources
- Key Dates
- FAQs

http://ibortransition.bmo.com/

BMO IBOR Transition Office

If you have questions about the material contained in this presentation or general questions on the IBOR transition, please reach out to BMO's IBOR Transition Office at IBOR.TransitionOffice@bmo.com.

IBOR Transition Checklist

Despite industry efforts to guide market participants in this transition, individual firms will need to make their own plans for the transition.

Project Governance/ Management

☑ **Identify:**
- Executive Sponsor(s)
- business/ workstream leads
- project management staff

☑ **Mobilize:**
- Steering Committee with Accountable Senior Executive(s) from each impacted area

☑ **Develop**:
- implementation roadmap

☑ **Confirm:**
- resource and budget needs

☑ **Establish:**
- project management framework to monitor progress of the implementation plan, identify and escalate risks

Exposure Analysis and Impact Assessment

☑ **Notional exposures:** Determine exposures to IBOR, including by risk sensitivity where possible

☑ **Products:** Use exposure analysis to determine which products reference IBORs

☑ **Systems/ Processes:** For each product, define direct and indirect impacts to systems/ processes

☑ **Contractual impacts:** Identify and assess contractual impacts, number of contracts, timing of contracts (e.g. maturing before or after 2021) and type

☑ **Stakeholder/ Counterparty impacts:** Determine which stakeholders/ counterparties are impacted

Transition Strategies

☑ **Develop transition plans for the following**:
- Business strategy by group;
- New products;
- communication

☑ **Business Strategy:**
- Define strategy and timeline for reducing reliance on IBORs

☑ **Product Strategy**:
- Define timeline for offering new RFR-linked products
- Define risk and new product approval requirements

☑ **Communication:**
- Develop a robust internal and external communication strategy, including senior management and Board reporting
- Educate internal stakeholders
- Provide clear messaging on transition to external counterparties

Risk Management

☑ **Key risks:** Define key transition risks (including market readiness, business impacts, financial, operational and legal risks)

☑ **Measure/Monitor:** Establish processes to measure and monitor the identified material risks under transition scenarios

☑ **Mitigation:** Identify mitigating actions to address identified transition risks with focus on product, basis, operational, and conduct risk

☑ **Model impact:** Assess impact to risk models and develop processes for updating guidelines for validation requirements

Contractual Remediation

☑ **Existing IBOR-related Contracts:**
- Review to determine the impact of fallbacks, identify: triggers, terms requiring change, financial impacts, external counterparty impacts, and legal interpretations
- Create an inventory of identified triggers
- Define approach and prioritization for renegotiating/ repapering contracts.

☑ **New contracts:**
- Make every effort to incorporate available, recommended fallback language (developed by ISDA, ARRC, and other industry working groups)

Infrastructure Readiness

☑ **Operational and Technology:**
- Assess where IBORs are used across all businesses and operations
- Inventory technology, operations, and modeling tools to understand where they are using IBORs

☑ **Accounting/ Reporting:**
- Identify impact on finance systems, operations and reporting
- Identify and understand impacts to hedge accounting standards and processes

☑ **Taxation and Regulation:**
- Determine tax, accounting and compliance implications
- determine impact of tax on regulatory capital
- determine tax reporting requirements

Appendix

1. Industry Work Effort
2. SOFR v. Effective Fed Funds

BMO IBOR Transition Office

Industry Work Effort

Industry working groups and individual firms are preparing and executing their transition plans and will likely continue to do so into 2022. Key industry work includes:

Transition Timeline

Q3 '20
By the end of Q3 2020 lenders should be in a position to offer non-LIBOR linked products to their customers.

2H '20
IASB published guidance on hedge accounting treatment of loans, bonds & derivatives.

OCT 23 '20
Publication of revised 2006 ISDA Definitions and protocols with new IBOR fallback provisions.

OCT '20
FSB published report on LIBOR transition progress.

DEC 31 '20
Target for cessation of new use of USD LIBOR for FRNs.

Securitizations technology/ operations vendors to be ready to transact SOFR

JAN 1 '21
GSEs will no longer purchase LIBOR-indexed ARMs.

APR 01 '21
BoE will increase haircuts on LIBOR-linked pre-positioned collateral.

MAY 17 '21
Refinitiv, CDOR's administrator, will cease publishing the 6 and 12 month tenors as of May 17th, 2021.

JUNE 30 '21
Target for cessation of new use of USD LIBOR for business loans, securitization and derivatives.

DEC 31 '21
EMMI to cease publication of EONIA rates.

€ RFR Working Group recommends firms introduce fallback language before Dec. 31, 2021

DEC 31 '21
FCA will no longer compel panel banks to submit LIBOR quotes.

DEC 31 '21
IBA target to cease the publication of GBP, EUR, CHF, JPY LIBOR, as well as one-week and two-month USD LIBOR.

Past Milestones | **2020** | **2021** | **2022/2023**

SEPT 30 '20
Hardwired fallbacks incorporated in business loans and student loans.

Develop resource guides to support market participants' efforts to develop consumer education and outreach.

Target cessation for new applications for close-end residential mortgages using USD LIBOR and maturing after 2021.

Business and consumer loans technology/ operations vendors to be ready to transact SOFR.

OCT 16 '20
LCH Limited and CME Group plan to move SOFR discounting on all USD denominated SwapClear contracts.

End Q4 '20
Forward looking term versions of SONIA to be available in the loan market.

JAN 25 '21
IBOR Fallbacks Supplement to the 2006 ISDA Definitions and the ISDA 2020 IBOR Fallbacks Protocol will take effect on January 25, 2021

Q1 '21
Expected UK FCA announcement regarding the end of LIBOR

End Q1 '21
Cease all new issuance of sterling LIBOR-referencing loan products that expire after the end of 2021.

H1 '21
Forward-looking term SOFR rate to be published.

Q2 '21
CCPs to no longer accept new swap contracts for clearing with EFFR as PAI and discounting.

SEPT 30 '21
Target for cessation of new use of USD LIBOR for CLOs.

JUNE 30 '23
IBA target to cease the publication of overnight and one-, three-, six- and 12-month USD LIBOR

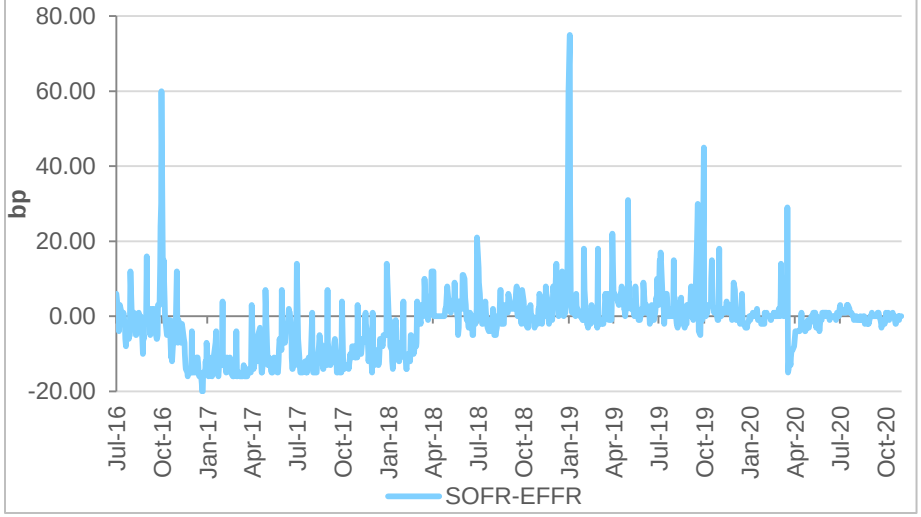
SOFR vs Effective Fed Funds

- Repo trades traditionally trade below Fed Funds and this has been the case recently.
- However, futures suggest that this should reverse through 2021. This is likely caused by:
  - An elevated bill supply.
  - Lowest 25% of transactions are trimmed from the SOFR calculation to remove specials.
- This methodology biases SOFR higher as lowest GC transactions are omitted.
- SOFR effectively becomes the median of the highest 75% of volume-weighted transactions.

Historical SOFR – Effective Fed Funds Spread

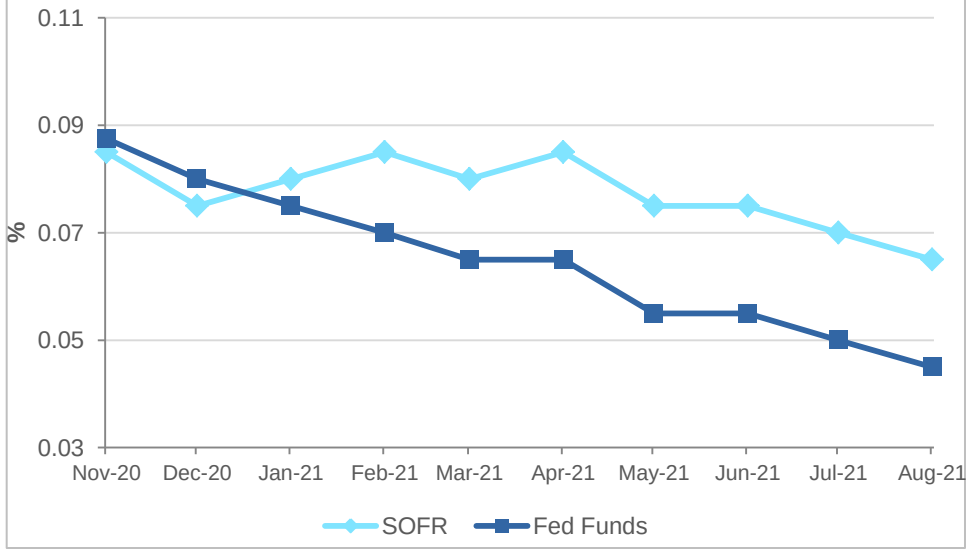
Source: Bloomberg as at Nov. 2, 2020

September 17, 2019 spread of 295bps has been omitted from the graph due to outlier effects.



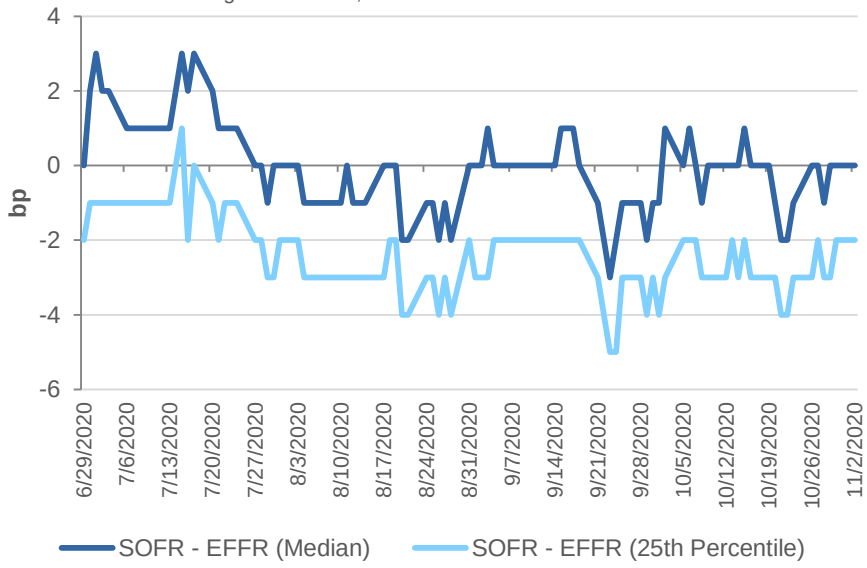
1M SOFR Futures vs Fed Fund Futures

Source: Bloomberg as at Nov. 2, 2020



SOFR – Effective Fed Funds Spread

Source: Bloomberg as at Nov. 2, 2020



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