Adopting Alternative Reference Rates

July 2019

Replacing LIBOR: Alternative Reference Rates Overview

1 LIBOR Faces an Uncertain Future

"The regulator of LIBOR has said that it is a matter of how LIBOR will end rather than if it will end, and it is hard to see how one could be clearer than that"

"Many seem to take comfort in continuing to use LIBOR…but history may not view that decision kindly"

– Randal Quarles, FRB, June 2019

Regulatory and advisory bodies have identified flaws with LIBOR

- **Lack of Transaction Data**
- **Judgement Based**
- **Potential for Manipulation**

2 Global Developments in Alternative Rates

- **ARRC published fallback language for new USD LIBOR cash market products**
- **Reformed Sonia gaining liquidity**
- **EONIA to be redefined as ESTR + spread in October**
- **BOJ Study Group selected TONA; multi-rate approach**
- **SNB changed policy target rate to SARON**

3 Transition from LIBOR to Occur Over Next 2.5 Years

2018

April 3, 2018: NY Fed began publishing SOFR

April 23, 2018: BoE began publishing Reformed SONIA

2019

2020

2021

FCA may compel banks to submit towards LIBOR for a maximum 2Y period; however, the FCA has confirmed that all 20 panel banks have agreed to support LIBOR until 2021

2Y Period

Uncertainty

Alternative Reference Rates – Global Streams

- The Financial Stability Board (FSB) and Financial Stability Oversight Council (FSOC) determined that the secular decline in wholesale unsecured short-term funding by banks poses serious structural risks for unsecured benchmarks
  - Actual transactions make up <30% of data used to produce 3M and 6M USD Libor
- Central Banks initiated working groups beginning in 2014 to address this issue and establish alternative reference rates compliant with IOSCO principles

	UNITED STATES	UK	EUROPEAN UNION	JAPAN	SWITZERLAND
Working Group	• Alternative Reference Rate Committee (ARRC) – Buy-Side Advisory Group	• Working Group on Sterling Risk-Free Reference Rates	• Working Group formed by FSMA, ESMA, ECB, and the EC	• Study Group on Risk-Free Reference Rates • Cross-Industry Committee on Japanese Yen Interest Rate Benchmarks	• National Working Group
Sponsor Central Bank	• Federal Reserve Board	• Bank of England ("BOE")	• European Central Bank ("ECB")	• Bank of Japan ("BOJ"), Japan Financial Services Agency (Observer)	• Swiss National Bank
Alternative Reference Rate Proposals / Selections	• **Selected Secured** Overnight Financing Rate "SOFR" (Jun 2017) ✓	• **Selected Unsecured** Reformed Sonia (Apr 2017) ✓	• **Selected Unsecured** €STR (Sept. 2018) ✓	• **Selected Unsecured** TONA (Dec 2016) ✓	• **Selected Secured** SARON, an overnight GC Repo Rate (Feb 2016) ✓
Transition Strategy	• "Paced" transition, replacing LIBOR • SOFR publication began April 3, 2018	• Trade-off between ease of implementation & depth of market (OIS then LIBOR) • Sonia reforms took effect April 23, 2018	• High-level implementation plan published by ECB WG in Sept. 2018 • EU BMR takes effect on Jan 1, 2022	• Proposed roadmap for interest rate benchmark reform published in August 2018	• Termination of the TOIS fixing 12/29/17; SARON replaced TOIS in advance

1. Additional jurisdictions that are currently in progress for selecting a fall-back rate are Australia, Singapore and Hong Kong

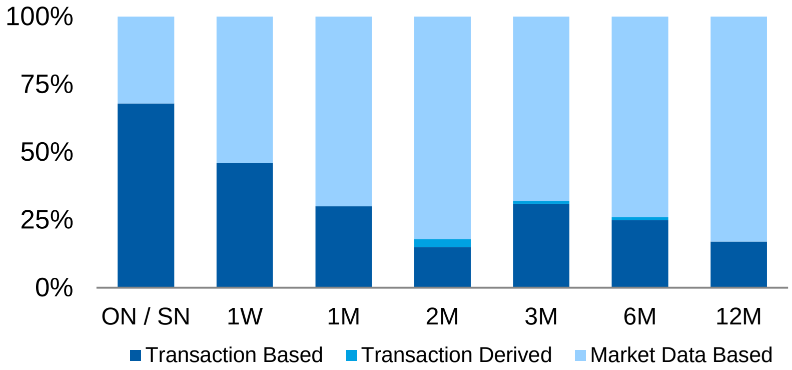
SECTION 1

US Risk-Free Rates

Increased Focus on Observable Transactions

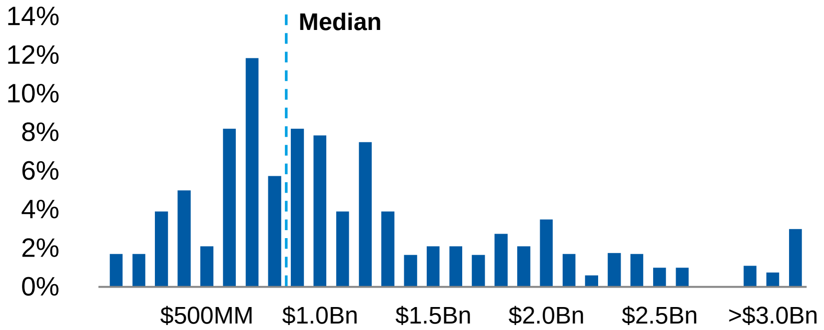
1 Most LIBOR Submissions Based on Expert Judgement

Submissions Types (%)



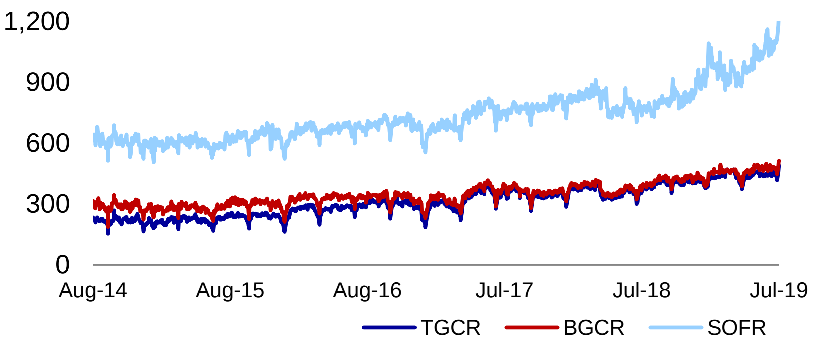
2 Low Level of Transactions Supporting ~$200Tn Contracts

Days with Observed 3M LIBOR Volume (%)



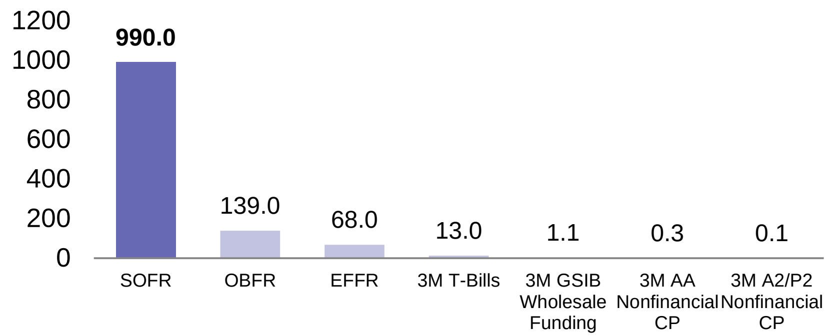
3 SOFR is Fully Transaction Based…

Aggregate Volume ($Bn)



4 …With Robust Underlying Volume

YTD Daily Volume ($Bn)



Sources: "IBA 2018 Q1 Report on Volumes" ICE LIBOR
"Introducing the Secured Overnight Financing Rate (SOFR)" Joshua Frost, FRBNY, November 2, 2017
"Introductory Remarks" Governor Jerome Powell, Federal Reserve System, November 2, 2017
Historical Repo Rates Data – Federal Reserve Bank of New York

Next 12 Months | Projected Transition Timeline in the US

Past Development

Upcoming Development

October 1, 2018
CME began clearing OTC swaps referencing SOFR using SOFR discounting

July 16, 2018
LCH began clearing OTC swaps that reference SOFR, using EFFR discounting

4Q'19
ISDA to publish new IBOR fallback terms including credit adjustment calculation[1]

- Length of lookback period
- Mean vs. median calculation

2H'2020
CCPs may adjust USD discounting/PAI regime from EFFR to SOFR, pending input from respective clients

2018 — Jan. 2019 — 2H'2020

April 3, 2018
NY Fed began publishing SOFR

May 7, 2018
CME launched SOFR futures

December 20, 2018
ISDA released final results of benchmark consultation

April-May 2019
ARRC released new LIBOR fallback terms for use in new cash products

ARRC Paced Transition Timeline

Jul-Dec 2018
Develop infrastructure for futures/OIS trading in SOFR

Trading begins in futures and/or bilateral uncleared OIS referencing SOFR

Jan-Mar 2019
Market readiness to trade cleared OIS referencing SOFR in current PAI environment

Jan-Mar 2020
Ability to trade cleared contracts based on either SOFR and current EFFR discount curves

Apr-Jun 2021
CCPs no longer accept new swap contracts for clearing with EFFR as PAI and discounting unless risk-reducing for legacy contracts

YE 2021
Creation of a term reference rate based on SOFR-derivatives markets once liquidity has developed sufficiently to produce a robust rate

1. ISDA definitions for EURIBOR and EUR LIBOR will be amended at a later date

ISDA Consultation | Review of Results from 2018

- ISDA completed a consultation to develop fallbacks to a RFR in the event a key IBOR is discontinued
- Market participants responding to the consultation prefer **compounding in arrears** (term adjustment) and **historical average** (credit adjustment)
- ISDA's fallback protocol is a backstop and is not intended to replace the voluntary conversion of IBOR swaps to swaps linked to RFRs

Term Adjustment: Compounding in Arrears

Description: Compound observed daily rates over the full period, final rate is set at the end of the period

Credit Adjustment: Historical Average

Description: Spread between LIBOR and RFR (adjusted for term component) equal to average differential over past [x] years. There will be a transition period to avoid a "cliff effect"

1. ISDA Consultation applied to only GBP LIBOR, CHF LIBOR, JPY LIBOR, TIBOR, Euroyen TIBOR and BBSW
2. Length of the Historical Average lookback period and averaging calculation (median vs. mean) are still undetermined

ISDA Consultations | Remaining Work in 2019

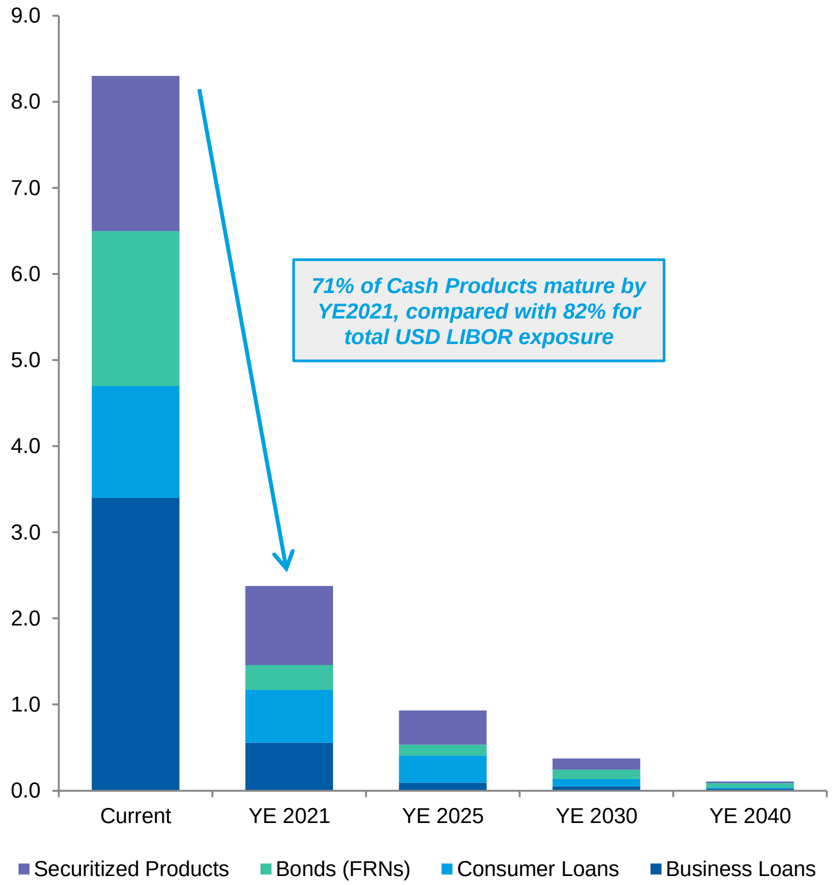
	1 Additional Currencies	2 Pre-Cessation Issues	3 Spread Adjustment
Key Question	***What should be the fallback mechanism for USD LIBOR, CDOR, and HIBOR?***	***How should the protocol deal with statements of non-representativeness?***	***How should the credit spread adjustment between RFRs & IBORs be calculated?***
Background	• 2018 consultation covered GBP LIBOR, CHF LIBOR, JPY LIBOR, TIBOR, Euroyen and BBSW • This consultation asks the same questions of 3 additional currencies (USD, CAD, CNH)	• International Regulators (OSSG) encouraged ISDA to seek market opinion on pre-cessation issues • ARRC included pre-cessation triggers in recommended fallback language for new USD LIBOR cash products	• Historical mean/median approach selected for RFR credit adjustment, though calculation parameters not yet finalized 1. Should calculation be a mean or a median? 2. What is the length of the lookback period?
Timeline	**May'19 – July'19**	**May'19 – July'19**	**3Q'19 – YE'19**
Respond	**Complete**	**Complete**	**–**

Sources: "Timeline for Implementation of IBOR Fallbacks" – ISDA – February 2019
"Derivative Contract Robustness to Risks of Interest Rate Benchmark Discontinuation" – Andrew Bailey, John Williams – April 2019
"May 2019 Benchmark Fallbacks Consultations" – ISDA – May 2019

Transition Challenges in the US Cash Market

Cash Market Roll-Down Over Time

$Tn Outstanding



Typical Contract Language Varies Across Cash Products

	Fallback Rate	Consent Required
Business Loans	• Obtain bank quotes → Alternative Base Rate – Prime Rate – EFFR plus fixed spread	• **Bilateral Loans:** Agreement between borrower and lender • **Syndicated Loans:** Unanimous consent
Bonds (FRNs)	• Obtain bank quotes → Fixed Rate at last published LIBOR set	• Unanimous consent among bondholders
Securitized Products [1]	• **Agency MBS and CMO:** Issuer selection • **Non-agency MBS and ABS:** Bank poll → Fixed Rate at last published LIBOR set • **CLO:** Final LIBOR set	• **Agency MBS and CMO:** Unanimous consent • **Non-agency MBS and ABS:** Unanimous consent • **CLO:** Unanimous consent (typically called after 1-2 years)
Mortgages / Consumer Loans	• Alternative Base Rate plus / (minus) spread – Spread component undefined	• Chosen by noteholder

Source: “Second Report,” Alternative Reference Rates Committee, March 2018
1. Securitized Products include MBS & CMOs, CLOs, ABS and CDOs

ARRC's Preliminary Recommendations for XCCY Swap Interdealer Market Conventions

Potential Conventions in RFR-RFR Trades

1. **Frequency of Payments**
   - Quarterly payments on each leg of swap
2. **Exchange of notional principal cash flows**
   - Exchange of notional principal cash flows at the start and maturity dates of the swap
3. **Interest convention**
   - Compound daily settled in arrears
4. **Alignment of payment or rate fixing dates**
   - Alignment of payment dates
5. **Spot (2 business days) start**
   - Spot (2 business days) start should be recommended
6. **Reset of notional principals**
   - Not necessary to recommend a standard
7. **Discounting and PAI**
   - Not necessary to recommend a standard

Potential Conventions in RFR-IBOR Trades

1. **Conventions for the RFR leg**
   - Should match RFR accrual conventions which develop in the RFR-RFR cross currency market
2. **Conventions for the IBOR leg**
   - IBOR leg of the RFR-IBOR cross currency market should match the conventions developed in the related IBOR currency
3. **Aligning accrual conventions with cash products**
   - Not yet determined

Source: "Preliminary Recommendations for Interdealer Cross-Currency Swap Market Conventions" – ARRC – May 2019

ARRC Dashboard | Priorities for 2019

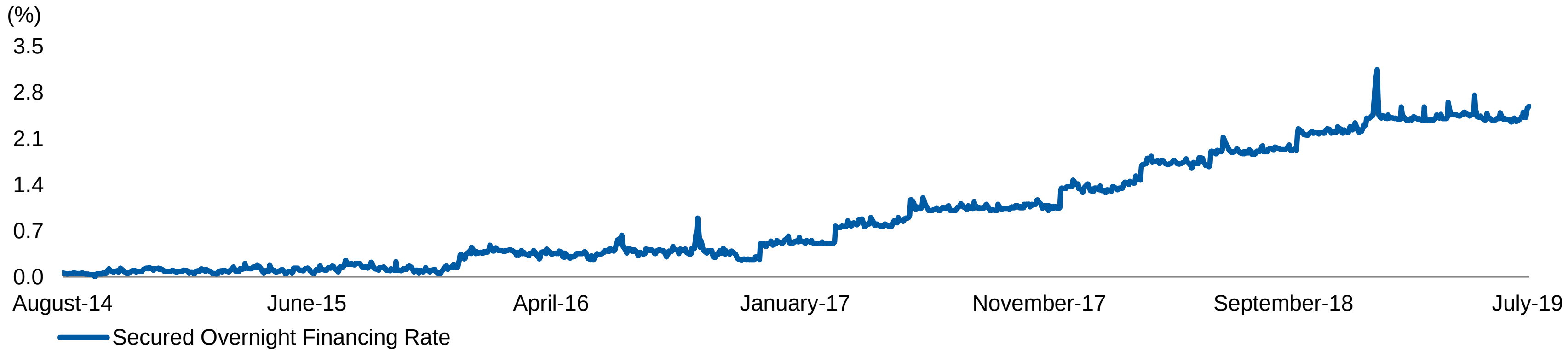
In addition to the ARRC's paced transition plan, ARRC objectives for 2019 include:

ARRC Objectives	2019 Priorities / Milestones	Date
Build market liquidity and drive demand for SOFR	• FRB staff to publish indicative compounded SOFR and forward-looking SOFR • ARRC to launch infrastructure and Ops working group • Encourage launch of SOFR loans and securitizations	• 2Q'19 ✓ • 2Q'19 ✓ • YE'19
Create and implement robust fallbacks	• ARRC to issue recommended fallback language for FRNs, syndicated loans, bilateral loans, and securitizations • ARRC to assess fallback spread adj. for cash products • ISDA to finalize definition amendments and release protocol for legacy trades • ARRC to continue to identify needed regulatory relief and tax/accounting requirements to eliminate hurdles in transition • ARRC to explore options for NY State legislative relief on legacy products	• 2Q'19 ✓ • 2H'19 • YE'19 • Ongoing • Ongoing
Launch consumer products-focused working group	• ARRC to launch consumer products working group (incl. CFPB) • ARRC to consult on consumer product fallbacks and describe applications of SOFR in consumer products • ARRC members to introduce an ARM structure based on SOFR	• 1Q'19 ✓ • 2Q'19 ✓ • 2Q'19 – 3Q'19 ✓
Education and outreach	• ARRC to continue ongoing targeted engagement through trade associations, industry conferences and media with policymakers to coordinate transition • ARRC to continue to issue best practices, FAQs and consultations • ARRC to publish bi-monthly newsletter to promote transparency and awareness of developments	• Ongoing
Coordinate across national working groups	• ARRC to continue regular communication with other NWGs and cross-currency workstreams to share best practices and identify risks • NWGs to provide update on implementation progress and plans	• Ongoing • 2H'19

Appendix

U.S. Alternative Reference Rate | SOFR

- On June 22, 2017, the ARRC selected the SOFR as the alternative rate for USD LIBOR. Thereafter, the Federal Reserve Board issued a request for public comment on the three new reference rates to be published
  1. **SOFR**, **S**ecured **O**vernight **F**inancing **R**ate – selected by the ARRC as alternative reference rate to LIBOR Comprised of UST BNY Triparty, DTCC Cleared Bilateral (trimmed) and GCF trades
  2. **TGCR, T**riparty General **C**ollateral **R**ate – only UST BNY Triparty trades
  3. **BGCR, B**road **G**eneral **C**ollateral **R**ate – UST BNY Triparty trades and DTCC Cleared GCF trades (excluding DTCC Cleared Bilateral)
- On February 28, 2018, the NY Fed announced its plans to begin the publication of the three new reference rates on April 3, 2018
- On March 9, 2018, the NY Fed released a time series of the volume-weighted mean rate of the primary dealers' overnight Treasury general collateral repo borrowing activity as collected each morning by the Open Market Trading Desk
- Additional information on SOFR:
  - High daily notional volume/transactions (~$900Bn)
  - Publication time of approximately 8:00AM ET based on the prior day's trading activity
- SOFR derivatives (futures and swaps) began trading in mid-2018, and though liquidity remains limited, an implied term structure can be derived that may help alleviate one of the biggest challenges for the cash market



Source: New York Fed Staff calculations

U.S. ARRC Broadened to Facilitate LIBOR Transition

In March 2018, the ARRC was expanded to include a broader set of market participants to increase coordination

- Intended to ensure the successful implementation of the Paced Transition Plan and will support the committee's ability to coordinate and track planning across financial products as market participants transition to alternative reference rates and address risks in legacy contract language

ARRC Membership

MEMBERS

- American Bankers Association*
- AXA*
- Bank of America
- BlackRock*
- Citigroup
- CME Group
- CRE Finance Council*
- Deutsche Bank
- Federal National Mortgage Association*
- Federal Home Loan Mortgage Corporation*
- GE Capital*
- Goldman Sachs
- Government Finance Officers Association*
- HSBC
- Intercontinental Exchange*
- International Swaps and Derivatives Association
- JP Morgan Chase & Co.
- LCH Clearnet
- MetLife*
- Morgan Stanley
- National Association of Corporate Treasurers*
- Pacific Investment Management Company*
- TD Bank*
- The Federal Home Loan Bank of New York*
- The Independent Community Bankers of America*
- The Loan Syndications and Trading Association*
- The Securities Industry and Financial Markets Association*
- Wells Fargo
- World Bank Group*

EX OFFICIO MEMBERS

- Board of Governors of the Federal Reserve System
- Consumer Financial Protection Bureau*
- Federal Deposit Insurance Corporation*
- Federal Housing Finance Agency*
- Federal Reserve Bank of New York
- Office of Financial Research
- Office of the Comptroller of the Currency*
- U.S. Commodity Futures Trading Commission
- U.S. Securities and Exchange Commission*
- U.S. Treasury Department

*Designates a new member of the ARRC

Frequently Asked Questions – SOFR

Why does the market need a new benchmark rate?

LIBOR is increasingly based on the expert judgment of panel banks due to the declining amount of unsecured, wholesale borrowings by banks since the financial crisis. For this reason, LIBOR is increasingly less of a robust, transactions-based market interest rate as envisioned by international standards for benchmarks.

What other rates were considered for replacing USD LIBOR?

The ARRC considered a comprehensive list of potential alternatives, including other term unsecured rates, overnight unsecured rates such as the Effective Federal Funds Rate (EFFR) and the Overnight Bank Funding Rate (OBFR), other secured repo rates, Treasury bill and bond rates, and overnight index swap rates linked to EFFR.

Will there be a “term SOFR”?

Once the initial steps of the ARRC’s Paced Transition Plan are successfully accomplished, which is expected in 2021, and liquid derivative markets referencing SOFR have developed, the final step in the Paced Transition Plan calls the creation of a forward-looking term rate based on SOFR-linked derivative markets.

Who administers and produces SOFR and how is the rate production process reviewed?

The New York Fed is the administrator and producer of SOFR. The New York Fed publishes SOFR on a daily basis on its website at approximately 8:00 a.m. eastern time. An internal New York Fed Oversight Committee periodically reviews the rate production process. The Oversight Committee consists of members from across the New York Fed organizational structure who are not involved in the daily production of SOFR.

Is SOFR meant to co-exist with LIBOR, or is it meant to replace LIBOR?

The ARRC’s focus is to encourage voluntary adoption of SOFR, rather than to mandate a transition away from USD LIBOR. SOFR, therefore, will co-exist with USD LIBOR as long as USD LIBOR is published, offering market participants an alternative reference rate for new transactions.

Who will be impacted by this transition to SOFR?

Due to the broad use of USD LIBOR as a reference rate, all financial market participants including retail customers, corporations, issuers, investors, asset managers, service providers of financial products, and large financial institutions are impacted by the risks associated with USD LIBOR.

What sort of financial products are expected to reference SOFR?

SOFR is suitable to be used across a broad range of financial products, including but not limited to, derivatives (listed, cleared, and bilateral-OTC), and many variable rate cash products that have historically referenced LIBOR.

What is “fallback language”?

“Fallback language” refers to the legal provisions in a contract that apply if the underlying reference rate in the product (e.g. LIBOR) is discontinued or unavailable.

What should market participants do to strengthen fallback language in derivatives?

ISDA is in the process of updating the definitions of USD LIBOR and other key benchmarks tied to interbank funding markets used in derivatives contracts to include new fallbacks (SOFR with certain contemplated adjustments for USD LIBOR) in the event of a permanent discontinuation of the relevant benchmark. ISDA also plans to publish a multilateral protocol to assist market participants in including the amended definitions (i.e., the definitions with fallbacks for benchmark cessations) in legacy swap contracts.

What should market participants do to strengthen fallbacks in cash products?

Although the timing and method of implementing new fallbacks in cash products will vary with the product type, the ARRC plans to consult on standardized fallback language available for voluntary adoption for a variety of cash products by the end of 2018.

How do we know SOFR is here to stay?

The overnight U.S. Treasury repo market that SOFR is based on is the largest rates market at a given maturity in the world, and SOFR encompasses the widest coverage of the market available, which will allow it to evolve with the market. The ARRC concluded that SOFR is superior to USD LIBOR, and other alternative reference rates considered by the ARRC. The coordination with a broad range of financial market participants, and commitments from the private-sector (including the financial services industry) will ensure the availability, adoption, and transition to SOFR in a smooth and timely manner.

Additional Global Developments for Other IBORs

- Although the FSB recommendations were directed at LIBOR, TIBOR and EURIBOR, other members have also taken steps to reform their existing rates in line with the advice given by the FSB and the IOSCO Principles

	Australia	Brazil	Canada	Hong Kong	Mexico	Singapore	South Africa
Administrator	• Australian Securities Exchange ("ASX")	• Brazilian Stock Exchange (CETIP/BM & FBOVESPA)	• Thomson Reuters	• Treasury Markets Association ("TMA")	• Banco de México ("BdM")	• Association of Banks in Singapore ("ABS")	• South African Futures Exchange ("Safex")
Sponsor Central Bank	• Reserve Bank of Australia ("RBA")	• Brazilian Central Bank ("BCB")	• Bank of Canada	• Hong Kong Monetary Authority ("HKMA")	• Banco de México ("BdM")	• Monetary Authority of Singapore ("MAS")	• South African Reserve Bank ("SARB")
IBOR	• Bank Bill Swap Rate ("BBSW")	• DI rate	• Canadian Dollar Offered Rate ("CDOR")	• Hong Kong Interbank Offered Rate ("HIBOR")	• The Interbank Equilibrium Interest Rate ("TIIE")	• Singapore Interbank Offered Rate ("SIBOR")	• Johannesburg Interbank Average Rate ("JIBAR")
Reference Rate Update	• Transactions-based methodology commenced in May 2018 • Proposed to strengthen fall back arrangements	• Methodology was reviewed in July 2016 • DI rate anchored on the Selic rate • A monitoring group exists at the BCB to discuss other initiatives	• No changes currently being made to the CDOR • Pursuing a multiple rate approach with CDOR, CORRA (overnight RFR) and term CORRA	• Ongoing assessment & consultation paper • Potential to reform HIBOR • May take a "waterfall" of information input	• BdM staff have recommended TIIE reforms to align with IOSCO Principles • No intentions to discontinue TIIE rate • Need to develop OIS market	• Considering enhancements to methodology and alternative benchmarks • Waterfall methodology to be implemented by 2019	• SARB published report in Jan. 2018 clarifying governance for JIBAR • May refine SABOR to become main unsecured overnight rate

Source: FSB Progress report on implementation of July 2014 FSB recommendations
FSB Progress report on reforming major interest rate benchmarks (Nov. 2018)