LIBOR Transition

As of: May 1, 2019

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LIBOR and its impact, by the numbers

1986
year **LIBOR was introduced**

2021
year after which the **FCA will no longer compel panel banks** to submit to LIBOR

$370T
total outstanding notional of **IBOR** exposures across markets and currencies

$300T
total outstanding notional of **USD LIBOR and EURIBOR** exposures ($150T for each rate) globally

$150T
Notional **Interest Rate Derivatives** trading volume linked to LIBOR in 2018

11:55am
Time (GMT) at which LIBOR is normally published for each currency and tenor combination on every business day

97%
portion of **syndicated loans in the US market** (~$3.4T in outstanding volumes) that reference USD LIBOR

3m
benchmark tenor most widely referenced, by volume

SOURCE: ISDA, “IBOR Global Benchmark Survey 2018 Transition Roadmap” (data as of 2014)

Industry and GS context for the LIBOR transition

Industry context

- In July 2017, Andrew Bailey, the Chief Executive of the Financial Conduct Authority (FCA), stated that **the FCA will no longer compel panel banks to contribute to LIBOR after 2021**[1]
  - **LIBOR phase out** likely to be accompanied by the retirement of other global IBORs
  - In anticipation of this transition, **the US, UK, EU, Switzerland, and Japan have all selected alternative risk-free rate benchmarks**
  - The industry expects that the phase-out and search for new benchmarks may lead to **lower rates, increased volatility, and reduced liquidity** in the near term
  - However, it is also expected that **financial products that are based on the alternative rates will emerge/grow** quickly, as is already happening
- There are **multiple business, operational, financial and risk** decisions and actions immediately at-hand across the industry, by global banks, their clients, and other market participants (e.g., CCPs)

GS efforts to date

- GS has **established a central program** to manage the LIBOR transition which has the full commitment and support of firmwide leadership. The mandate of this program is cross-divisional and cross-regional
- The firm has **appointed a senior business leader**, Jason Granet to lead this program
- Among other activities, firm leaders are **centrally and locally engaged in**:
  - **Proactively engaging with clients**
  - **Actively contributing** to industry discussions on the selection and design of alternate rates
  - **Identifying exposures** to understand the full impact of the transition
  - **Assessing different scenarios** for the future of LIBOR and alternative risk-free rates
  - **Being a market-maker in products referenced to alternative RFRs** to help increase the size of the overall market whilst sizing participation to overall firmwide risk limits
- These efforts will **inform ongoing engagement** with clients, counterparties and other stakeholders to ensure preparedness for the transition

1 Andrew Bailey, "The Future of LIBOR" July 27 2017

Objectives of the Goldman Sachs LIBOR Transition Program

GS business principles	Program objectives
▪ “We constantly strive to anticipate the rapidly changing needs of our clients”	▪ Ensure **a seamless IBOR transition for our clients, the market place, and our Firm** ▪ Provide a **distinguished client experience on the transition**
▪ “We stress teamwork in everything we do”	▪ Raise Firm and Industry-wide **awareness around the impacts and magnitude** of the IBOR transition
▪ “We stress creativity and imagination in everything we do”	▪ Empower the Firm to deliver thoughtful and **differentiated alternative RFR-linked offerings**

There is no guarantee that these objectives will be met.

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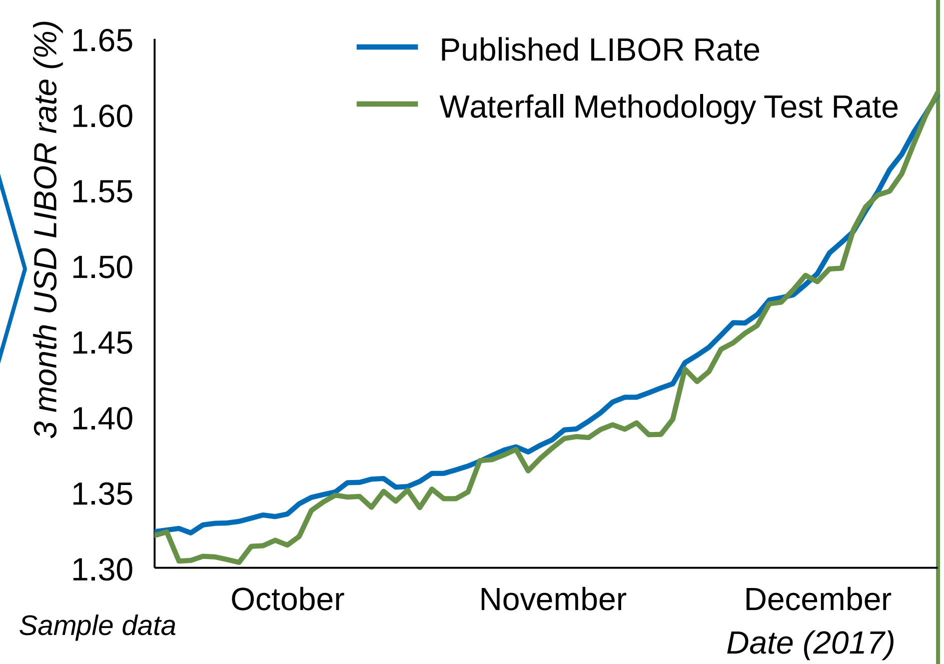
Review of LIBOR: London Interbank Offered Rate

- Since January 1, 1986, the London Interbank Offered Rate (LIBOR) has been the **"official" interest rate** at which banks can borrow short-term funds without posting collateral in the interbank market
- LIBOR **underpins the financial industry, serving as the base / benchmark** for an estimated **$370 trillion of financial products**, including:
  - **Debt instruments** – e.g., mortgages, corporate loans, government bonds, credit cards, student loans
  - **Interest rate derivatives** – e.g., swaps, options, forward rate agreements
- LIBOR is an estimate of the rate that 12-16 panel banks (depending on the currency) would be charged if they were to **borrow overnight from other banks**

New "Waterfall Methodology" for LIBOR fixings

- In 2016 and 2017, the ICE Benchmark Association (IBA) worked with panel banks to develop its **new "Waterfall Methodology" for LIBOR fixings**
- IBA's principal goal in introducing the new methodology is to publish, in all market conditions, a wholesale funding rate (i.e., LIBOR) **anchored in real transaction data** (i.e., unsecured, wholesale funding transactions) rather than subjective submissions to the greatest extent possible
- The "Waterfall Methodology" will continue to be a **trimmed mean calculation** using the following process:
  - **Level 1:** Volume Weighted Average Price ("VWAP") on current transactions; IBA will determine the eligible criteria
  - **Level 2:** Time-weighted historical eligible transactions
  - **Level 3:** Panel banks will base their submissions on related transactions/instruments

Comparison: Published LIBOR rate vs Waterfall rate



SOURCE: ISDA, "The $370 Trillion Benchmark Challenge" (https://www.isda.org/2018/02/05/the-370-trillion-benchmark-challenge/); ICE, "ICE LIBOR Evolution" (https://www.theice.com/publicdocs/ICE_LIBOR_Evolution_Report_25_April_2018.pdf)

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Review of LIBOR: Panel Banks by Currency

✓ Bank submits to this currency

Bank	USD LIBOR	GBP LIBOR	EUR LIBOR	CHF LIBOR	JPY LIBOR
BNP Paribas SA (London Branch)		✓			
Cooperative Rabobank U.A.	✓	✓	✓		
Credit Agricole Corporate & Investment Bank	✓	✓			
Deutsche Bank AG (London Branch)	✓	✓	✓	✓	✓
Société Générale (London Branch)		✓	✓	✓	✓
HSBC Bank plc	✓	✓	✓	✓	✓
Lloyds Bank plc	✓	✓	✓	✓	✓
National Westminster Bank plc	✓	✓	✓	✓	✓
Santander UK plc		✓	✓		
Barclays Bank plc	✓	✓	✓	✓	✓
Credit Suisse AG (London Branch)	✓		✓	✓	
UBS AG	✓	✓	✓	✓	✓
Citibank N.A (London Branch)	✓	✓	✓	✓	
Bank of America N.A. (London Branch)	✓				
JP Morgan Chase Bank, N.A. (London Branch)	✓	✓	✓	✓	✓
Royal Bank of Canada	✓	✓	✓		
MUFG Bank, Ltd	✓	✓	✓	✓	✓
Sumitomo Mitsui Banking Corporation Europe Limited	✓				✓
The Norinchukin Bank	✓				✓
Mizuho Bank, Ltd		✓	✓		✓

SOURCE: ICE Benchmark Administration (https://www.theice.com/iba/libor), Any reference to a specific company or security does not constitute a recommendation to buy, sell, hold or directly invest in the company or its securities.

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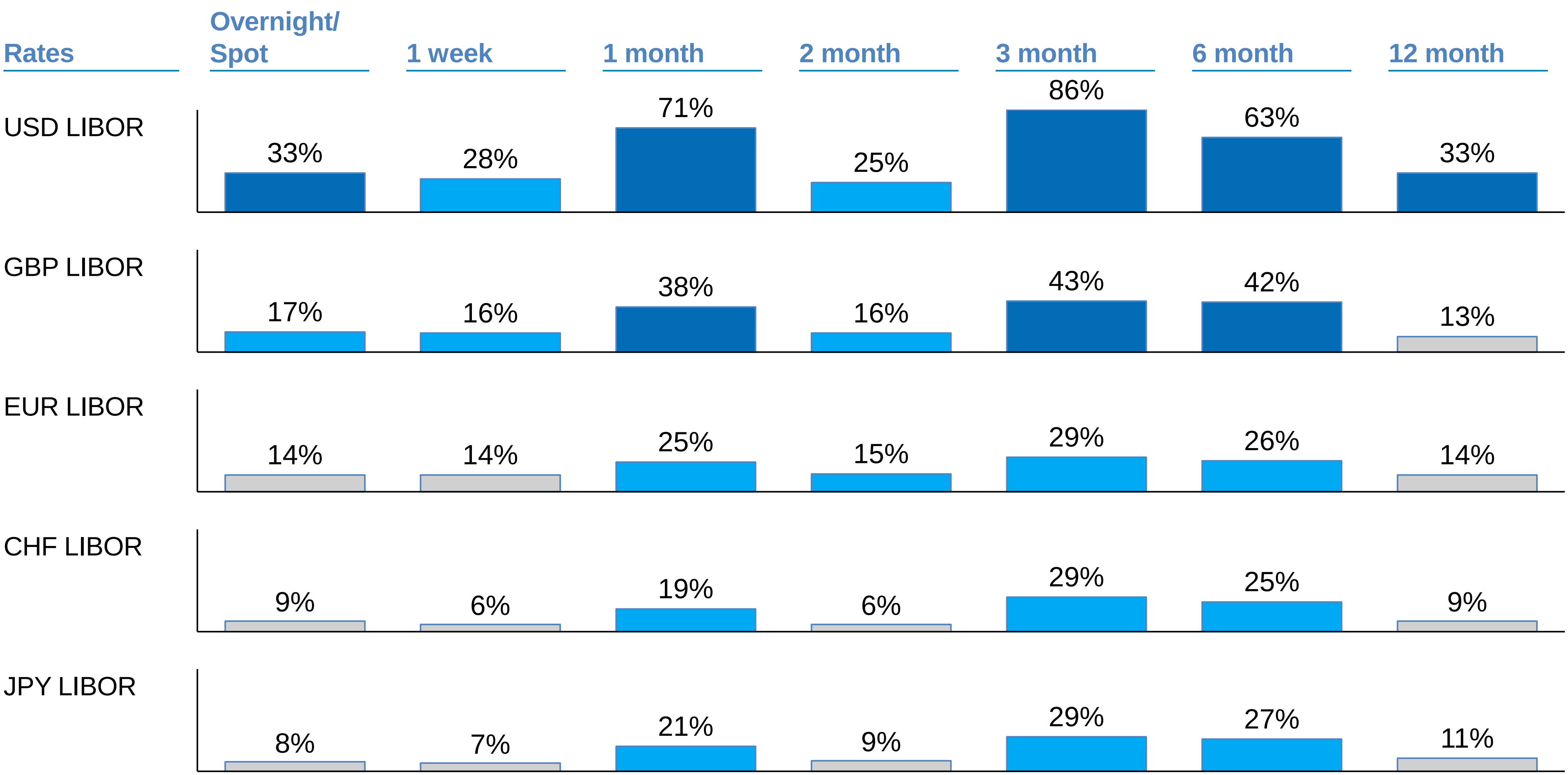
Review of LIBOR: Use by Tenor

Rare use (<15%) Medium use (15-30%) Heavy use (>30%)

Percentage of respondents to the IBA's *Survey on the Use of LIBOR* that selected such currency and tenor pair as one of the top 17 they use as of March 2019



SOURCE: ICE Benchmark Administration, press search, industry calls, Results of the IBA Survey on the Use of LIBOR, March 2019, Survey Question: "IBA would like to understand which LIBOR currency and tenor pairs you and/or your organisation use the most and for which you would like to see IBA work to seek an agreement with globally active banks to support publication after 2021. Please select up to a maximum of 17 currency and tenor pairs." n=109

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Int'l Organization of Securities Commissions (IOSCO): Principles for Financial Benchmarks

- In **July 2013**, IOSCO published the **"Principles for Financial Benchmarks"** final report with the objective of creating an **overarching framework of principles for benchmarks used in financial markets** to be followed by administrators
- These principles (summarized below) are intended to **promote the reliability of benchmark determinations** and **address benchmark governance, quality, and accountability mechanisms**
- The IOSCO principles were referenced in the **FSB's July 2014 report "Reforming Major Interest Rate Benchmarks"**, which kick-started creation of industry and regulatory working groups to select alternate risk-free rates (RFRs)

Category	Description	Principles
Governance	▪ Administrators should have the appropriate governance in place in order to protect the integrity of the benchmark determination process and to address conflicts of interest	1. Overall responsibility of the administrator 2. Oversight of third parties 3. Conflicts of interest for administrators 4. Control framework for administrators 5. Internal oversight
Quality of the benchmark	▪ The design of a benchmark should result in a reliable representation of the economic realities of the interest rate that it seeks to measure ▪ The data used to construct a benchmark should be based on prices, rates, indices, or values that have been formed in an active market	6. Benchmark design 7. Data sufficiency 8. Hierarchy of data inputs 9. Transparency of benchmark determinations 10. Periodic review
Quality of the methodology	▪ Administrators should publish or make available the methodology used to make benchmark determinations ▪ Administrators should have clear written policies and procedures to address the need for possible cessation of a benchmark	11. Content of the methodology 12. Changes to the methodology 13. Transition 14. Submitter code of conduct 15. Internal controls over data collection
Accountability	▪ Administrators should publish or make available a written complaints procedures policy, by which stakeholders may submit complaints including concerning whether a specific benchmark determination is representative of the underlying interest rate it seeks to measure	16. Complaints procedures 17. Audits 18. Audit trail 19. Cooperation with regulatory authorities

SOURCE: IOSCO, "Principles for Financial Benchmarks," July 2013 (https://www.iosco.org/library/pubdocs/pdf/IOSCOPD415.pdf); FSB, "Reforming Major Rate Benchmarks," 22 July 2014 (http://www.fsb.org/wp-content/uploads/r_140722.pdf)

Despite recent reforms, LIBOR is expected to be phased out over the next 2-3 years

- Despite recent efforts to reform existing LIBOR benchmarks, **international regulatory bodies are promoting** new interest rate benchmarks (i.e. Alternative Risk Free Rates), due to a number of factors:
  - **Limitations in the relevance** of LIBOR as a benchmark rate (e.g., it is based on expert judgment rather than actual transactions)
  - Questions around the **sustainability and stability** of LIBOR in stressed market conditions, given the lack of an active and highly liquid underlying market
  - **Instances of LIBOR manipulation** in the 2008 financial crisis and the 2012 LIBOR scandal
- As announced in July 2017 by Andrew Bailey, Chief Executive of the UK Financial Conduct Authority (FCA), **banks will no longer be compelled to submit rates** that are currently used to calculate LIBOR **after year-end 2021**
- In July 2018, Andrew Bailey further reiterated the **likelihood of LIBOR discontinuation** and the need for **market preparedness for the transition**
- Additionally, several regulators across the globe have continued to state the importance of the transition

> *"Let me immediately remind firms of their responsibility […] It is therefore an imperative that we take preparations for 2021 seriously."*
> Megan Butler, Executive Director of Supervision – Investment, Wholesale and Specialists at the FCA

> *"Every firm that has exposure to LIBOR needs to prepare now for the risk—indeed, the likelihood—that LIBOR will cease in the near future."*
> Michael Held, Executive Vice President and General Counsel, Federal Reserve Bank of New York

SOURCE: FCA, "The future of LIBOR," speech by Andrew Bailey at Bloomberg London, 27 July 2017 (https://www.fca.org.uk/news/speeches/the-future-of-libor); FCA, "Interest rate benchmark reform: transition to a world without LIBOR," speech by Andrew Bailey, 12 July 2018 (https://www.fca.org.uk/news/speeches/interest-rate-benchmark-reform-transition-world-without-libor), The economic and market forecasts presented herein are for informational purposes as of the date of this presentation. There can be no assurance that the forecasts will be achieved. Please see additional disclosures at the end of this presentation.

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Working groups have been created to identify and facilitate adoption of alternate risk-free rates

Jurisdiction	Working Group	Alternative RFR	Rate administration	Characteristics: Secured vs. Unsecured	First publication	Description
US	Alternative Reference Rates Committee	Secured Overnight Financing Rate (SOFR)	Federal Reserve Bank of New York	Secured	3 April 2018	▪ Fully transaction-based benchmark ▪ Encompasses a robust underlying market ▪ Overnight, nearly risk-free reference rate that correlates closely with other money market rates ▪ Covers multiple repo market segments, allowing future market evolution
UK	Working Group on Sterling Risk-Free Reference Rates	Reformed Sterling Overnight Index Average (SONIA)	Bank of England	Unsecured	23 April 2018	▪ Fully transaction-based benchmark ▪ Encompasses a robust underlying market ▪ Overnight, nearly risk-free reference rate ▪ Includes an expanded scope of transactions to overnight unsecured transactions negotiated bilaterally and arranged with brokers ▪ Includes a volume-weighted trimmed mean
Europe	Working Group on Risk-Free Reference Rates for the Euro Area	Euro Short-Term Rate (€STR)	European Central Bank	Unsecured	Anticipated October 2019	▪ Based upon overnight borrowing costs of banks ▪ Excludes Money Market Fund (MMF) activity ▪ Will include deposits but exclude CP/CD transactions (therefore, "some" MMF activity will be captured) ▪ Calculated as a volume-weighted trimmed mean
Switzerland	The National Working Group on CHF Reference Rates	Swiss Average Rate Overnight (SARON)	SIX Swiss Exchange	Secured	Already published prior to 2018	▪ Became the reference interbank overnight repo on 25 August 2009 ▪ Secured rate that reflects interest paid interbank overnight
Japan	Study Group on Risk-Free Reference Rates	Tokyo Overnight Average Rate (TONAR)	Bank of Japan	Unsecured	Already published prior to 2018	▪ Fully transaction-based benchmark for the uncollateralized overnight call rate market ▪ The Bank of Japan calculates and publishes the rate on a daily basis, using information provided by money market brokers known as Tanshi, as an average, weighted by the volume of transactions corresponding to the rate

SOURCE: ISDA, "IBOR Global Transition Roadmap," 1 February 2018 (https://www.isda.org/a/g2hEE/IBOR-Global-Transition-Roadmap-2018.pdf)

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Timeline: Past events in the LIBOR transition

Jul 2013
IOSCO published **"Principles for Financial Benchmarks"** highlighting the need for appropriate benchmark governance, integrity, methodology, quality and accountability

Jul 2014
FSB published **"Reforming Major Interest Rate Benchmarks,"** kickstarting creation of working groups to select alternate risk-free rates (RFRs)

Dec 2016
Tokyo Overnight Average Rate (TONAR) selected as preferred JPY RFR (already in publication)

Apr 2017
First activity in the **bilateral SARON swap market**

Apr 2017
Sterling Overnight Index Average (SONIA) selected as preferred GBP RFR, with reforms to the rate underway

Jun 2017
Secured Overnight Financing Rate (SOFR) selected as preferred USD RFR

Sep 2017
ECB announced that it will start providing an **overnight unsecured index** before 2020

Oct 2017
Swiss Average Rate Overnight (SARON) selected as preferred CHF RFR

Dec 2017
Discontinuation of TOIS fixing, replaced by **SARON**

Feb 2018
EMMI concluded **EONIA's compliance** with European Bench-marks Regulation (BMR) "cannot be warranted"

Apr 2018
New York Fed/ OFR began **publishing SOFR**

Apr 2018
Publication of **reformed Sterling Overnight Index Average (SONIA)** (BoE reforms effective)

May 2018
CME launched **SOFR futures**

Jul 2018
- LCH began **clearing SOFR swaps** with current EFFR discounting environment
- Fannie Mae issues **first SOFR-based FRN**

Sep 2018
€STR selected as recommended alternate euro RFR and EONIA replacement

Sep 2018
FCA and PRA issued **"Dear CEO Letter"**

Oct 2018
- **SOFR futures** surpass $1T in notional value
- **Capital markets issuance between SONIA** and SOFR reached >$15B

Oct 2018
CME began clearing swaps using **SOFR PAI/ discounting**

Dec 2018
Cessation of 2w, 2m, 9m EURIBOR tenors

Dec 2018
Lloyds issued **first securitization** linked to SONIA (Elland RMBS)

Q1 2019
IBA process of transitioning to the **Waterfall Methodology**

Q1 2019
EMMI published a **response to its hybrid EURIBOR consultation,** detailing calculation methodology

Mar 2019
ECB released consultation on transition path from EONIA to the €STR and €STR-based forward-looking term structure

SOURCE: ARRC Progress Timeline, 30 October 2018; ISDA, "IBOR Global Transition Roadmap 2018", 1 February 2018; EMMI, "EURIBOR and EONIA reforms," 26 February 2018

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Timeline: Future events in the LIBOR transition

April 2019
ISDA consultation to be launched for USD, HKD, and CAD

Q2-Q4 2019
Agreed upon derivatives fallback language to be included in **updated 2006 ISDA Definitions**

Q2 -Q3 2019
ISDA to ask for feedback regarding the methodology for the spread adjustment calculation

Q3-Q4 2019
Creation of term SONIA reference rate (subject to outcome of consultation)

GBP fallback language agreed upon and implemented (all asset classes)

1 Oct 2019
€STR publication begins

Q4 2019
ISDA is expected **to release protocol** and **update 2006 definitions**

ISDA consultation is expected for EURIBOR and EUR LIBOR

Expected transition to new **hybrid methodology for EURIBOR**

1 Jan 2020
Original deadline for compliance with the **EU Benchmarks Regulation (BMR)** (EONIA and/or EURIBOR no longer permitted in new contracts)

Q1 2020
CCPs to begin allowing a choice between clearing new or modified swap contracts in current PAI/ discounting environment or **SOFR PAI/ discounting**

Q2-4 2021
Creation of term SOFR reference rate
(may be earlier, depending on derivatives market activity/liquidity)

31 Dec 2021
Potential extended deadline for BMR compliance (proposed by EU MEPs)
for **critical benchmarks**

1 Jan 2022
Banks no longer compelled by the FCA to make LIBOR submissions

SOURCE: ARRC Progress Timeline, 30 October 2018; ISDA, “IBOR Global Transition Roadmap 2018”, 1 February 2018; EMMI, “EURIBOR and EONIA reforms,” 26 February 2018, The economic and market forecasts presented herein are for informational purposes as of the date of this presentation. There can be no assurance that the forecasts will be achieved. Please see additional disclosures at the end of this presentation.

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Several industry consultations and formal regulatory requests related to the transition are underway (1/2)

Interested party	Description of consultation / request	Submission deadline	Status
International Swaps and Derivatives Association (ISDA)	Consultation on technical issues related to new benchmark fallbacks for derivatives contracts that reference certain IBORs	October 22, 2018	In progress
Bank of England – Working Group on Sterling Risk-Free Reference Rates	Consultation on practical recommendations aimed at catalyzing the development of Term SONIA Reference Rates (TSRRs)	October 26, 2018	Closed
South African Reserve Bank (SARB)	Consultation on proposals for the reform of key interest rate benchmarks used in South Africa and proposals on new benchmarks that could potentially be used as reference interest rates	October 26, 2018	In progress
Federal Reserve – Alternative Reference Rates Committee (ARRC)	Consultations (x2) on USD LIBOR fallback contract language for FRNs and syndicated business loans	November 8, 2018	Closed
	Consultations (x2) on USD LIBOR fallback contract language for bilateral business loans and securitizations	February 5, 2019	
European Money Markets Institute (EMMI)	Consultation on hybrid methodology for EURIBOR	November 30, 2018	Closed
	Launched consultation for EONIA to become tracker rate for €STR	April 15, 2019	In progress
Financial Conduct Authority (FCA) **Prudential Regulation Authority** (PRA)	"Dear CEO" letter requesting a Board-approved summary including (1) quantification of firm's LIBOR exposures, (2) development and application of transition scenarios, and (3) risk assessment and mitigation plan	December 14, 2018	In progress
London Clearing House (LCH)	Consultation on transition of discounting and price alignment interest in the USD swaps market from Fed Funds to SOFR	December 14, 2018	In progress
Japanese Bankers Association TIBOR Administration (JBATA)	"1st Consultative Document" on an approach for Integrating Japanese Yen (JPY) TIBOR and Euroyen TIBOR	January 18, 2019	In progress
ECB – Working Group on Euro RFRs	Consultation on an €STR-based term structure methodology as a fallback in EURIBOR-linked contracts	February 1, 2019	Closed
	Request for feedback on the working group's proposed transition path from EONIA to €STER	February 1, 2019	Closed

SOURCE: ISDA, BoE, SARB, ARRC, EMMI, FCA, LCH, JBATA, ECB working group on euro RFRs

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Several industry consultations and formal regulatory requests related to the transition are underway (2/2)

Interested party	Description of consultation / request	Submission deadline	Status
Hong Kong Monetary Authority (HKMA)	"Dear CEO" lite letter sent to authorized institutions instructing authorized institutions be prepared for transition	N/A	N/A
Canadian Alternative Reference Rate Working Group (CARR)	Consultation on proposed enhancements to the existing Canadian Dollar Overnight Repo Rate Average (CORRA)	April 20, 2019	In progress
Swiss Financial Market Supervisory Authority (FINMA)	Questionnaire sent out to certain banks requesting feedback on to a detailed questionnaire to ensure preparation on the transition	April 30, 2019	In progress
ICE Benchmark Administration (IBA)	Request for feedback on US Dollar ICE Bank Yield Index and its methodology, particularly from cash market participants	March 31, 2019	Closed
Chicago Mercantile Exchange (CME)	Discussion document on transition of discounting and price alignment interest in the USD swaps market from Fed Funds to SOFR	N/A	In progress
Hong Kong Treasury Markets Association	Consultation regarding an alternative reference rate (HONIA) for the Hong Kong Interbank Offered Rate (HIBOR)	April 30, 2019	In progress
Swedish Bankers' Association	Consultation regarding an alternative reference rate for the Stockholm Interbank Offered Rate (STIBOR)	April 30, 2019	In progress

SOURCE: ISDA, BoE, SARB, ARRC, EMMI, FCA, LCH, JBATA, ECB working group on euro RFRs, HKMA, CARR, FINMA, IBA, CME, TMA, SBA

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ISDA Consultation on IBOR Fallbacks – Context

- In July 2018, ISDA launched a **market-wide consultation on technical issues related to new benchmark fallbacks** for derivatives contracts that reference certain IBORs
- The consultation set out options for **2 types of adjustments** that would apply to the fallback rate for derivatives contracts in the event an IBOR is permanently discontinued, given two key differences between IBORs and alternative risk-free rates (RFRs):
  - **Term-rate adjustments:** IBORs are term rates published in multiple tenors, while alternative RFRs are currently only overnight rates
  - **Credit-spread adjustments:** IBORs contain a credit spread component while alternative RFRs do not (or have less of a credit component)
- All market participants were asked to provide a qualitative assessment of their **preferences on adjustment combinations** for various IBOR-RFR pairs:
  - **9 possible combinations** of 4 term-rate and 3 credit-spread adjustments
  - **6 IBOR-RFR pairs in primary scope** (GBP LIBOR/SONIA, JPY LIBOR/TONA, TIBOR/TONAR, Euroyen TIBOR/TONAR, CHF LIBOR/SARON, BBSW/RBA cash rate AUS) with **3 pairs in secondary scope** (USD LIBOR/SOFR, EUR LIBOR/€STR, EURIBOR/€STR)
- Each participant was requested to submit **single response per institution** by the October deadline

SOURCE: ISDA, "Consultation on Certain Aspects of Fallbacks for Derivatives Referencing GBP LIBOR, CHF LIBOR, JPY LIBOR, TIBOR, Euroyen TIBOR and BSSW," 12 July 2018 (https://www.isda.org/2018/07/12/isda-publishes-consultation-on-benchmark-fallbacks/)

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Simplified example of the Historical Mean Spread applied to an adjusted RFR calculated in Arrears

Example Assumptions

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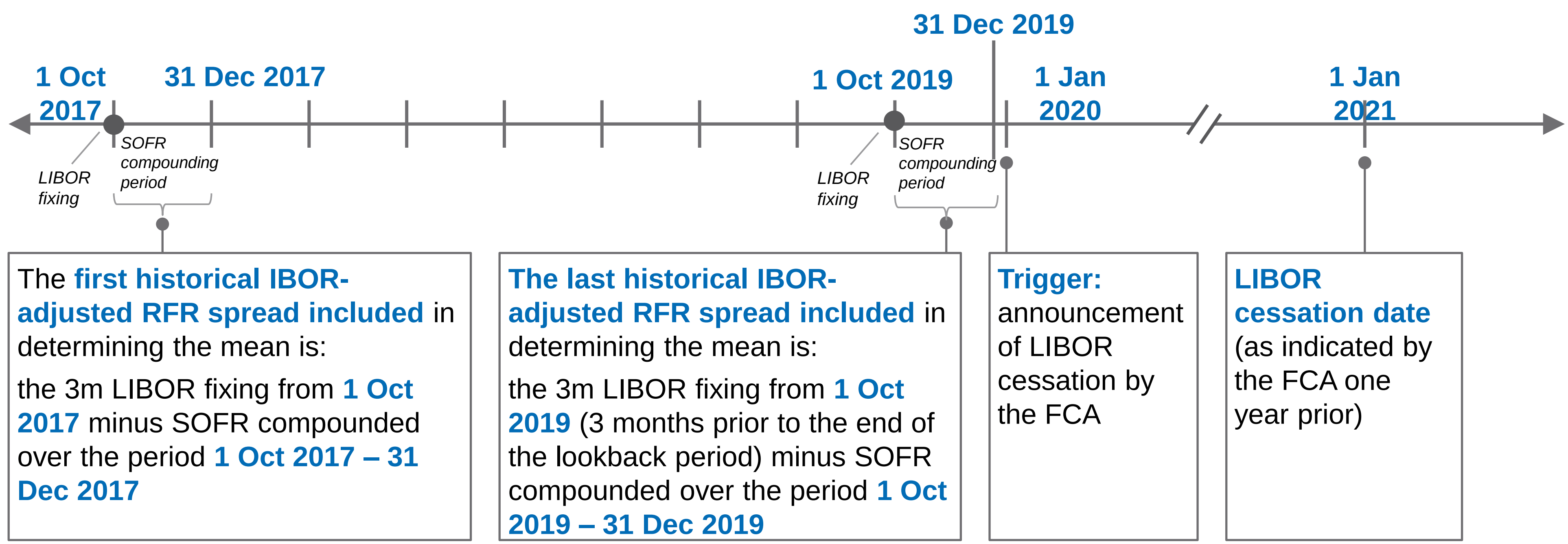
- Underlying IBOR = 3m USD LIBOR ("**3mL**")
- Alternative RFR = **SOFR**
- Historical lookback period selected by ISDA = **2 years (504 business days)**
- Announcement of LIBOR cessation by the FCA (the "**trigger**" event) occurs **1 Jan 2020** (i.e., the date prior to announcement, and the most recent data point included in the historical lookback period, is **31 Dec 2019**); LIBOR will no longer be published after **1 Jan 2021**

Illustration of credit spread calculation



SOURCE: ISDA, "Consultation on Certain Aspects of Fallbacks for Derivatives Referencing GBP LIBOR, CHF LIBOR, JPY LIBOR, TIBOR, Euroyen TIBOR and BSSW," 12 July 2018 (https://www.isda.org/2018/07/12/isda-publishes-consultation-on-benchmark-fallbacks/). These examples are for illustrative purposes only and are not actual results. If any assumptions used do not prove to be true, results may vary substantially.

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ISDA Consultation on IBOR Fallbacks – Final results

Preference indicated by majority of respondents

Details to follow

Term-rate adjustments

	Respondents' rankings	Pros / cons discussed by respondents
Spot Overnight Rate	▪ Preferred by only 2 respondents (<1.5%)	⊖ Lacks any term structure, associated with high volatility and could have large economic impact ⊖ Incompatible with other OIS derivatives ⊖ Vulnerable to manipulation and litigation risk
Convexity-adjusted Overnight Rate	▪ Preferred by only 2 respondents (<1.5%)	
Compounded Setting in Arrears Rate	▪ Preferred by the vast majority of respondents (almost 90%)	⊕ Reflects actual daily interest rate movements during the relevant period ⊕ Less volatile than spot overnight and mirrors the structure of the OIS market ⊖ Info needed to determine the rate not available at the start of the period, posing operational challenges that may impede take-up
Compounded Setting in Advance Rate	▪ Preferred by 11 respondents (<8%)	⊕ Similar advantages to setting in arrears ⊕ Data is available at the start of the period, so could be operationally easier ⊖ Backward-looking nature is disadvantageous and could result in value transfers

Credit-spread adjustments

	Respondents' rankings	Pros / cons discussed by respondents
Forward Approach	▪ Preferred by 1/3 of respondents but strictly opposed by others	⊕ Would minimize value transfers at the time of the trigger (potentially reducing legal risks) and should reflect current market spreads ⊖ Relies on market liquidity and data which may not exist at the time of trigger, in addition to being operationally complex ⊖ Vulnerable to market distortions and manipulation around the time of transition ⊖ Could lock in a spread based on a disrupted market
Historical Mean/ Median Approach	▪ Preferred by a significant majority (over 2/3) across different respondent groups ▪ Most who preferred the forward approach ranked the historical mean/median approach 2nd and would support it	⊕ Robust and most resistant to manipulation ⊕ Shorter lookback period could better reflect market conditions and have data readily available, be more resistant to manipulation, and minimize value transfer ⊖ May create value transfer or market disruption at time of trigger by not reflecting contemporaneous market conditions, as well as potential hedging issues ⊖ One-year transition would be operationally complex
Spot-Spread Approach	▪ Preferred by only 4 respondents (<3%)	⊕ Simple and somewhat resistant to manipulation (though others pointed out it may still be susceptible to manipulation) ⊖ Might capture unusual market conditions during a period of market dislocation

SOURCE: "Anonymized Narrative Summary of Responses to the ISDA Consultation on Term Fixings and Spread Adjustment Methodologies" (The Brattle Group, prepared for ISDA, 20 December 2018)

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ISDA Consultation on IBOR Fallbacks – Historical Mean/Median Approach Parameters

Parameter	Range of responses received by ISDA
Mean vs. median	▪ **49% of respondents preferred the median** while 19% preferred the mean – Median approach **removes the impact of outliers** and is more stable/less volatile than the mean Several suggested a **trimmed mean** to address the issue of outliers – Others viewed the mean as a **better reflection of the market** *because* it takes into account outliers ▪ ISDA considers these percentages **informative but not dispositive** and will continue to work with its independent advisors to determine the parameters
Historical lookback period	▪ Of the 104 respondents selecting from the provided options (5 years, 10 years, or neither), **50% selected 5 years** to balance the dual interests of **mitigating risk of manipulation** and **reflecting recent market conditions** ▪ For some respondents, longer lookback periods (e.g., 10 years or more) were preferred to capture the **full economic cycle**, while others preferred much shorter periods to **minimize value transfer** ▪ **Modifications proposed** included taking the average between a long and short lookback period, including some data between trigger and discontinuation, utilizing weighting/decay function, and taking data from a fixed date to the calibration date rather than a fixed term
Transitional period	▪ Respondents shared mixed views on the function of the **transition period – no clear consensus** ▪ Those supporting the one-year transition period noted the ability to create a **linkage to current market conditions** ▪ Opponents noted the **additional complexity** which may not outweigh the supposed value in smoothing spreads toward the historical average, including potential **valuation difficulties** attributed to variable spreads when pricing a single instrument

SOURCE: “Anonymized Narrative Summary of Responses to the ISDA Consultation on Term Fixings and Spread Adjustment Methodologies” (The Brattle Group, prepared for ISDA, 20 December 2018)

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ISDA Timeline

Jan - July 2019
- ISDA Benchmark Working Groups **discuss "compounded setting in arrears rate"**
- ISDA and The Brattle Group to **analyze and perform sensitivity analysis on the "historical mean/median approach" to the spread adjustment**

Jan – Sep/Dec 2019
- **Public sector antitrust/competit-ion review** of calculation methodology

Aug – Sep 2019
- **Finalize amendments to 2006 ISDA Definitions and protocol** to include amended definitions in existing transactions

Q4 2019
- **ISDA consultation expected** for EURIBOR and EUR LIBOR
- **Expected launch of final amendments to 2006 ISDA Definitions and protocol**, with effective date approximately three months after release for all rates except for EURIBOR and EUR LIBOR

April 2019, with 8-week comment period
- **ISDA consultation** for USD, HKD and CAD
- Request for **market feedback on pre-cessation issues** and related document solutions for derivatives

May 2019
- **Selection of vendor** to publish adjustments

July 2019, with 4-6 week comment period
- **Publication of complete methodology** to be implemented and questions regarding open issues for **public review and comment**

Confidential

SOURCE: ISDA, "Letter to FSB OSSG", 10 April 2019. The economic and market forecasts presented herein are for informational purposes as of the date of this presentation. There can be no assurance that the forecasts will be achieved. Please see additional disclosures at the end of this presentation.

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ISDA Fallbacks: Discontinuation of select tenors

2013 ISDA Discontinue Rates Maturities Protocol

- Swap market participants that adhere to the **2013 ISDA Protocol include the following language** in confirmations for covered transactions:

  "This Confirmation incorporates the terms of the ISDA 2013 Discontinued Rates Maturities Protocol […]. If an Affected Discontinued Rate or an Affected Interpolated Rate is to be determined for a Reset Date for this Protocol Covered Transaction for which (a) there is no Overriding Fallback Provision therefor, and (b) the Fixing Date(s) therefor occurs (i) on or after the Amendment Effective Date for this Protocol Covered Transaction and (ii) on or after the Discontinuation Date for the relevant Affected Discontinued Rate(s), then notwithstanding anything to the contrary herein, ***the rate used in lieu of such Affected Discontinued Rate or such Affected Interpolated Rate, as applicable, for such Reset Date shall be the Interpolated Rate in relation to such Affected Discontinued Rate or such Affected Interpolated Rate****, as applicable, for such Reset Date."*

- According to these provisions, unless the trade confirmation provides its own fallback for how to determine the rate once a referenced maturity is discontinued, the **rate will be determined through interpolation**

Implications for discontinuation of select tenors

- According to the 2013 ISDA Protocol, **if the discontinued tenor can be interpolated** (i.e., 6-month USD LIBOR can be interpolated using 3-month and 12-month USD LIBOR), **the rate discontinuation trigger does not apply and fallback provisions are therefore not triggered**
- However, **if an overnight or 12-month rate is discontinued, the rate discontinuation trigger applies** since these tenors cannot be interpolated
- When applicable, the **interpolated rate data will be included in the historical time series** if the date range is covered
- For example, as of December 3, 2018, EMMI **ceased to publish the 2-week, 2-month, and 9-month EURIBOR tenors**; these tenors would be interpolated if referenced in a derivative contract and fallback provisions would not be triggered, since the overnight and 12-month tenors continue to be published

SOURCE: ISDA (https://www.isda.org/2018/06/06/euribor-discontinuation-of-tenors/)

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ISDA Consultation on IBOR Fallbacks – Reactions by central counterparty clearing houses

CCP	Reaction
London Clearing House (LCH)	▪ On December 20, 2018 (but prior to the ISDA release of final consultation results), LCH issued Circular No. 3999, in which the clearing house announced its **intention to incorporate ISDA's recommended fallbacks "as soon as they are made available"** in both new and outstanding derivatives contracts
CME Clearing	▪ On December 21, 2018 (after the release of the final ISDA consultation results), CME announced that it **intends to align with ISDA** with respect to revised fallback language in their rules ▪ CME noted that they "**[reserve] the right to make necessary adjustments** based on consultations with [their] clients"
Others	▪ It is expected that other major clearing houses (e.g., ICE, Eurex, Nasdaq Clearing) will follow LCH and CME's lead in **adopting ISDA's recommended fallbacks in their respective rulebooks**, potentially after consultation with members of each CCP

SOURCE: LCH Circular No. 3999, "LCH's position in respect of ISDA's recommended Benchmark Fallback Approaches," 20 December 2018 (https://www.lch.com/membership/ltd-membership/ltd-member-updates/lchs-position-respect-isdas-recommended-benchmark); CME Group announcement, 21 December 2018

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2nd Public Consultation by the Euro Working Group

Determining an €STR term structure methodology as a EURIBOR fallback

Consultation details

- The working group is seeking **feedback on the need for term rates in different products and on the analysis of the following four forward-looking methodologies** building on as yet non-existent €STR-based derivatives markets **for deriving a euro risk-free term rate**:
  - **OIS transactions-based methodology**: Uses actual EUR OIS transaction data to construct a term rate representing the future market expectation for the €STR overnight rate
  - **OIS quotes-based methodology**: Uses the mid-price for OIS quotes obtained from regulated electronic trading venues
  - **OIS composite methodology**: Combines the quotes-based methodology with any available transaction data to produce a composite rate derived from the two data sources according to certain weightings
  - **Future-based methodology**: Uses a sequence of overlapping futures to extract expected levels of the RFR between ECB monetary decision dates
- The working group currently believes the **OIS quotes-based methodology is the most likely to be viable**. However, as derivatives markets referencing €STR develop, a futures-based methodology could present advantages

	Pros	Cons
01 OIS transactions-based methodology	• Provided sufficient transactions and volumes are available, least risk of manipulation • Simple to understand	• Reliant on sufficient volumes in spot transactions • Reliant on sufficient activity in the market in all monetary policy conditions • Not suitable for a point-in-time fixing
02 OIS quotes-based methodology	• Robust even when only a limited number of actual transactions available • Basic methodology already in use for BMR/IOSCO benchmarks (for example ICE Swap rate) • Underlying data comes from heavily regulated sources	• Not based on actual transactions • Reliant on dealers providing liquidity on individual electronic trading platforms with tight bid/ask pricing
03 OIS composite methodology	• Robust even when only a limited number of actual transactions available	• Operationally challenging • Agreement on decision paths under different liquidity scenarios • Not suitable for a point-in-time fixing
04 Futures-based methodology	• Simple from a modelling perspective • Transparent and robust • Rate directly reconstructable by market participants • Based on a heavily regulated underlying market • Less open to manipulation	• Model risk related to the model calibration • Reliant on liquid Future markets • Understanding for the real economy potentially challenging • Model assumptions may not match economic reality • An administrator may not be comfortable with the influence they have on the model

Consultation Results

On March 14th 2019, the ECB working group release results from their consultation:

"The working group on euro risk-free rates ***recommends the OIS (tradable) quotes-based methodology as the €STR-based forward-looking term structure*** *methodology as a fallback to Euribor-linked contracts within a reasonable time period following the launch of the daily €STR publication.*

It acknowledges that a successful transition from EONIA to the €STR is needed with (i) significant transfer of liquidity to €STR OIS markets, (ii) transparent and regulated underlying derivatives markets such as trading on multilateral trading facilities (MTFs), (iii) sufficient sources of data."

SOURCE: ECB, "Second public consultation by the working group on euro risk-free rates," December 2018 (https://www.ecb.europa.eu/paym/pdf/cons/euro_risk-free_rates/ecb.consultation_details_201812.en.pd

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Working Group on Euro RFRs: Recommendations on the transition from EONIA to €STR

Possible transition paths

Parallel run approaches *(voluntary market-led transition)*

Contractual alternative approaches *(EONIA discounting regime ceases after a discounting switch date)*

Pure succession rate approaches *(EONIA publication ceases as of succession date and €STR is used)*

Recalibration approaches *(EONIA methodology becomes dependent on €STR; preferred option among recalibration approaches is time-limited recalibration with spread and single discounting)*

Working Group's recommendations to EMMI (administrator of EONIA)

- **Before January 1, 2020:**
  - **Modify the current EONIA methodology** to become **€STR plus a spread** (€STR +/- X bps) in accordance with FSB recommendations and IOSCO principles
  - Engage with relevant authorities to **ensure the compliance of EONIA**, under its evolved methodology, **with the EU Benchmarks Regulation**
  - Consider and **consult market participants on discontinuing the publication of EONIA** under its evolved methodology after a transition period ending YE 2021
- Consider an EONIA-€STR spread methodology based on a **simple average with an observation period of at least 12 months**, combined with a **15% trimming mechanism**
- The effective determination of the spread be **announced before €STR's first day of publication** and the recalibration date be on the first day of €STR's publication

Working Group's recommendations to / request of market participants

- Gradually **replace EONIA with €STR as a reference rate for all products and contracts** and make all adjustments necessary for using €STR as their standard benchmark after the transition period (including making the appropriate changes to systems to enable a T+1 publication)
- Make all **reasonable efforts to replace EONIA with €STR as a basis for collateral interest** for both legacy and new trades with each of its counterparties (clean discounting)

SOURCE: ECB, "Report by the working group on euro risk-free rates on the transition from EONIA to €STR," December 2018 (https://www.ecb.europa.eu/paym/pdf/cons/euro_risk-free_rates/ecb.eoniatransitionreport201812.en.pdf)

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EMMI Consultation on EURIBOR calculation methodology

Context

- The **European Money Markets Institute (EMMI)** administers the following two indexes: **EURIBOR**, the money market reference rate for the euro, and **EONIA,** the effective overnight reference rate for the Euro
- In May 2017, EMMI announced its **plans to transition from the current quote based calculation methodology of EURIBOR to a transaction-based methodology**, known as the "**hybrid methodology**" to comply with EU Benchmarks Regulation (BMR) and solicited consultation from stakeholders
- In February 2019, EMMI published a **response to its hybrid EURIBOR consultation** by providing detailed information regarding which transactions (e.g., minimum trade size) **are eligible to be considered for Level 1 and Level 2 submissions** in the hybrid three tier calculation hierarchy
- In February 2019, EMMI announced its intention to apply for authorization as the administrator of EURIBOR to the Belgian FSMA and begin to **transition to the hybrid EURIBOR methodology in Q2 2019**

Previous calculation of EURIBOR

- 19[1] **Panel Banks submit their belief** of what one prime bank would quote another prime bank for **interbank term deposits** within the euro zone for various tenors

Hybrid calculation of EURIBOR[2]

- Each individual **Panel Bank's daily contribution**, for each Defined Tenor, will be determined on the **basis of one of the following three levels**:
  - Level 1: **"Eligible Transactions",** that meet defined requirements such as currency (Euro), trade size (EUR 20MM), trade date (occur on target date), settlement date (T, T+1, T+2), defined maturity windows, approved counterparties and trade type (fixed rate, or floating rate transactions referenced to the unsecured euro overnight interest rate where panel bank can report a fixed rate equivalent)
  - Level 2: **Interpolation from transactions that are near "Eligible"** (e.g., occurred with securities with non-matching tenors or on near target days), in the following hierarchy:
    - 2.1 Adjusted linear interpolation from adjacent Defined Tenors
    - 2.2 Transactions at non-Defined Tenors
    - 2.3 Eligible transactions from prior dates
  - Level 3: **Transactions in the underlying Interest** that were excluded from Level 1 and Level 2 contributions, and/or other **data from a range of markets** closely related to the unsecured euro money market

1 Belfius; BNP-Paribas; HSBC; Natixis; Crédit Agricole s.a.; Société Générale; Deutsche Bank; DZ Bank; National Bank of Greece; Intesa Sanpaolo; UniCredit; Banque et Caisse d'Épargne de l'État; ING Bank; Caixa Geral De Depósitos (CGD); Banco Bilbao Vizcaya Argentaria; Banco Santander; CECABANK; CaixaBank S.A.; Barclays
2 https://www.emmi-benchmarks.eu/assets/files/D0034A-2019%20Euribor%20Hybrid%20Methodology_2019_02_12.pdf

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ARRC Recommended Fallback Language

Floating Rate Notes and Syndicated Loans

		Description/ overall rationale for fallback	Triggers	Fallback waterfall	Adjustments
Floating Rate Notes[1]		▪ Recommended language that can **voluntarily** be incorporated into documentation for new FRNs	▪ **Public statement** by Benchmark administrator (IBA) or a supervisory governmental authority (FCA, FED, bankruptcy/resolution court with jurisdiction) to the administrator that they will **discontinue the Benchmark.** Replacement date would be **cessation date** ▪ Public statement by a supervisory governmental authority that the Benchmark is **no longer representative**	▪ **Interpolated** LIBOR ▪ **Term SOFR** + Adjustment ▪ **Compounded SOFR** + Adjustment – In **arrears** – Flexibility built into language to reflect **evolving market conventions (e.g., lookback vs. lockout)** – Option for market participants to **change to "Simple Average SOFR"** ▪ Replacement rate **recommended by Relevant Governmental Body** + Adjustment ▪ **ISDA** Fallback Rate + Adjustment ▪ **Issuer Selected** Rate + Adjustment	▪ **ARRC** Selected ▪ **ISDA** Fallback ▪ **Issuer** Selected
Syndi-cated Loans[2]	**Hardwire approach**	▪ Provides clarity and consistency by using **clear, observable** triggers and successor rates with Adjustment adjustments and obviates the need for seeking consent for an amendment in many cases ▪ Includes an **additional "Early Opt-in Trigger"** to leverage syndicated loans' natural flexibility to reduce risk by **reducing the inventory of LIBOR-based loans prior to discontinuation**	▪ **Cessation and representativeness** triggers detailed above ▪ **Early Opt-in Trigger** – Notification by the Administrative Agent that **at least [X] currently outstanding U.S. dollar-denominated syndicated credit facilities at such time contain Term SOFR plus a Benchmark Replacement Adjustment** – **The joint election** by the Administrative Agent, the Borrower and the Required Lenders that an Early Opt-in Election has occurred	▪ **Term SOFR** + Adjustment ▪ **Next Available Term SOFR** + Adjustment ▪ **Compounded SOFR** + Adjustment – In **arrears or advance** – Flexibility built into language to reflect **evolving market conventions (e.g., lookback vs. lockout)** – Option for market participants to **change to "Simple Average SOFR"** ▪ **Borrower and Administrative Agent Selected Rate** + Adjustment	▪ **ARRC** Selected ▪ **ISDA** Fallback ▪ **Borrower and Administrative Agent** Selected
	Amend-ment approach	▪ **All decisions about successor rate and adjustment will be made in the future**. This may be appropriate before market has further visibility into replacement rates ▪ Includes an **additional "Early Opt-in Trigger" for same reason as the hardwire approach**	▪ **Cessation and representativeness** triggers detailed above ▪ **Early Opt-in Trigger** – Determination that **U.S. dollar-denominated syndicated credit facilities are being executed or amended**, as applicable, to incorporate or adopt a new benchmark interest rate to replace LIBOR – **The election** by the Administrative Agent or by the Required Lenders to declare that an Early Opt-in Election has occurred	▪ **The borrower and the administrative agent select a successor rate** (which may, but need not, be a SOFR term rate) – Due consideration given to any recommendation by the **Relevant Governmental Body or any evolving or then prevailing market convention**	▪ **The borrower and the administrative agent select an adjustment,** considering any recommendation by the **Relevant Governmental Body or any evolving or then prevailing market convention**

1 ARRC Recommendations regarding more robust fallback language for new issuances of LIBOR floating rate notes

2 ARRC Recommendations regarding more robust fallback language for new issuances of LIBOR syndicated loans

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ARRC Recommended Fallback Language

Floating Rate Notes[1]

Description	▪ Recommended language that can **voluntarily** be incorporated into documentation for new FRNs
Triggers	▪ Public statement by Benchmark administrator (IBA) or a supervisory governmental authority (FCA, FED, bankruptcy/resolution court with jurisdiction over the administrator) that they will **discontinue the Benchmark** – Replacement date would be **cessation date** ▪ Public statement by the regulatory supervisor for the administrator of the Benchmark announcing that the Benchmark is **no longer representative**

Replacement Rate Waterfall

Fallback 1	**Interpolated** LIBOR
Fallback 2	**Term SOFR** + Benchmark Replacement Adjustment
Fallback 3	**Compounded SOFR** + Benchmark Replacement Adjustment ▪ In **arrears** ▪ Flexibility built into language to reflect **evolving market conventions (e.g., lookback vs. lockout)** ▪ Option for market participants to **change to "Simple Average SOFR"**
Fallback 4	Replacement rate **recommended by Relevant Governmental Body** + Benchmark Replacement Adjustment
Fallback 5	**ISDA** Fallback Rate + Benchmark Replacement Adjustment
Fallback 6	**Issuer Selected** Rate + Benchmark Replacement Adjustment

Benchmark Replacement Adjustment Waterfall

- **ARRC** Selected Adjustment
- **ISDA** Fallback Adjustment[2]
- **Issuer** Selected Adjustment

1 ARRC Recommendations regarding more robust fallback language for new issuances of LIBOR floating rate notes
2 If the Replacement Rate is equivalent to the ISDA Fallback Rate

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Common FRN Fallback Language Sequence

Original Floating Rate

"LIBOR will be the rate for deposits… commencing on the second London Business Day immediately following that LIBOR Interest Determination Date, **that appears on the LIBOR Page**… **as of 11:00 A.M.**, London time, on that LIBOR Interest Determination Date."

Check data on LIBOR01 Page (on Reuters Screen or such other page as may replace the LIBOR01 page on that service**)** → **If yes** ✓

If no

"[T]he Calculation Agent shall request the principal offices … **four major reference banks**… in the London interbank market **and will request… such bank's quotation of the rate** (3M$ deposit rate for >$1mm) … If at least two such quotations are provided, then **LIBOR… will be the arithmetic mean** of such quotations." → **If yes** ✓

If no

"If fewer than two quotations are provided, then **LIBOR… will be the arithmetic mean** of the rates **quoted** (3M$ deposit rate for >$1mm)… **in the applicable Principal Financial Center… by three major banks**… selected by the Calculation Agent" → **If yes** ✓

If no

- **Discretion of the calculation agent**
- **Use the rate from the immediately preceding interest determination date**
- **Use the last reported LIBOR rate**

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ARRC Recommended Fallback Language

Syndicated Loans[1]

	Description	Triggers	Replacement Rate	Benchmark Replacement Adjustment
Hardwired approach	▪ Recommended language that can **voluntarily** be incorporated into documentation for new syndicated loans ▪ Uses **clear, observable triggers** and successor rates with spread adjustments, including an **additional "Early Opt-in Trigger"**	▪ **Public statement** by Benchmark administrator (IBA) or a supervisory governmental authority (FCA, FED, bankruptcy/resolution court with jurisdiction over the administrator) that they will **discontinue the Benchmark** – Replacement date would be **cessation date** ▪ Public statement by the regulatory supervisor for the administrator of the Benchmark announcing that the Benchmark is **no longer representative** ▪ **Early Opt-in Trigger** – Notification by the Administrative Agent that **at least [X] currently outstanding U.S. dollar-denominated syndicated** credit facilities at such time contain Term SOFR plus a Benchmark Replacement Adjustment – The **joint election** by the Administrative Agent, the Borrower and the Required Lenders that an Early Opt-in Election has occurred	▪ **Term SOFR** + Benchmark Replacement Adjustment ▪ **Next Available Term SOFR** + Benchmark Replacement Adjustment ▪ **Compounded SOFR** + Benchmark Replacement Adjustment – In **arrears or advance** – Flexibility built into language to reflect **evolving market conventions (e.g., lookback vs. lockout)** – Option for market participants to **change to "Simple Average SOFR"** ▪ **Borrower and Administrative Agent Selected Rate** + Benchmark Replacement Adjustment	▪ **ARRC** Selected Adjustment ▪ **ISDA** Fallback Adjustment ▪ **Borrower and Administrative Agent** Selected Adjustment
Amendment approach	▪ Recommended language that can **voluntarily** be incorporated into documentation for new syndicated loans ▪ All decisions about successor rate and adjustment will be **made in the future** ▪ Includes an **additional "Early Opt-in Trigger"**	▪ **Public statement** by Benchmark administrator (IBA) or a supervisory governmental authority (FCA, FED, bankruptcy/resolution court with jurisdiction over the administrator) that they will **discontinue the Benchmark** – Replacement date would be **cessation date** ▪ Public statement by the regulatory supervisor for the administrator of the Benchmark announcing that the Benchmark is **no longer representative** ▪ **Early Opt-in Trigger** – Determination that **U.S. dollar-denominated syndicated credit facilities are being executed or amended**, as applicable, to incorporate or adopt a new benchmark interest rate to replace LIBOR – **The election** by the Administrative Agent or by the Required Lenders to declare that an Early Opt-in Election has occurred	▪ **The borrower and the administrative agent select a successor rate** (which may, but need not, be a SOFR term rate) – Due consideration given to any recommendation by the **Relevant Governmental Body or any evolving or then prevailing market convention**	▪ **The borrower and the administrative agent select** a Benchmark Replacement adjustment, considering any recommendation by the **Relevant Governmental Body or any evolving or then prevailing market convention**

1 ARRC Recommendations regarding more robust fallback language for new issuances of LIBOR syndicated loans

Contents

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Overview of changes to global benchmark landscape

Primary benchmarks in use

USD	USD LIBOR	▪ Indicates the average rates at which panel banks could obtain wholesale, unsecured funding for set periods in USD ▪ Based on quotes from 16 panel banks ▪ Published by ICE in the same 7 tenors as all LIBORs
GBP	GBP LIBOR	▪ Indicates the average rates at which panel banks could obtain wholesale, unsecured funding for set periods in GBP ▪ Based on quotes from 16 panel banks ▪ Published by Intercontinental Exchange (ICE) in 7 tenors: overnight/spot next, 1w, 1m, 2m, 3m, 6m and 12m
EUR	EUR LIBOR	▪ Indicates the average rates at which panel banks could obtain wholesale, unsecured funding for set periods in EUR ▪ Based on quotes from 15 panel banks ▪ Published by ICE in the same 7 tenors as all LIBORs
EUR	EURIBOR	▪ Rate at which euro interbank term deposits are being offered by one prime bank to another within the EMU zone ▪ Based on quotes from 20 panel banks (from 44 in 2012) ▪ Published by European Money Markets Institute (EMMI) in 8 tenors (1w, 2w, 1m, 2m, 3m, 6m, 9m, and 12m) with 2w, 2m, and 9m ceasing after 3 Dec 2018 ▪ Reforms underway, which may enable continuation of EURIBOR beyond 2021
EUR	EONIA	▪ Reflects all overnight unsecured lending transactions in the interbank market, initiated within the euro area by panel banks ▪ Based on quotes from 28 panel banks (80% of data from 5 banks) ▪ Published by EMMI in one tenor (overnight) ▪ Expected to be non-compliant with EU BMR and thus discontinued after 2021
CHF	CHF LIBOR	▪ Indicates the average rates at which panel banks could obtain wholesale, unsecured funding for set periods in CHF ▪ Based on quotes from 11 panel banks ▪ Calculated and published by ICE in the same 7 tenors as all LIBORs
JPY	JPY LIBOR	▪ Indicates the average rates at which panel banks could obtain wholesale, unsecured funding for set periods in JPY ▪ Based on quotes from 12 panel banks
JPY	JPY Tokyo Interbank Offered Rate (TIBOR)	▪ Reflects prevailing rates in the unsecured interbank call market ▪ Based on quotes from 15 panel banks ▪ Calculated and published by the Japanese Bankers Association (JBA) TIBOR Administration in 6 tenors: 1w, 1m, 2m, 3m, 6m, 12m ▪ Reforms underway (may be integrated with Euroyen TIBOR)
JPY	Euroyen TIBOR	▪ Reflects prevailing rates in the Japan Offshore Market ▪ Based on quotes from 14 panel banks ▪ Calculated and published by the JBA TIBOR Administration in 6 tenors: 1w, 1m, 2m, 3m, 6m, 12m ▪ Reforms underway (may be integrated with JPY TIBOR)

Preferred alternative risk-free rates (RFRs)

Secured Overnight Financing Rate (SOFR)	▪ Secured ▪ Fully transaction-based, covering multiple repo market segments ▪ First published Apr 2018
Reformed Sterling Overnight Index Average (SONIA)	▪ Unsecured ▪ Fully transaction-based; reforms have expanded scope to include o/n transactions negotiated bilaterally and with brokers ▪ "Reformed" SONIA first published in Apr 2018; SONIA had been used as OIS reference rate prior
Euro Short-Term Rate (€STR)	▪ Unsecured ▪ Based on o/n borrowing costs of banks, excluding most MMF activity ▪ Anticipated Oct 2019 ▪ Selected as replacement for EONIA in OIS contracts
Swiss Average Rate Overnight (SARON)	▪ Secured ▪ Reflects interest paid interbank overnight ▪ Established rate
Tokyo Overnight Average Rate (TONAR)	▪ Unsecured ▪ Fully transaction-based, reflecting the uncollateralized overnight call rate market ▪ Established rate

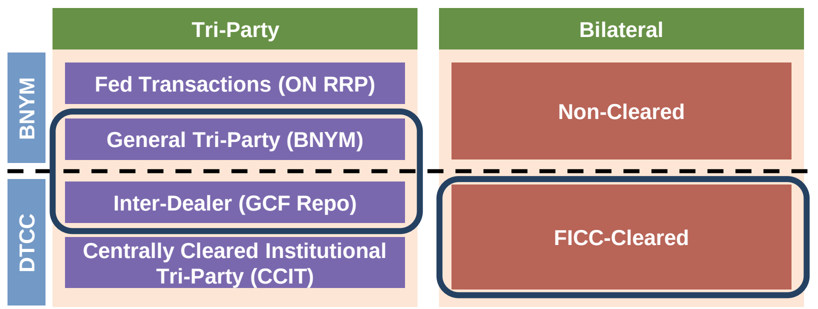
SOURCE: ISDA IBOR Global Transition Roadmap, Feb 1, 2018 (https://www.isda.org/a/g2hEE/IBOR-Global-Transition-Roadmap-2018.pdf)

What is SOFR?

Secured Overnight Finance Rate (SOFR) – USD LIBOR alternative recommended by ARRC

Calculation and administration

- Volume-weighted median of transaction-level tri-party repo data collected from the Bank of New York Mellon (BNYM) and the Depository Trust and Clearing Corporation (DTCC):
  - **Tri-party Treasury general collateral repo transactions** cleared and settled by Bank of New York Mellon, excluding repo transactions made through the Fixed Income Clearing Corporation General Collateral Financing repo market (FICC GCF), and excluding transactions in which the Federal Reserve is a counterparty
  - **Tri-party Treasury general collateral repo transactions** made through the FICC GCF repo market, for which FICC acts as central counterparty
  - **Bilateral Treasury repo transactions** cleared through the FICC Delivery-versus-Payment service



- Based on real and observable underlying repo transactions ($800B market) producing a stable, reliable and accurate reference rate
- Published daily at 8 am ET based on the prior day's trading activity
- Daily survey of primary dealers' overnight repo borrowing will act as a potential contingency data source
- Subject to extensive oversight, including regular review by oversight bodies and comprehensive Ethics and Conflicts of Interest policies for staff

Characteristics

- Secured
- Fully transaction-based
- Encompasses a robust underlying market
- Overnight, nearly risk-free reference rate that correlates closely with other money market rates
- Covers multiple repo market segments allowing for future market evolution

Key milestones

- First published on 3rd April 2018 based on the data for the prior day
- Fannie Mae issued the first SOFR-linked security on 26th July 2018 and the transaction was well received by the market and investors
- An index for SOFR swaps has been built and forward curves have also been developed to be used for discounting purposes
- With the futures market quoted out to 2yr, the rate is organically being adopted by the broader market

SOURCE: Federal Reserve

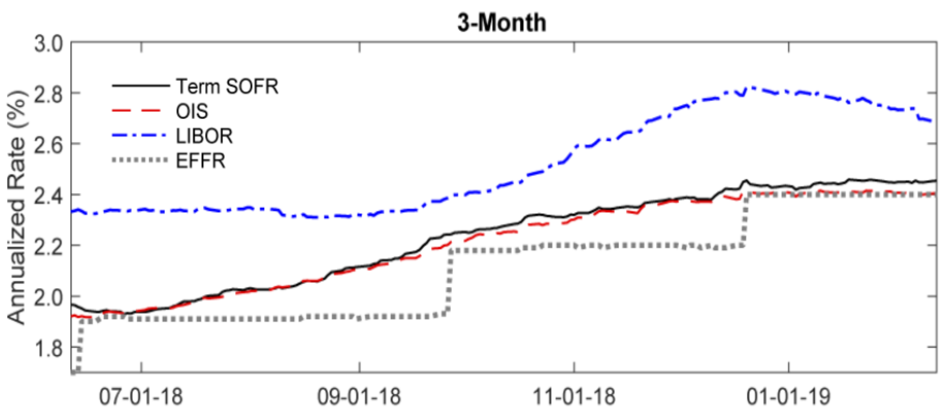
Goldman Sachs

Indicative forward-looking SOFR term rates[1]

Description, methodology and potential future uses

Background to the indicative term rate

- Two Fed economists introduced an **approach to inferring** indicative **forward-looking SOFR term rates**
- The rates they approximate are **conceptually similar to the term LIBOR rates** that are currently in use
- Their approach uses **transaction prices for SOFR futures** contracts to infer forward interest rates
- The derived term rates are **encouraging**
  - Term rates are **less volatile** than the overnight rate
  - Term SOFR rates **closely track Fed Funds** OIS rates
  - FOMC's September and December **rate hikes were anticipated** by SOFR futures markets
- Their approach and the rates they have indicated are intended for **informational purposes only**



Calculation methodology

- The rates are underpinned by **end-of-day CME-traded SOFR futures** contracts
- The model uses **one-month and three-month futures** contracts to estimate **term rates up to six months out,** as it is constrained by currently traded instruments and volumes
- The model makes **simplifying assumptions** to pin down expected forward rate paths by estimating the size of rate changes on a small number of fixed dates:
  - Expected forward SOFR rates potentially jump up or down on **scheduled Federal Open Market Committee (FOMC) policy rate announcement dates**
  - Expected forward SOFR rates remain **constant between meeting dates**
- The size and direction of forward rate jumps on future FOMC announcement dates is estimated by using the **observed prices of derivatives whose settlement value depends on the forward rate path**
- To estimate forward rates out to a specific horizon, the approach observes prices for **several contracts with settlement windows collectively spanning the time horizon**

Potential future uses

- **Given sufficient market liquidity, the approach could**
  - Estimate SOFR term rates for tenors longer than six months
  - Leverage intraday prices over a narrow trading window
  - Integrate prices from futures contracts beyond CME, to include ICE, other exchanges, and OTC swaps
  - Weight contracts by measures of market depth or trading volume
- **These timely prices would make the forward-looking term rates more appropriate for commercial contracts**

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

SOFR: ARRC Paced Transition Plan and anticipated vs. actual timing

2018 – 2019 | **2020 – 2021**

ARRC Paced Transition Plan

Infrastructure

April 3, 2018: New York Fed/ OFR begins publishing SOFR

Bilateral trading

By year-end 2018: Trading begins in futures and/or bilateral, un-cleared OIS that reference SOFR

Cleared OIS

2019 Q1: Trading begins in cleared OIS that reference new rate in the current (EFFR) PAI environment

New/modified swap contracts

2020 Q1: CCPs begin allowing market participants a choice between clearing new or modified swap contracts (benchmarked to EFFR, LIBOR, and SOFR) into the current PAI/ discounting environment or one that uses SOFR

CCP changes

2021 Q1: CCPs no longer accept new swap contracts for clearing with EFFR as PAI and discounting, except to close out or reduce outstanding risk in legacy contracts that use EFFR as PAI/ discounting. Existing contracts using EFFR as PAI/ discounting continue to exist in the same pool, but would roll off over time as they mature or are closed out

Term rate

By year-end 2021: Creation of a forward-looking term reference rate based on SOFR-derivatives markets once liquidity has developed sufficiently to produce a robust rate

Comple-ted steps

2018 H2: Infrastructure for futures and/or OIS trading in SOFR put in place by ARRC members ***(completed as anticipated)***

May 7, 2018: CME begins to publish SOFR futures ***(completed earlier than anticipated)***

July 18, 2018: LCH begins clearing SOFR swaps ***(completed earlier than anticipated)***

October 1, 2018: CME begins clearing SOFR swaps ***(completed earlier than anticipated)***

October 1, 2018: CME begins clearing SOFR swaps using SOFR PAI/ discounting ***(completed earlier than anticipated)***

SOURCE: Federal Reserve, "ARRC Progress Timeline," 30 October 2018 (https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2018/ARRC-Progress-Timeline-Oct-30.pdf)

What is reformed SONIA?

Reformed Sterling Overnight Index Average (SONIA) – GBP LIBOR alternative recommended by Sterling WG

Calculation and administration

- Widely used interest rate benchmark and the reference rate for sterling Overnight Indexed Swaps (OIS)
- Defined as the measure of the rate at which interest is paid on sterling short-term wholesale funds in circumstances where credit, liquidity and other risks are minimal
- Measured as the trimmed mean of interest rates paid on eligible sterling denominated deposit transactions (unsecured transactions of one business day maturity greater than or equal to 25MM GBP reported to the Bank's Sterling Money Market daily data collections)
- Published daily at 9 am ET based on the prior day's trading activity
- Extensive oversight, including governance arrangements in line with international regulatory best practice for benchmark administration:

The Bank as Administrator of SONIA
Deputy governor of Markets and Banking is responsible under Senior Manager's Regime

Fed Transactions (ON RRP)
Day-to-day activities undertaken across Markets and Statistics, with appropriate segregation of duties

Second line of defence
A central Bank-wide risk function and a compliance division provide independent forward-looking assessment and challenge of risks across operations and business areas

Third line of defence
Internal and External Auditors independently and objectively evaluate internal controls, risk management and governance processes

Characteristics

- Viable even with lower transactional volumes should there be any material structural changes
- Conceptually straightforward and relatively stable underlying market
- Overnight, unsecured and nearly risk-free reference rate that has a high correlation with the Bank rate
- Already used as a reference rate for sterling OIS, enables faster progress towards adoption

Key milestones

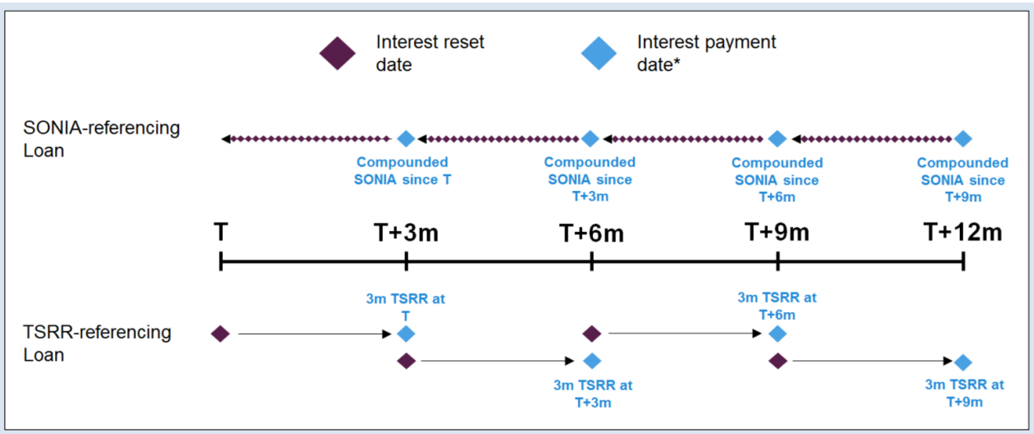
- Began March 1997 and managed by Bank of England since April 2016
- "Reformed" SONIA captures several reforms implemented on 23rd April 2018 (after multiple rounds of BoE consultations):
  - BoE assumed end-to-end administration of SONIA (incl. calculation, publication) from the Wholesale Market Brokers Association (WMBA)
  - Inputs to SONIA broadened to include overnight unsecured transactions negotiated bilaterally as well as those arranged through brokers
  - Methodology changed to a volume-weighted trimmed mean (previously an untrimmed weighted average)
  - Publication time changed to 9am on the following London business day, from 6pm on the same day

SOURCE: Bank of England

Term SONIA Reference Rates (TSRRs)

Sterling WG Consultation on TSRRs

- The Working Group on Sterling Risk-Free Reference Rates (Sterling WG) launched a consultation on TSRRs in July 2018 seeking "feedback on practical recommendations aimed at **catalysing the development of TSRRs**", which the WG anticipates could be available in H2 2019
- The consultation requests feedback around the following:
  - **Sources of demand** for TSRRs across different use cases;
  - SONIA derivative markets which could be used as the **basis for TSRR price discovery**;
  - Potential **data sources and methodologies** which could be used to construct TSRRs; and
  - Next steps for market participants to **progress the development** of TSRRs
- Example of interest rate payments using SONIA (an overnight rate) versus a TSRR (term rate), for a loan product:



*In practice, the last daily interest reset date would be a number of days (between 2 to 5 days) before the interest payment date to allow time for calculation and settlement.

Summary of TSRR Consultation Results

- The Sterling WG published a **summary of the 45 responses** received as part of the consultation in November 2018
- Primary conclusions from the responses:
  - A TSRR could **facilitate the transition** in certain **cash market** segments
  - Current SONIA **futures markets** are capable of facilitating price discovery, particularly if **OIS swaps contracts** are considered alongside as additional inputs
  - TSRRs would benefit from **further growth** in OIS and SONIA futures markets
  - Appropriate **governance and controls** are required, including greater transparency and verifiable quotes and publication by a trusted central authority (e.g., central bank)
  - **Avoiding systematic TSRR usage in derivatives markets** will be essential – a majority of respondents (mostly banks) noted the impact on OIS liquidity and/or inhibited market growth that could result
  - **Consistency across currencies** and cooperation across jurisdictions is desirable
- Beyond the explicit scope of the consultation, the option of a **temporary TSRR** was raised as a way to mitigate fragmentation risks

SOURCE: "Consultation on Term Sonia Reference Rates" (Bank of England, July 2018); "Consultation on Term SONIA Reference Rates – Summary of Responses" (Bank of England, November 2018)

Goldman Sachs

European Benchmarks Regulation (BMR): Impact and developments

Primary rate(s) impacted

EURIBOR · €STR · EONIA · All benchmarks

Yet to occur

2018 (all)
EMMI conducts stakeholder consultations and conducts impact assessment on the proposed hybrid EURIBOR methodology

2019-2021 (all)
EMMI submits to the Belgian FSMA its application as administrator of the EURIBOR benchmark, in case EMMI has grounds to consider the benchmark compliant

May 2017
EMMI announces that its plan to move from the current quote-based methodology for EURIBOR to a transaction-based methodology is not feasible given limited transactions; hybrid methodology to be developed at a later date

1 Jan 2018
BMR effective date - benchmark users required to create and maintain robust benchmark contingency plans and reflect them in new contracts

Feb 2018
EMMI states that EONIA's compliance with BMR by 1 January 2020 "cannot be warranted"

21 Sep 2018
Three EU MEPs propose an amendment to the European Supervisory Authorities (ESA) review text that would allow a two-year extension to the BMR deadline for benchmarks deemed critical

13 Dec 2018
EU Parliament approves text that extends the BMR transition period for critical benchmarks (including EURIBOR and EONIA) through year-end 2021; amendment must be confirmed by European Council of EU member governments before May 2019

Oct 2019
€STR publication begins (expected, at the latest)

Q4 2019
EMMI to implement new hybrid methodology for EURIBOR (expected, at the latest)

8 June 2016
EU Benchmarks Regulation (BMR) establishes a harmonized regulatory framework that imposes conditions on benchmark contributors and administrators

Sep 2017
Working group on euro risk-free rates ("euro WG") established by the ECB, together with FSMA, ESMA, and the European Commission

H2 2017
EURIBOR hybrid methodology development period

26 Feb 2018
Inaugural meeting of the euro WG

13 Sep 2018
Euro WG recommends that €STR be used as the RFR for the euro area (replacement for EONIA, and potentially EURIBOR), and requests that the European Commission (EC) extend the transition period for RFR transition by 3 years (in line with expected LIBOR cessation at year-end 2021)

25 Sep 2018
Speech by Benoit Coeure of the ECB, emphasizing that "new benchmark measures need to be in place by 1 January 2020"

3 Dec 2018
Panel banks' EURIBOR rate submissions no longer published; cessation of 2 week, 2 months, and 9 months EURIBOR tenors

25 Feb 2019
Political agreement reached to extend the EU BMR deadline by 2 years to Dec 2021 for critical and third country benchmarks. The extension has been attached to the low-carbon benchmarks legislation.

Next steps include to finalizing the relevant legislative provisions, which will need to be formally adopted by the European Parliament and Council before this enters into force.

31 Dec 2021
Extended deadline for BMR compliance for critical benchmarks and third country benchmarks (the additional time given for third country benchmarks to allow for working with non-EU regulators). Deadline has to be adopted by the European Parliament and Council

BMR requirements for benchmark users:

- Create and maintain a "robust" benchmark contingency plan which must be reflected in contracts with clients and made available to competent authorities upon request
- Subject to the transition period (1/1/2018 – 12/31/2019 for non-critical benchmarks, 1/1/2018 – 12/31/2021 for critical benchmarks) and hardship exceptions, only use benchmarks that are listed in the ESMA register or provided by administrators that are listed in the ESMA register

SOURCE: EMMI EURIBOR and EONIA reforms (Feb 2018); EMMI EURIBOR Hybrid Methodology State of Play (May 2018)

Goldman Sachs

Comparison: Current EUR benchmark rates vs. €STR

Benchmark		Total outstanding notional ($T)	Administrator(s)	Description of rate
Current	EURIBOR	150	▪ Administrated by European Money Markets Institute (**EMMI**) ▪ Global Rate Setting Systems (**GRSS**) acts as calculation agent	▪ Rate at which **euro interbank term deposits** are offered by one prime bank to another within the EMU zone ▪ Reliant on a panel of **20 quoting banks** (from 44 in 2012) ▪ **Unsecured rate** currently calculated for **5 tenors**: 1w, 1m, 3m, 6m, and 12m (2w, 2m, and 9m tenors discontinued as of 3 Dec 2018) ▪ Reforms by EMMI (including development of a hybrid methodology) underway, with the expectation that **reformed EURIBOR will be compliant with the EU BMR** by the extended deadline of 1 Jan 2022
	EONIA	25	▪ Administered by **EMMI** ▪ **ECB** acts as calculation agent	▪ An effective overnight rate computed as a weighted average of all **overnight unsecured lending transactions** in the interbank market, initiated within the euro area by the contributing panel banks ▪ Reliant on a panel of **28 quoting banks** (with 80% of transaction data coming from 5 banks) ▪ **Unsecured overnight rate** (one tenor) ▪ Anticipated to **no longer have approved benchmark status** under the EU BMR beyond year-end 2021
	EUR LIBOR	2	▪ Administered by Intercontinental Exchange (**ICE**), specifically the ICE Benchmark Administration (**IBA**)	▪ Indicates the average rates at which panel banks could obtain **wholesale, unsecured funding** for set periods in EUR ▪ After transition to Waterfall Methodology (Q1 2019), will be **anchored in transactions** to the greatest extent possible, but still **reliant on a panel of 15 quoting banks** ▪ **Unsecured rate** produced for **7 tenors**: overnight/spot next, 1w, 1m, 2m, 3m, 6m and 12m
New (expected Oct 2019)	€STR		▪ Will be administered by the **ECB**	▪ Reflects **wholesale euro unsecured overnight borrowing costs** of euro area banks, based entirely on actual individual transactions in euro that are reported by banks in accordance with the ECB's money market statistical reporting (MMSR) ▪ Based upon **transactions between 52 banks** with volumes of ~30B EUR per day ▪ **Unsecured overnight rate** (one tenor)

SOURCE: ECB Working Group on Euro Risk-Free Rates; EMMI; ICE

Goldman Sachs

What is €STR?

Euro Short-Term Rate (€STR) – EUR LIBOR, EURIBOR alternative recommended by Euro WG

Calculation and administration	▪ Calculated for each business day as a volume-weighted trimmed mean rounded to the third decimal
	▪ Calculations will be based entirely on actual individual transactions in euro that are reported by banks in accordance with the ECB's money market statistical reporting (MMSR)
	▪ Based upon transactions between 52 banks, with volumes of ~30B EUR per day
	  ▪ Excludes Money Market Fund (MMF) activity
	  ▪ Includes deposits but excludes CP/CD transaction (therefore "some" MMF activity will be captured)
	▪ The rate will be available by 09:00 CET on each TARGET2 business day, based on actual individual transactions from the previous day

Characteristics	▪ Reflects wholesale euro unsecured overnight borrowing costs of euro area banks – not as broad as SOFR in the transactions it captures
	▪ Meets requirements laid out in the EU Benchmarks Regulation (BMR), effective January 2018 and established in response to the LIBOR and EURIBOR scandals
	  – EU Benchmarks Regulation Group created to bring stability, accuracy and integrity back to benchmarks
	  – "Article 28(2) of the European Benchmarks Regulation requires users to plan for cessation of any benchmark and reflect such plan in their contracts."[1]

Key milestones	▪ Recommended by the working group on Euro risk-free rates as its preferred alternative euro risk-free rate and replacement for EONIA ▪ Will be published by October 2019 ▪ Usage of benchmarks not compliant with the EU BMR will be restricted from 1 Jan 2020; the transition period for critical benchmarks, including EURIBOR and EONIA, was extended through 31 December 2021

1 European Securities and Markets Authority (ESMA)

Goldman Sachs

What is SARON?

Swiss Average Rate Overnight (SARON) – CHF LIBOR alternative recommended by the National WG on CHF Reference Rates

Calculation and administration	▪ Overnight interest rate average referencing the Swiss Franc interbank repo market, launched by the Swiss National Bank (SNB) in cooperation with SIX Swiss Exchange ▪ Based on concluded transactions and trade quotes posted on the SIX Repo trading platform, provided they lie within the parameters of the quote filter (parameterized in a way that limits the possibilities for manipulation) ▪ Continually calculated in real time and published every ten minutes, with fixings conducted three times a day (at 12 pm, 4 pm and 6 pm) to serve as a reference reading for derivative financial products and the valuation of financial assets ▪ Has become the standard for interbank deposits, remuneration of collateral and discounting ▪ Under the surveillance of SIX Swiss Exchange and regulated under the Swiss Financial Market Act (FMIA) – Index Commission for the Swiss Reference Rates serves as an advisory and oversight panel – Compliant with the IOSCO[1] Principles for Financial Benchmarks
Characteristics	▪ Considerably lower volatility compared to reference rates based on the unsecured money market ▪ Risk-neutral benchmark particularly suitable for secured loans due to the negligible counterparty and liquidity risks ▪ Calculated on concluded transactions and binding quotes on a regulated trading platform ▪ Use of quote filter limits the possibilities for manipulation to an absolute minimum ▪ Historical data does not require a license and is publicly available; current data can be obtained via all standard data vendors or directly from SIX Swiss Exchange
Key milestones	▪ Replaced the previously used repo overnight index (SNB) of 5th August 2009 ▪ Replaced TOIS (Tomorrow/Next Overnight Indexed Swaps) as of 29th December 2017 ▪ Clearing of SARON swaps is already offered by major clearing houses

1 International Organization of Securities Commissions

SOURCE: Swiss National Bank

Goldman Sachs

What is TONAR?

Tokyo Overnight Average Rate (TONAR) – JPY LIBOR, TIBOR, Euroyen TIBOR alternative recommended by Study Group on RFRs

Calculation and administration

- Transaction-based benchmark for the uncollateralized overnight call rate using information provided by money market brokers, calculated and published by the Bank of Japan (BOJ)
- Methodology:
  - The volume-weighted average call rate is the average call rate weighted by the volume of the transactions corresponding to each rate
  - The rate is calculated by dividing the sum of the product of each transaction volume and the corresponding rate by the sum of the overall transaction volumes, based on data submitted by information providers (Ueda Yagi Tanshi Co., Ltd.; Central Tanshi Co., Ltd.; The Tokyo Tanshi Co., Ltd)
  - The maximum (minimum) rate is the highest (lowest) rate of the maximum (minimum) rates submitted by the information providers
- A provisional result is published on the evening (at 17:15 JST, except on the last business day of the month when it is 18:15 JST) of the period start; the final result is published in the morning (10:00 JST) of the end date

Characteristics

- Unsecured overnight rate with considerable transaction volume and a diversity of trading participants
- Currently used:
  - As a reference rate for OIS
  - In calculating interest payments on JPY cash collateral in a Credit Support Annex (CSA) for derivatives transactions
  - By the Japan Securities Clearing Corporation (the central clearing organization for JPY IRS) calculation of interest payments on variation margin

Key milestones

- Study Group on risk-free reference rates has been working on a Japanese yen nearly risk-free benchmark rate since April 2015
- TONAR was identified as the preferred alternative RFR in Japan in December 2016

1 International Organization of Securities Commissions

SOURCE: Bank of Japan

Goldman Sachs

What is happening in other currencies?

Existing benchmarks impacted by transition	■ Australia, Brazil, Canada, Hong Kong, Mexico, Singapore, and South Africa have all progressed their plans to reform their rates based upon the recommendations made in the FSB's 2014 *Reforming Major Interest Rate Benchmarks* ■ IBORs in these jurisdictions include: – AUD Bank Bill Swap Rate (BBSW) – Brazil overnight interbank offered rate (DI rate) – Canadian Dollar Offered Rate (CDOR) – Hong Kong Interbank Offered Rate (HIBOR) – Mexico's Interbank Equilibrium Interest Rate (TIIE) – Singapore Interbank Offered Rate (SIBOR) – Johannesburg Interbank Average Rate (JIBAR)
Alternative RFRs proposed	■ Preferred alternative RFRs already selected include: – AUD – RBA Cash Rate (current OIS rate) – BRL – Selic rate (overnight govt't repo transactions) – CORRA – Canadian overnight repo rate average ■ In other jurisdictions, choice of RFRs not yet made – HKD – Weighing different options (e.g., HONIA) – MXN – Considering 3 options (2 overnight gov't repo) – SGD – Considering RFR alternatives for derivs – ZAR – Consulting on proposals for RFRs
Industry-regulatory working group efforts	■ CAD – Canadian Alternative Reference Rate WG created in March to develop a robust term RFR (enhanced CORRA) to co-exist with CDOR ■ Hong Kong Treasury Markets Association (TMA) Market Practices Committee – industry working group established by the HK TMA in preparation for the transition ■ Banco de Mexico (BdM) creating Mexican Bankers Association working group ■ Association of Banks in Singapore–Singapore FX Market Comm. Working group facilitating SIBOR reforms ■ South African Reserve Bank (SARB) established a joint public and private Market Practitioners Group (MPG) ■ Less formal industry-regulatory interactions in other jurisdictions
Industry & market developments	■ In Australia and Canada, authorities support a multiple-rate approach, for which infrastructure is already in place ■ In Brazil, the Selic rate has been calculated since 1986 and a underlies floating-rate Treasury bonds and some Central Bank market instruments; futures liquidity to be developed ■ In other jurisdictions, reforms to existing benchmarks and/or consideration of alternatives are underway

SOURCE: FSB, "Reforming major interest rate benchmarks – Progress report" (14 November 2019)

Contents

What is Ameribor – Description & comparison to SOFR

- **Ameribor is a new USD-denominated interbank interest rate** reflecting the borrowing rates paid by members of the American Financial Exchange (AFX), a self-regulated exchange that include 101 U.S. registered financial institutions between $500 million and $150 billion in assets
- Ameribor is a transaction-based short-term interest rate based on **actual prices paid for loans executed between small and mid-sized U.S. depositories** on the AFX Electronic Trading System, and is published in two tenors:
  - The **Overnight rate** is calculated using the weighted average daily volume for all transactions in the AFX overnight unsecured markets
  - The **30 Day rate** is calculated using the 30 trading day rolling average of the weighted average daily volume in the AFX overnight unsecured markets
  - Both tenors are denoted as a **360-day annualized percentage rate** up to the fifth decimal
- **A key difference between Ameribor and SOFR** is that the former is unsecured, resulting in a roughly 15 basis point spread to both LIBOR and SOFR, as well as the liquidity of transactions underlying the rates – **SOFR is supported by $850B in daily repo transactions**, compared to **$15B in loan principal *monthly* for Ameribor**
  - Regional and other smaller banks may find their **borrowing costs more accurately reflected** in the unsecured Ameribor than in SOFR
  - It is unclear whether Ameribor will be broadly adopted by a range of market participants given **uncertainty around FASB hedge accounting designation** and **whether the ARRC would support the rate for widespread use**
- ServisFirst Bank (an Alabama-based commercial lender with $7 billion in assets) made the **first loan referencing in Ameribor in September 2018** to a car dealer in Tennessee and selected the benchmark rate because “it’s reflective of our cost of funds,” according to CEO Tom Broughton

Source: https://ameribor.net/#/about; https://bankingjournal.aba.com/2018/11/the-replacements/

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US Dollar ICE Bank Yield Index

Description and methodology

Description / rationale[1]

- ICE has introduced a **preliminary methodology** for a **new interest rate**
- It is intended to measure yields at which **investors are willing to invest US dollar funds** in large, internationally active banks **on a wholesale, unsecured basis**
- ICE expects the index to be **well-suited for cash markets** since it will:
  - Incorporate an **average bank's arms length funding costs**
  - Be linked to the **average cost of funds** of large banks
  - Result in **forward-looking tenors** (proposed one, three and six-month)

Calculation methodology[1]

- The index will be **underpinned entirely by transaction data** representing short-term, unsecured bank investment yields

	Transactions included	Data source	Weighting adjustment for each transaction
Wholesale primary market	▪ Inter-banks deposits ▪ Institutional certificates of deposit ▪ Commercial paper	▪ Data sourced daily from 13 large, internationally active banks	▪ 100%
Secondary market	▪ Secondary market bond transactions	▪ FINRA TRACE data on issuances by 36 eligible issuer banks	▪ 50% since transactions tend to be of smaller size

- Transactions will be **filtered by a number of criteria** (e.g., transaction type, counterparty, location, size)
- Eligible transactions will be **sorted by days to maturity**. Data from previous days would be included if there is not enough number of transactions (included in the calculation at a lower weight)
- All eligible weighted transactions allocated to each maturity range will be used to **plot a daily yield curve** with a time horizon of up to one year

Potential risks/shortcomings[2]

- **Permanency:** Reliant on panel banks submitting transaction data and it is uncertain if panel banks would **submit data beyond 2021**
- **Reliability:** Unclear how the rate would **behave in times of market stress;** its reliance on lagged data and relatively small number of underlying transactions may introduce volatility in turbulent markets
- **Representativeness**: Back testing shows periods of **divergence from LIBOR**, potentially due to wide universe of underlying transactions and outsized impact of small trades
- **Usefulness**: Unlikely to be eligible as a hedge accounting benchmark, since it is **not a risk free rate**

1 ICE Benchmark Administration
2 Federal Reserve comments on Bank Yield Index (2/28/2019).

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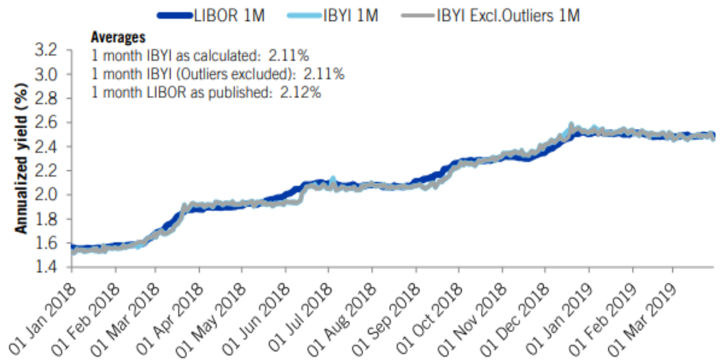
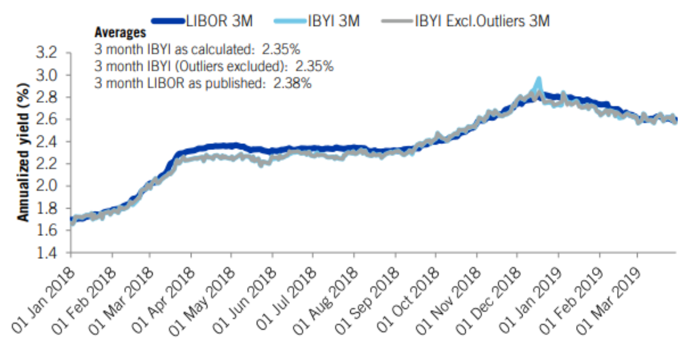
US Dollar ICE Bank Yield Index

Historical performance and next steps

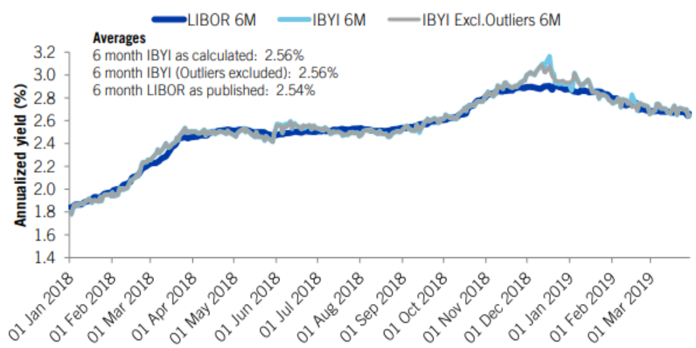
U.S. Dollar ICE Bank Yield Index: 1M



U.S. Dollar ICE Bank Yield Index: 3M



U.S. Dollar ICE Bank Yield Index: 6M



Next steps:

- **ICE is seeking feedback on the index and its methodology from all stakeholders, and in particular cash market participants. Feedback period has been extended from an initial deadline of March 31st to May 31st**
- **Initial feedback received centered around the criteria for identifying eligible transactions, weightings of primary and secondary data, the yield curve methodology, and contingencies when insufficient data is available**
- **In light of this feedback, ICE published an update to its white paper providing more detailed information regarding its proposals**
- **If supported, ICE intends to collate and review all responses and refine the index, test throughout 2019 and launch the index and commence publication during the first quarter of 2020**

Confidential

SOURCE: ICE Benchmark Administration

Past performance is not indicative of future results. **Past performance does not guarantee future results, which may vary.**

Contents

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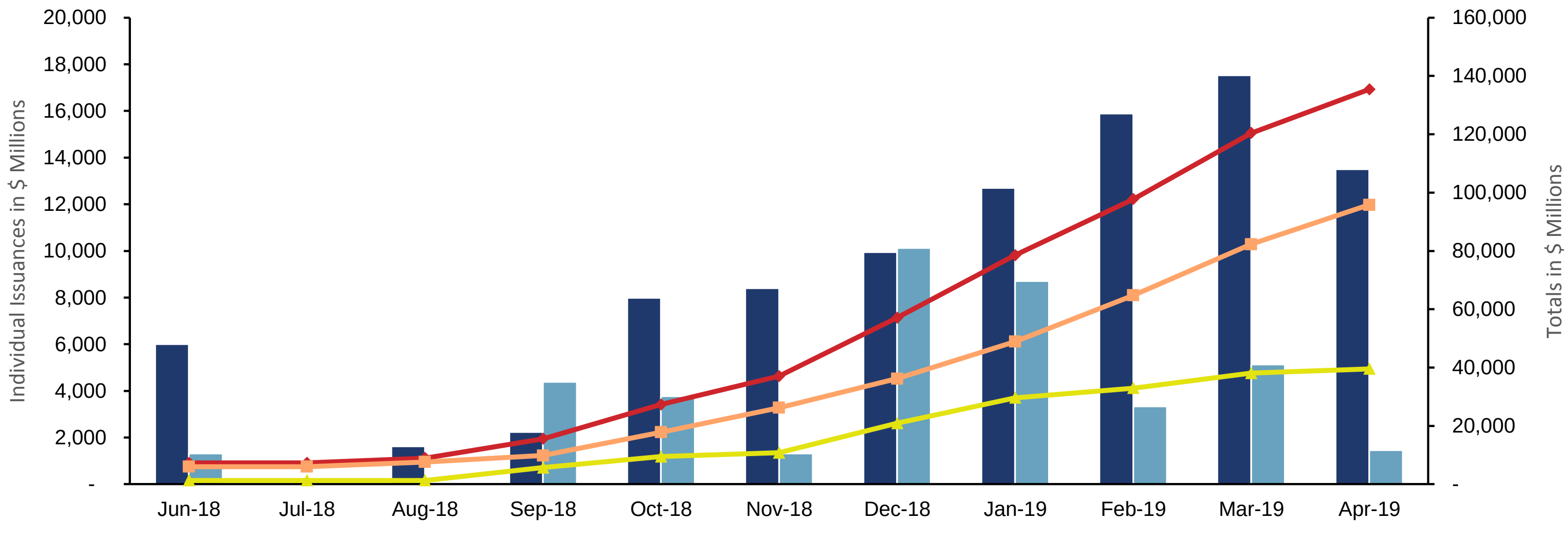
Capital Markets

SOFR summary statistics and highlights:

- Before November, all deals besides the MTA remarketing had maturities of 2 years or less
- GSE deals account for ~3/4 of all SOFR issuance to date
  - Fannie Mae issued nearly half of that share
  - FHLB has announced a SOFR credit advance program, offering maturity up to 120 months
- MTA was the first Municipal SOFR deal
- African Development Bank issued the first green SOFR bond
- European Investment Bank issued the first compounded SOFR deal
- Mizuho Bank New York Branch issued a SOFR linked floating rate CD which is the first such product by a Japanese Bank serving a US institutional investor base
- Citi issued a $1bn 2yr SOFR deal in early March

SONIA summary statistics and highlights:

- Longer-term issuance, with a 3-5 year maturity for most (excluding securitization)
- European Investment Bank issued the first ever 'reformed SONIA' deal
- FMS (non-supranational SSA) issued the first Sonia-linked transaction
- Elland RMBS deal by Lloyds, backed by Bank of Scotland-originated residential mortgage loans, marks the first securitization referencing SONIA
- Lloyds & Santander issued the first and second SONIA linked covered bonds



Note: SONIA issuances assume an exchange rate of £1 = $1.3
Source: Bloomberg

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Exchange traded contracts referencing LIBOR alternatives – SOFR and SONIA

Reference rate	Contracts traded	Daily volume[1], # of contracts	Open interest, # of contracts	Exchange
SOFR	1-month SOFR futures	7,706	63,183	CME Group
SOFR	3-month SOFR futures[2]	7,599	62,306	CME Group
SOFR	1-month SOFR index futures	1,075	3,196	ICE Futures Europe
SOFR	3-month SOFR index futures	504	3,451	ICE Futures Europe
SONIA	CurveGlobal 3-month SONIA futures	1,370	56,681	London Stock Exchange Group
SONIA	1-month SONIA index futures	40	12,346	ICE Futures Europe
SONIA	3-month SONIA index futures[3]	3,003	27,897	ICE Futures Europe
SONIA	Quarterly IMM SONIA futures	1,446	13,788	CME Group
SONIA	MPC SONIA futures	0	1,440	CME Group

1. *All data as of trade date 29 April 2019*
2. *Inter-commodity spreads (ICS) offered by CME Group include: 1m SOFR/3m SOFR, 1m SOFR/30-day FF, 3m SOFR/Eurodollar, 30-day FF/3m SOFR*
3. *Inter-contract spread offered by ICE: 3m SONIA/Short Sterling*

SOURCE: CME Group, ICE Report Center, London Stock Exchange

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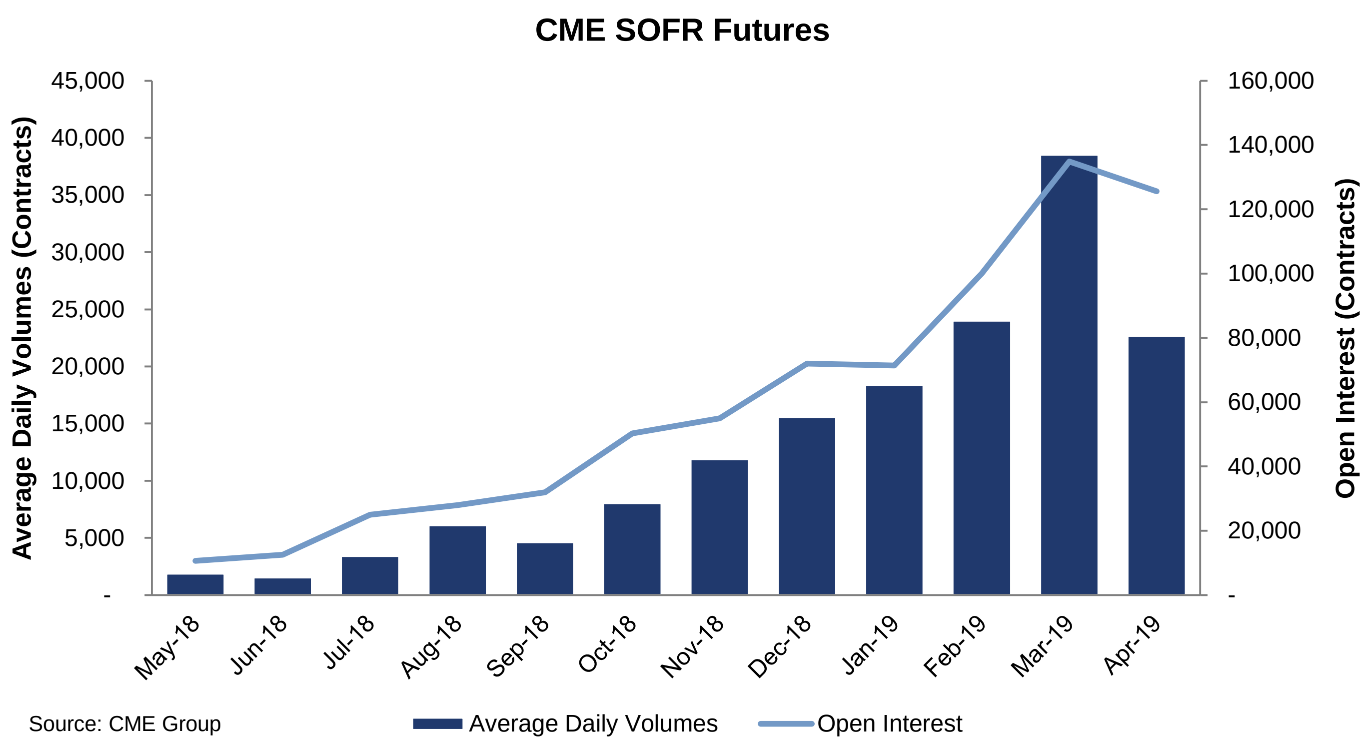
Exchange traded contracts referencing LIBOR alternatives – SOFR and SONIA



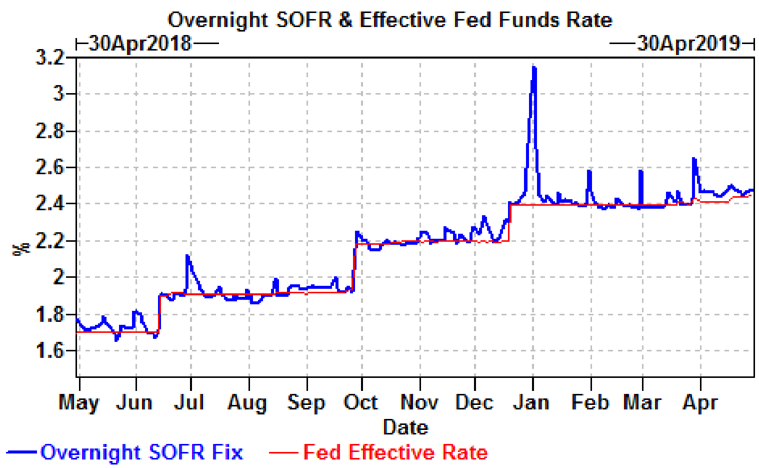
Source: CME Group

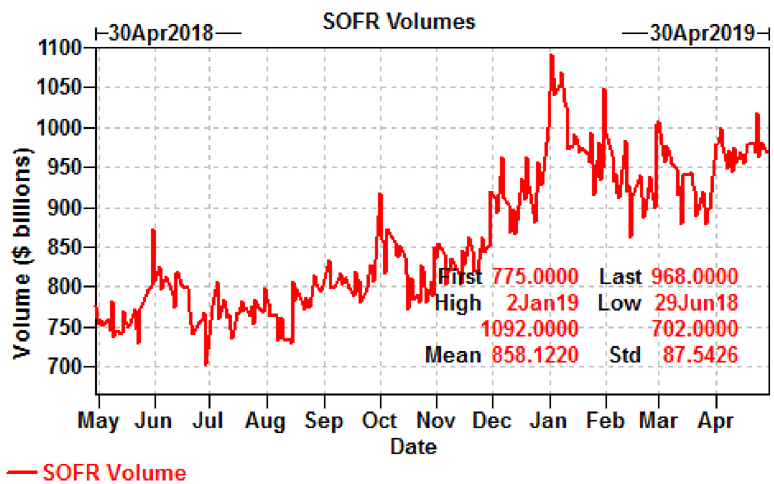
- **SOFR open interest futures at CME have surpassed 100k contracts on 19 February 2019. This represents 99% growth since 3 January 2019.**
- **$3.3 Trillion in notional has traded (through 20 February), representing $51 million in DV01 risk transfer since launch on May 7, 2018.**
- **Average daily volume exceeds 38k contracts/day in March.**

Goldman Sachs

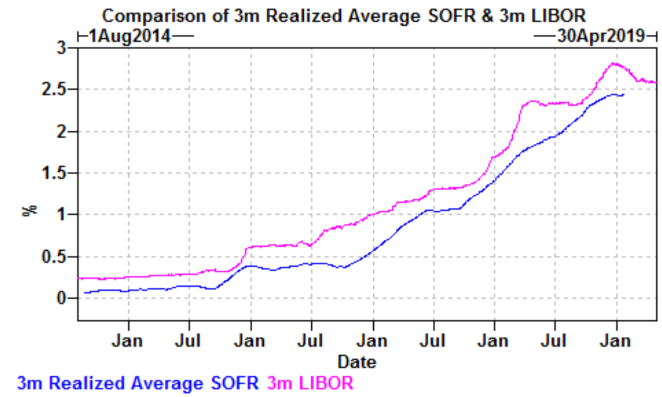
USD market trends

- **Volumes and SOFR rate:** Around YE, **volumes** were at **all-time highs** of $1,092bn, with the SOFR **fix** at 315 bps on 2-Jan. On 31-Dec, SOFR transactions were being executed at the 625bp mark (99th percent)

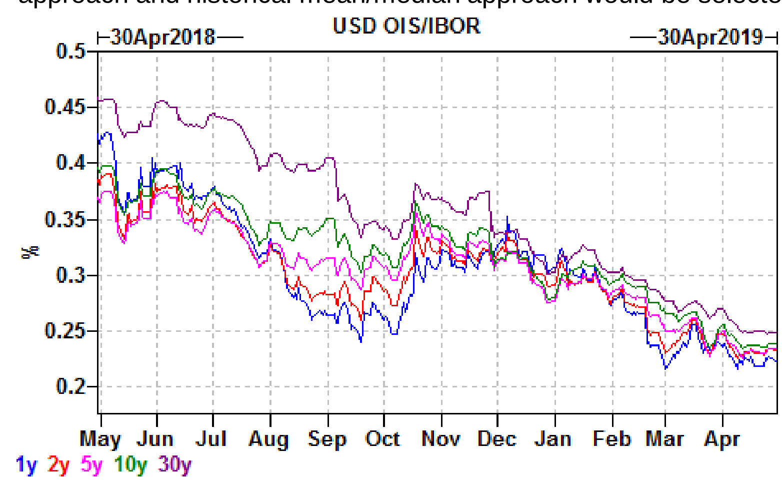




- SOFR has been published by FRBNY for less than one year, but the Fed maintains SOFR **proxy data back to 2014.**
- **Average SOFR is a more stable rate than 3month $LIBOR**

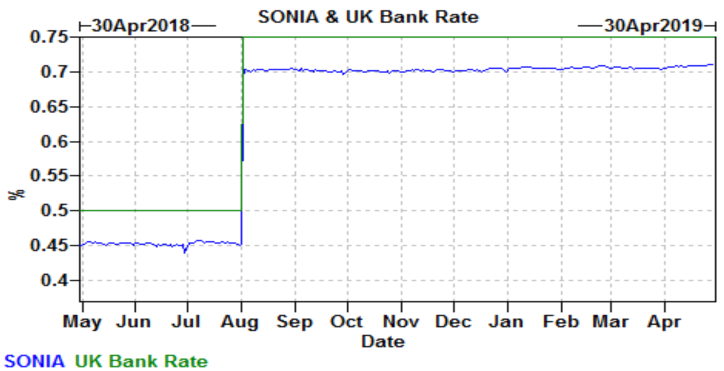


- **USD OIS/LIBOR term structure flattened strongly** at the end of November on the back of the recent ISDA consultation announcement (i.e., preliminary results suggesting the compounded setting in arrears approach and historical mean/median approach would be selected)

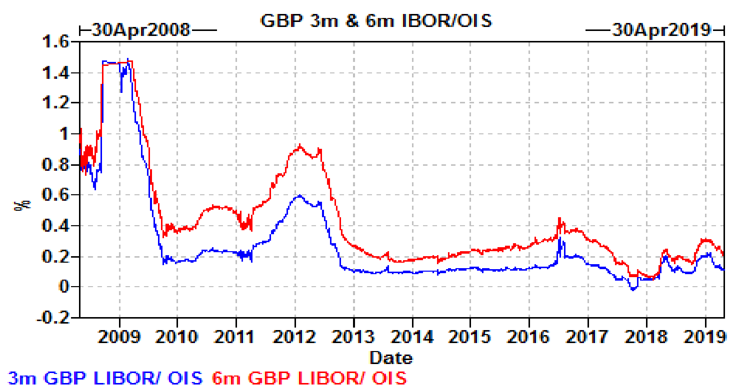


SOURCE: GS Securities Division. Past performance is not indicative of future results

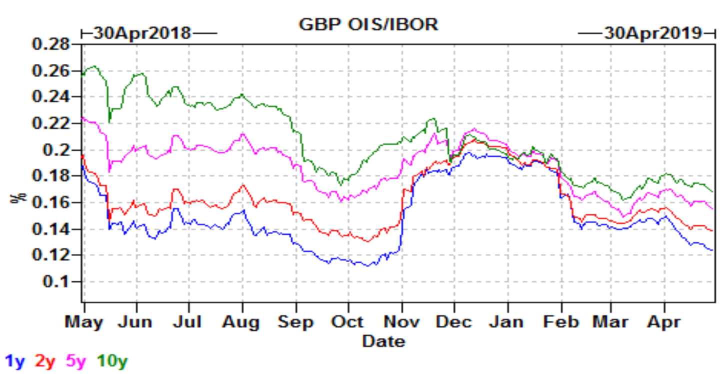
GBP market trends



- As shown in the chart at left, SONIA accurately **tracks the UK Bank Rate**



- The **significant availability of data for SONIA** implies that it would be possible to have a long lookback period upon which to base adjustments to SONIA to determine the fallback for GBP LIBOR; however, longer lookback periods may capture some of the **extreme volatility exhibited in the crisis period**, which may impact **credit-spread adjustments**



- As with USD, the **GBP OIS/LIBOR term structure flattened strongly** at the end of November on the back of the recent ISDA consultation announcement (i.e., preliminary results suggesting the compounded setting in arrears approach and historical mean/median approach would be selected)

SOURCE: GS Securities Division. Past performance is not indicative of future results

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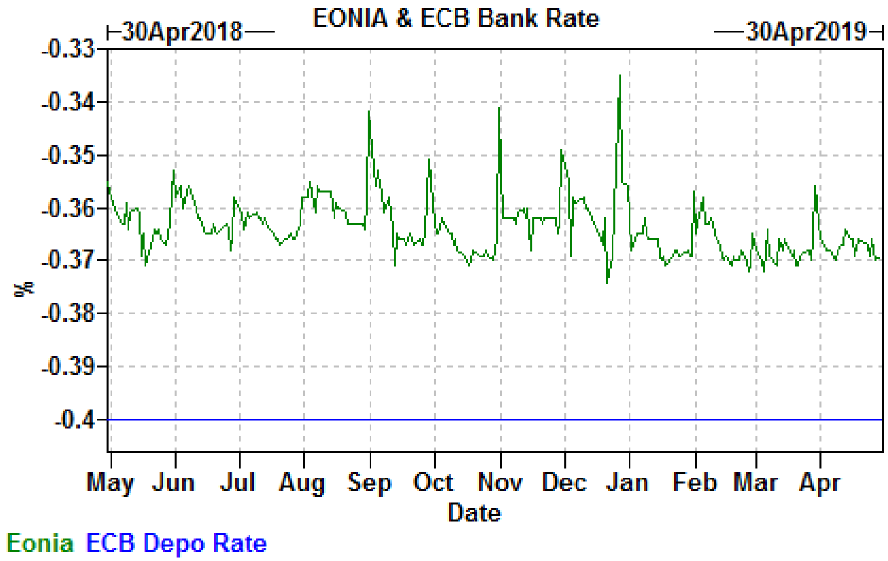
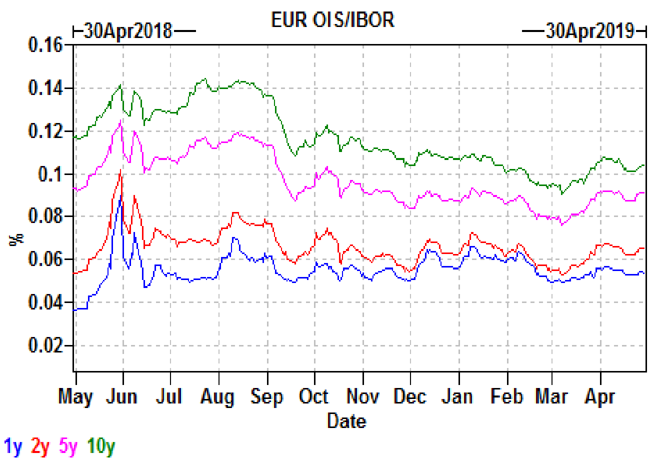
EUR market trends

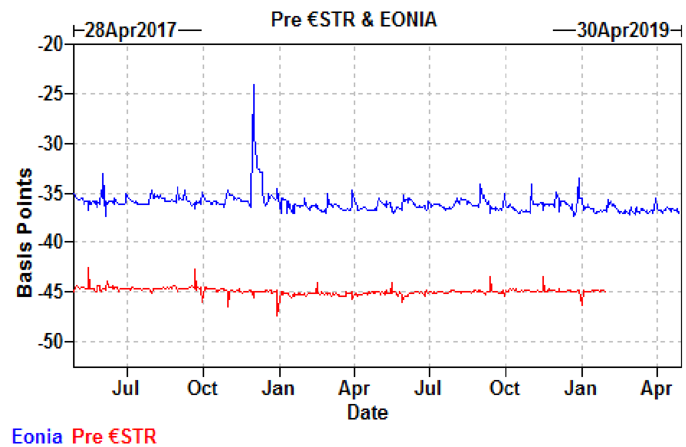


- **€STR is yet to be published**, but is expected by October 2019 at the latest; hence, we expect to have an even **shorter available time series of data than SOFR** on which to base calculations for credit spread adjustments in determining EUR LIBOR, EONIA, and/or EURIBOR fallback rates
- €STR is expected to have a very **stable spread to EONIA**



- **EUR OIS/LIBOR term structure flattened** at the end of November on the back of the recent ISDA consultation announcements, though the move was less pronounced than in other currencies

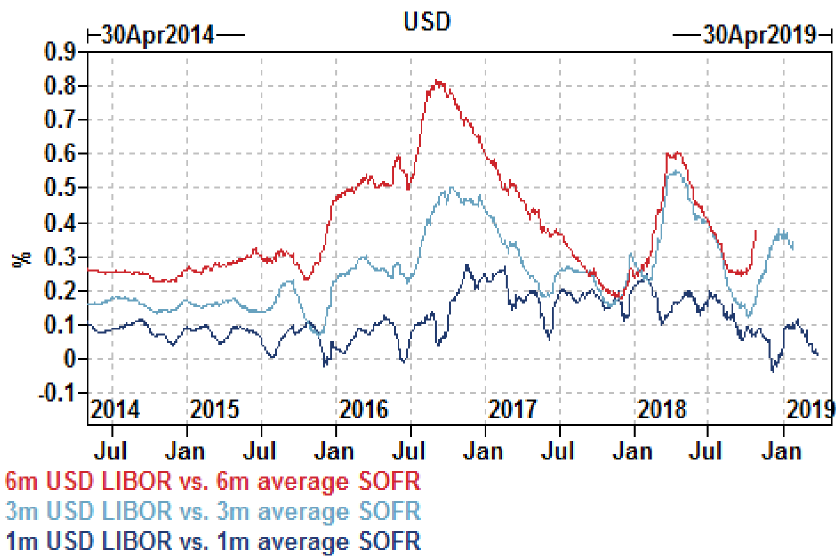
- The ECB has begun publication of **Pre-€STR data**

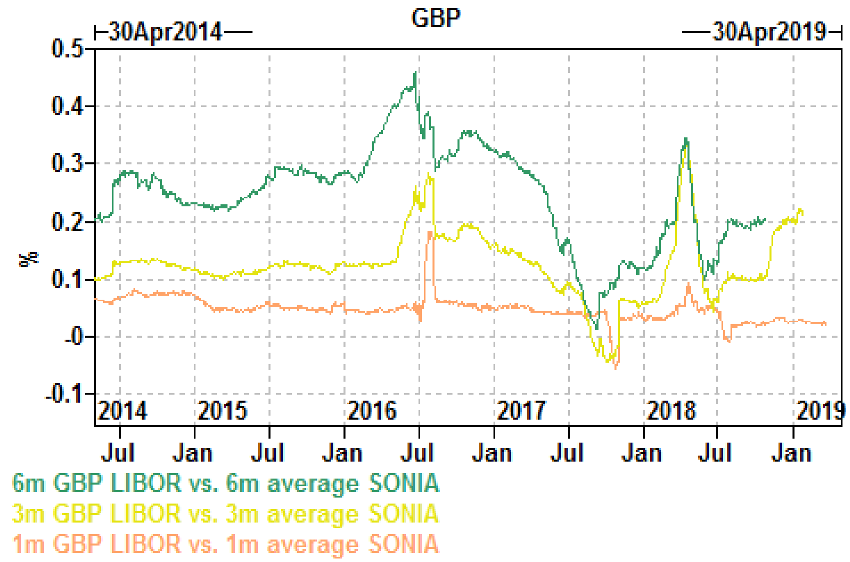


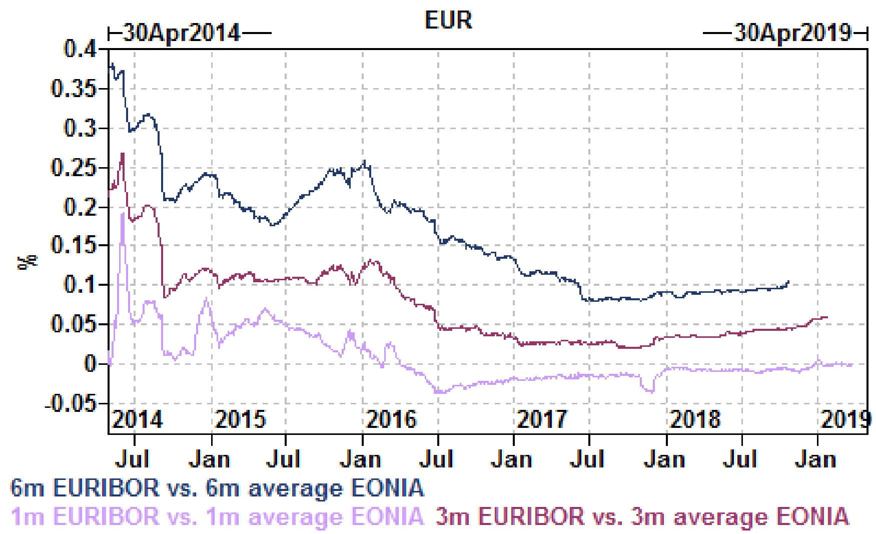
SOURCE: GS Securities Division. Past performance is not indicative of future results

Realized Spreads

In accordance with ISDA's proposed methodology







SOURCE: GS Securities Division. Past performance is not indicative of future results

Contents

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Hedge Accounting: FASB Update

Derivatives and Hedging (Topic 815) – Inclusion of SOFR

Details on next page

FASB update

- **Background:**
  - Topic 815, Derivatives and Hedging, provides guidance on the risks associated with financial assets or liabilities that are permitted to be hedged
  - At present, eligible benchmark interest rates are USTs, LIBOR, OIS Rate based on the Fed Funds Effective Rate, and the SIFMA Municipal Swap Rate
- **Update:**
  - The Fed requested that the OIS rate based on SOFR be considered eligible as a US benchmark interest rate for the purposes of applying hedge accounting under Topic 815
  - The Fed and ARRC expressed the importance of including the OIS rate based on SOFR as a benchmark rate for hedge accounting in facilitating broader use of the underlying SOFR rate in the marketplace
- **Outcome:**
  - Inclusion of the Secured Overnight Financing Rate (SOFR) and Overnight Index Swap (OIS) Rate as a US benchmark interest rate for hedge accounting purposes under Topic 815

Impacts, risks, and remaining concerns

- Amendments in this **Update apply to all entities that elect to apply hedge accounting** to benchmark interest rate hedges under Topic 815
- There are several adoption timelines:
  - For entities that have **not adopted Updated 2017-12,** the amendments in this Update are **required to be adopted concurrently** with the amendments in Update 2017-12
  - For public business that have already **adopted the amendments in Update 2017-12,** the amendments are effective for **fiscal years beginning after December 15, 2018,** and interim periods within those years
  - For non-public entities that have already **adopted the amendments in Update 2017-12,** the amendments are effective for **fiscal years beginning after December 15, 2019,** and interim periods within those years
  - **Early adoption is permitted** in any interim period upon issuance of this Update if an entity already has adopted Update 2017-12
- **Risks include** changes in fair values or cash flows of existing or forecasted issuances or purchases of fixed-rate financial assets or liabilities attributable to the designated benchmark interest rate (referred to as interest rate risks)
- **Announcement could spur:** increased deal flows, changes to interest rate risk hedging strategies, and increased market liquidity
- The market has some immediate **concerns regarding hedge accounting for LIBOR-based transactions** given the transition: whether LIBOR-based interest payments will be considered **probable of occurring** beyond the anticipated transition, and whether the transition will impact the asserted **"effectiveness" of a cash flow hedging relationship**
  - These concerns were appeased by comments made by the SEC in December, at least with respect to **2018 reporting**
  - It is expected that FASB will find **longer-term/ permanent solutions to these concerns in 2019**

SOURCE: FASB **document** (October 2018); : "Remarks before the 2018 AICPA Conference on Current SEC and PCAOB Developments"

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Hedge Accounting: SEC comments addressing concerns on treatment of LIBOR

Speech by SEC Accounting Staff (Rahim M. Ismail) – December 10, 2018

"Transition Away from LIBOR

[…] The first question related to whether the LIBOR based interest payments identified in cash flow hedge documentation are probable of occurring. In order to apply hedge accounting, the forecasted transaction being hedged, in this case the LIBOR based interest payments, has to be probable of occurring. The stakeholder requested the staff's view on whether registrants could continue to assert that cash flow hedges where the hedged item is documented as LIBOR based interest payments are probable of occurring for variable rate debt whose terms extend beyond the anticipated transition away from LIBOR. ***The stakeholder shared its view that hedge documentation involving LIBOR based cash flows implicitly considers the rate that would replace LIBOR, thereby allowing an entity to continue to assert that the hedged item is probable of occurring. The staff did not object to this view.***

[…] The second question was whether and how the expected transition away for LIBOR would impact the assessment of hedge effectiveness of a cash flow hedge of LIBOR based variable rate debt. In order to apply hedge accounting, a hedge must be assessed as highly effective both on a prospective and retrospective basis. ***The stakeholder shared its view that, as part of its assessment of hedge effectiveness, an entity could consider an expectation that anticipated changes to LIBOR will impact both the hedged item (e.g., forecasted interest payments on debt) as well as the hedging instrument (e.g., interest rate swap). The stakeholder further asserted that in light of this expectation, the anticipated transition away from LIBOR in and of itself would not impact the effectiveness of the hedge. The staff did not object to this view."***

The staff did not object to LIBOR based interest payments being considered probable (a requirement to apply hedge accounting) despite having terms that extend beyond the anticipated transition away from LIBOR

The staff did not object to the expectation that anticipated changes to LIBOR will impact both the hedged item as well as the hedging instrument, which would thereby limit the impact of the transition on the assessment of hedge effectiveness

SOURCE: "Remarks before the 2018 AICPA Conference on Current SEC and PCAOB Developments"

Hedge Accounting: International Impact (IASB)

Proposed Amendments to IFRS Standards

IASB staff proposals (Feb 2019)

- **Background:**
  - In December 2018, the International Accounting Standards Board (IASB), responsible for the International Financial Reporting Standards (IFRS), decided to add the ***IBOR Reform and its Effects on Financial Reporting* project** to its standard-setting program
  - The IASB staff **published a paper in February 2019** on the topic of issues leading up to IBOR reform, which includes proposed amendments to IFRS standards for specific issues
- **Proposals made:**
  - To provide **optional relief solely from the effects of IBOR reform uncertainties on the hedge accounting 'highly probable' requirement** – i.e., if the entity has designated forecast IBOR cash flows, or an IBOR risk component of forecast cash flows, as the hedged item, any potential amendments to the hedged item due to IBOR reform may be ignored when assessing whether the forecast transaction will occur
    - This relief will also apply to determining whether cash flows are still expected to occur, for cash flow hedge relationships that have already been discontinued for reasons other than IBOR reform, and amounts remain in the cash flow hedge reserve
  - To provide **optional relief under IAS 39 to require entities only to consider the existing contractual terms of the hedging instrument and hedged item** to demonstrate whether a cash flow hedge or a fair value hedge is expected to be highly effective, and, under IFRS 9, the staff propose relief to consider only the existing contractual terms in assessing whether there is an economic relationship between the hedging instrument and the hedged item

Impacts and remaining concerns

- The proposals refer to 'the existing contractual terms', which presumably is **intended to refer to the interest rate basis specified in the contract and not to include any fall-back language** in the contract specifying what would happen in the event that IBOR rates are not available
- The Staff paper states (see paragraph 57) that the amendments would provide relief for specific forward-looking assertions but **do not change the measurement of the hedging instrument and the hedged item**; however, the staff **do not explain how this measurement should occur**
  - For example, if an IBOR swap is designated as a hedge of a future variable interest rate, how should the hedged item be remeasured?
  - It would be helpful to be able to measure the hedged item consistently with its designation, so that if the designation is of IBOR cash flows or an IBOR component, it can be assumed that this is the hedged item to be remeasured, as long as there is an IBOR market
- As worded (see paragraph 73), the staff paper would appear to **prohibit designation of RFR risk in a hedge relationship until there is an available term structure of zero-coupon RFR rates**; this may restrict the issue of alternative RFR-referenced variable debt or the use of alternative RFR-referenced swaps
  - The project seems to assume that alternative RFR-referenced instruments will not be entered into until a future date when the reform is enacted, but it is expected that the transition will occur over the next few years.
  - Without entities entering into alternative RFR-referenced instruments, sufficient market liquidity is unlikely to arise, so there are concerns the proposals as-is may disincentivize transition to alternative RFRs
- **Next steps:**
  - An **Exposure Draft** will be published in April or May with an accelerated comment period, allowing final amendments to be published in November or December 2019
  - A **second phase of the project** will in future focus on issues arising once IBOR reform is enacted

SOURCE: IFRS Staff Paper (February 2019): "IBOR Reform and its Effects on Financial Reporting: Issues leading up to IBOR reform"

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Recent Regulatory Guidance: Swiss Financial Market Supervisory Authority (FINMA)

- FINMA has identified **three main risk areas**, which the National Working Group on Swiss Franc Reference Rates (NWG) is also examining, with respect to the LIBOR transition
- FINMA will pursue supervisory activities with respect to the LIBOR transition by:
  1) discussing **risks with supervised institutions** and continuing to support the NWG
  2) from January 2019 onwards, **contacting affected supervised institutions** and reviewing the adequacy with which risks are identified, limited, and monitored, including **addressing the LIBOR transition in the Swiss Solvency Test (SST)**

Risk area	Description	Recommended next steps
Legal risks	▪ Risk of potential legal disputes related to financial products referencing LIBOR with a final maturity date after 2021	▪ Amend contracts to include practicable fallback clauses ▪ Adopt a clear communication strategy toward customers and counterparties to help provide transparency / reduce the likelihood of legal conflicts
Valuation risks	▪ Valuation and basis risks resulting from the high amount of receivables and payables in derivatives and lending contracts that reference LIBOR ▪ Alternative RFRs are based solely on overnight rates, and maturity structure still needs to be defined – not possible to reliably predict the impact of LIBOR replacement on valuation of contracts and hedge transactions	▪ Utilize quantitative analysis to reduce uncertainty around the potential impact of LIBOR replacement on valuation
Operational risks	▪ From an operational point of view, products based on alternative RFRs must be usable in practice ▪ Risk of not being adequately prepared across operations, including technical infrastructure and data management	▪ Complete a timely assessment of operational readiness, which will help achieve a smoother transition to alternative RFRs ▪ Prepare technical infrastructure and data management for potential replacement

SOURCE: https://www.finma.ch/en/news/2018/12/20181217-aktuell-libor-aufsichtsmitteilung/

The Loan Market Association (LMA) remains active in market discussions to represent the loan market

Overview of the LMA involvement in the LIBOR transition

- The LMA is participating in various working groups, trade associations, and is responding to industry consultations to **ensure the interests of the loan market are represented**
  - Specifically, the LMA is a member of the **sterling, euro, and swiss franc working groups** in addition to being in coordination with other **trade associations** including the ACT, LSTA, APLMA, ICMA, ISDA, and AFME
- In terms of documentation, the LMA published it's **"Revised Replace-ment Screen Clause"** on May 25th, 2018 (which was subsequently updated in October 2018)
- This version of the clause provides greater flexibility compared to the earlier version as it **permits amendments with a lower consent threshold** in a wider range of circumstances
- The revised wording additionally allows for various **consequential amendments to be made, including amendments to preserve economic value**
  - This clause was developed with members of the LMA and the Association of Corporate Treasurers (ACT) and is applicable across various LIBOR currencies
- In October 2018, this clause was made **publicly available on the Bank of England website**

This was an important step in raising awareness of the implications of the transition away from LIBOR and the need for various parties to consider provisions in documentation referencing LIBOR

SOURCE: LMA News H1 2019

External mentions of LIBOR transition in 10Ks and 20-Fs (1/2)

	10K/20-F LIBOR reference[1]			
	Risk Factors	MD&A	Context of LIBOR reference	Actions or responses discussed
Goldman Sachs	✓	✓	▪ Detailed description of regulatory impetus for transition and financial and operational risks	▪ Detailed description of program including objectives, industry participation and operating model
Citi	✓	✗	▪ Detailed description of regulatory impetus for transition and financial, operational, legal exposures	▪ Detailed description of program including governance, workstreams, industry participation
Bank of America	✓	✓	▪ Detailed description of regulatory impetus for transition and financial, operational, regulatory exposures, and risks to wider financial system	▪ Brief introduction to program including industry and regulatory participation, contractual and operational risk management
J.P.Morgan	✓	✓	▪ Detailed description of the transition and risks to financial system, highlighting uncertainty in accounting standards	▪ Brief introduction to program including governance, customer outreach, model risk management, noting three scenarios across which risks are being assessed
Morgan Stanley	✓	✓	▪ Detailed description of global transition to alternative rates and financial, legal, regulatory, operational exposures	▪ Brief introduction to plans including customer outreach, industry participation, operational risk management
Wells Fargo	✓	✗	▪ Detailed description of financial exposures and impact on customers, with discussion of SOFR as an alternative RFR	▪ Brief introduction to program including contractual and operational risk management
American Express	✓	✗	▪ Brief description of the transition and financial exposures	▪ No planned responses to LIBOR discontinuation were mentioned
MetLife	✓	✗	▪ Brief description of transition and uncertain impact on MetLife issued or held securities, and to products, pricing and models	▪ No planned responses to LIBOR discontinuation were mentioned
PNC	✓	✗	▪ Detailed description of regulatory impetus for transition and financial exposures, with discussion of pre-2021 LIBOR quote unavailability	▪ Brief introduction of plans to transition LIBOR-linked products to alternative RFRs

1. LIBOR references must be substantive with regards to the transition. Mentions of LIBOR in a non-meaningful way e.g., as an example in the risks of floating rate references, are not included.
2. LIBOR transition was discussed extensively only in 2018 Annual Report to Shareholders, which is considered an "Incorporated Document" to the Wells Fargo 10K.
Any reference to a specific company or security does not constitute a recommendation to buy, sell, hold or directly invest in the company or its securities.

Goldman Sachs

External mentions of LIBOR transition in 10Ks and 20-Fs (2/2)

	10K/20-F LIBOR reference[1] Risk Factors	MD&A	Context of LIBOR reference	Actions or responses discussed
BlackRock	✗	✗	▪ Brief description of the transition and potential adverse impact on Blackrock's investments and creation of operational challenges	▪ No planned responses to LIBOR discontinuation were mentioned
	LIBOR mentioned in Business section in Regulatory Reform			
Prudential	✓	✓	▪ Brief description of transition, SOFR, and uncertain impact on held and issued securities and real estate activity	▪ No planned responses to LIBOR discontinuation were mentioned
SunTrust	✓	✗	▪ Brief description of transition and uncertain impact on revenue and expenses associated with floating rate liabilities, derivatives, and other financial instruments	▪ Brief description of potential for forced rebalancing of assets and liabilities and reforming financial instruments
Barclays	✓	N/A	▪ Brief description of the transition and statement that supporting the transition will be a time-consuming and costly task for industry participants	▪ No planned responses to LIBOR discontinuation were mentioned
Lloyds Bank	✓	N/A	▪ Detailed description of regulatory impetus for transition and risks to financial markets, as well as potential impact of the transition on the company and on customers	▪ Detailed description of program including governance, key activities, and stakeholder engagement strategies
AXA	✓	✗	▪ Brief description of the transition and anticipation of valuation risk for investments, hedging derivatives and other securities and contracts	▪ No planned responses to LIBOR discontinuation were mentioned
Ford	✓	✗	▪ Brief description of transition and potential for increase in Ford Credit's cost of funding	▪ No planned responses to LIBOR discontinuation were mentioned
McCormick	✓	✗	▪ Brief description of transition and potential for increase in the cost of variable debt	▪ Brief description of interest risk management policy through fixed and variable rate debt, interest rate derivatives
Mondelēz International	✗	✗	▪ Brief description of regulatory impetus for transition and financial exposures	▪ Brief description of interest risk management policy through fixed and variable rate debt, interest rate derivatives
	LIBOR mentioned in Market Risk Disclosures section			

1. LIBOR references must be substantive with regards to the transition. Mentions of LIBOR in a non-meaningful way e.g., as an example in the risks of floating rate references, are not included.
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Goldman Sachs 10K

Goldman Sachs 10K Risk Factors, MD&A (2018)

Introduction to LIBOR discontinuation:

- *"The FCA, which regulates LIBOR, has announced that it will not compel panel banks to contribute to LIBOR after 2021. It is likely that banks will not continue to provide submissions for the calculation of LIBOR after 2021 and possibly prior to then. Similarly, it is not possible to know whether LIBOR will continue to be viewed as an acceptable market benchmark, what rate or rates may become accepted alternatives to LIBOR, or what the effect of any such changes in views or alternatives may have on the financial markets for LIBOR-linked financial instruments. Similar statements have been made with respect to other IBORs."*

Description of risks:

- *"Uncertainty regarding IBORs and the taking of discretionary actions or negotiation of fallback provisions could result in pricing volatility, loss of market share in certain products, adverse tax or accounting impacts, compliance, legal and operational costs and risks associated with client disclosures, as well as systems disruption, model disruption and other business continuity issues. In addition, uncertainty relating to IBORs could result in increased capital requirements for the firm given potential low transaction volumes, a lack of liquidity or limited observability for exposures linked to IBORs or any emerging successor rates and operational incidents associated with changes in and the discontinuance of IBORs."*
- "This uncertainty could ultimately result in client disputes and litigation surrounding the proper interpretation of our IBOR-based contracts and financial instruments."

Internal efforts to support transition:

- *"We are seeking to facilitate an orderly transition from IBORs to alternative risk-free reference rates for us and our clients. Accordingly, we have created a program that focuses on:*
  - *Evaluating and monitoring the impacts across our businesses, including transactions and products;*
  - *Identifying and evaluating the scope of existing financial instruments and contracts that may be affected, and the extent to which those financial instruments and contracts already contain appropriate fallback language or would require amendment, either through bilateral negotiation or using industry-wide tools, such as protocols;*
  - *Enhancements to infrastructure (for example, models and systems) to prepare for a smooth transition to alternative risk-free reference rates;*
  - *Active participation in central bank and sector working groups, including responding to industry consultations; and*
  - *Client education and communication*
- *As part of this program, we have sought to systematically identify the risks inherent in this transition, including financial risks […] and nonfinancial risks […]. We are engaged with a range of industry and regulatory working groups (for example, ISDA, the Bank of England's Working Group on Sterling Risk Free Reference Rates and the Federal Reserve's Alternative Reference Rates Committee)."*

SOURCE: https://www.goldmansachs.com/investor-relations/financials/current/10k/2018-10-k.pdf

Institutions are publicly addressing the LIBOR transition in their financials (1/3)

Citi 10K Risk Factors (2018)

Introduction to LIBOR discontinuation:

- *"In 2017, the U.K. Financial Conduct Authority (FCA) noted that market conditions raised serious questions about the future sustainability of LIBOR benchmarks […] the future of LIBOR beyond 2021 remains uncertain."*

Description of risks:

- *"Citi's consumer and institutional businesses issue, trade, hold or otherwise use various products and securities that reference LIBOR […] the discontinuation of LIBOR or any other interest rate benchmark could result in increased financial, operational, legal, reputational or compliance risks."*
- *"[R]eplacement of LIBOR or any other benchmark with a new benchmark rate could adversely impact the value of and return on existing instruments and contracts."*

Internal efforts to support transition:

- *"Citi established a LIBOR governance and implementation program that includes senior management involvement. Citi's Asset and Liability Committee oversees the program, and includes reporting to the Citigroup Board of Directors. The program operates globally across Citi's businesses and functions."*
- *"Citi has developed an initial set of LIBOR transition action plans and associated roadmap under nine key workstreams: transition strategy and risk management; customer management; internal communications and training; financial exposures and risk management; regulatory and industry engagement; operations and technology; finance, tax and treasury; legal and contract management; and product management."*

Bank of America 10K Risk Factors, MD&A (2018)

Introduction to LIBOR discontinuation:

- *"The U.K. FCA announced in July 2017, that it will no longer persuade or require banks to submit rates for LIBOR after 2021. This announcement […] resulted in uncertainty about the future of LIBOR"*

Description of risks:

- *"[T[here can be no assurance that we […] will be adequately prepared for an actual discontinuation of benchmarks"*
- *"The discontinuation of benchmarks, including LIBOR, may have an unpredictable impact on the contractual mechanics of outstanding securities, loans, derivatives or other products"*
- *"[A]ny transition […] may alter the Corporation's risk profiles and models, valuation tools, product design and effectiveness of hedging strategies, as well as increase the costs and risks related to potential regulatory requirements."*

Internal efforts to support transition:

- *"The Corporation has established an enterprise-wide initiative to identify, assess and monitor risks associated with the potential discontinuation or unavailability of benchmarks, including LIBOR, and the transition to alternative reference rates."*
- *"[T]he Corporation is actively engaged with global regulators, industry working groups and trade associations to develop strategies for transitions from current benchmarks to alternative reference rates […] updating our operational processes and models to support new alternative reference rate activity."*
- *"Certain actions required to mitigate risks […] are dependent on a consensus being reached by the industry or the markets in various jurisdictions around the world."*

SOURCE: https://www.citigroup.com/citi/investor/data/q1804c.pdf?ieNocache=178; http://investor.bankofamerica.com/phoenix.zhtml?c=71595&p=irol-sec#fbid=-PXoDC4JHpJ/hashlink=16165865

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Goldman Sachs

Institutions are publicly addressing the LIBOR transition in their financials (2/3)

JPMorgan 10K Risk Factors, MD&A (2018)

J.P.Morgan

Introduction to LIBOR discontinuation:

- *"On July 27, 2017, the […] "FCA", which regulates […] "LIBOR", announced that the FCA will no longer persuade or compel banks to submit rates for the calculation of the LIBOR benchmark after 2021."*

Description of risks:

- *"Vast amounts of […] financial instruments are linked to the LIBOR benchmark, and any failure […] to replace LIBOR […] could, as noted above, result in disruption in the financial markets, […] all of which could have a negative impact on JPMorgan Chase"*
- *"NWGs are also working […] to manage the accounting implications of amending existing contracts […] Current efforts include […] potential alternatives to mitigate those impacts through interpretation of existing accounting rules, or through transition relief from FASB and IASB standard setting."*

Internal efforts to support transition:

- *"JPMorgan Chase established a Firmwide LIBOR Transition program in early 2018. The Firmwide CFO and the CEO of the CIB oversee the program as senior sponsors."*
- *"When assessing risks associated with IBOR transition, the program considers three possible scenarios: disorderly transition, measured/regulated transition, and IBOR in continuity."*
- *"Plans to mitigate the risks associated with IBOR transition have been identified, with some already in the early stages of implementation. Model risk, for example, will be mitigated by the identification and migration of swap curves"*
- *"The Firm is encouraging its clients to actively participate in industry consultations on fallback language"*

Morgan Stanley 10K Risk Factors, MD&A (2018)

Morgan Stanley

Introduction to LIBOR discontinuation:

- *"Central banks around the world […] have commissioned working groups of market participants and official sector representatives with the goal of finding suitable replacements for LIBOR"*

Description of risks:

- *"[A]ny such transition or reform could: [a]dversely impact the pricing, liquidity, value of, return on and trading for a broad array of financial products […] [r]equire extensive changes to documentation that governs or references IBOR […] [r]esult in inquiries or other actions from regulators […] [r]esult in disputes, litigation or other actions with counterparties […] [r]equire the transition and/or development of appropriate systems and analytics to effectively transition our risk management processes"*
- *"Depending on several factors including those set forth above, our business, financial condition and results of operations could be materially adversely impacted by the market transition or reform of certain benchmarks."*
- *"Other factors include the pace of the transition […], the specific terms […] of any alternative reference rate, […] and our ability to transition and develop appropriate systems"*

Internal efforts to support transition:

- *"[W]e are preparing to transition from the IBORs to these alternative reference rates. Our transition plan includes a number of key steps, including continued engagement with central bank and industry working groups and regulators, active client engagement, internal operational readiness, and risk management, among other things, to promote the transition to alternative reference rates."*

SOURCE: https://jpmorganchaseco.gcs-web.com/static-files/cdb056f9-4973-4dc9-9319-e418b9ccf28f; https://www.morganstanley.com/about-us-ir/pdf/MS_10K_December_31_2018.pdf

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Goldman Sachs

Institutions are publicly addressing the LIBOR transition in their financials (3/3)

McCormick 10K (2018)

Elements of publication:

- Context for the LIBOR transition
- Reference to the uncertainty regarding the transition and disclaimer for potential impacts
- Introduction to financial risk management procedures

Specific language used to describe transition:

- *"Certain of our variable rate debt, including our revolving credit facility, **currently uses LIBOR as a benchmark** for establishing the interest rate. **LIBOR is the subject of recent proposals for reform**. These reforms and other pressures **may cause LIBOR to disappear entirely** or to perform differently than in the past. The consequences of these developments with respect to LIBOR cannot be entirely predicted but could result in an **increase in the cost of our variable rate debt**."*
- *[…] "Our policy is to **manage our interest rate risk** by entering into both fixed and variable rate debt arrangements. We also use interest rate swaps to minimize worldwide financing cost and to achieve a desired mix of fixed and variable rate debt. We utilize derivative financial instruments to **enhance our ability to manage risk**, including interest rate exposures that exist as part of our ongoing business operations."*

Mondelez 10K (2018)

Elements of publication:

- Context for the LIBOR transition
- Discussion of size of financial exposure to LIBOR
- Introduction to financial risk management procedures

Specific language used to describe transition:

- *"We regularly evaluate our variable and fixed-rate debt as well as current and expected interest rates in the markets in which we raise capital. Our primary exposures include movements in U.S. Treasury rates, corporate credit spreads, commercial paper rates as well as limited **debt tied to London Interbank Offered Rates ("LIBOR")**. The Financial Conduct Authority in the United Kingdom plans to **phase out LIBOR by the end of 2021**."*
- *"We do not anticipate a **significant impact to our financial position** from the planned phase out of LIBOR given our current mix of variable and fixedrate [sic] debt. We periodically use interest rate swaps and forward interest rate contracts to **achieve a desired proportion of variable versus fixed rate** debt based on current and projected market conditions."*

SOURCE: https://ir.mccormick.com/sec-filings/sec-filing/10-k/0000063754-18-000008; https://ir.mondelezinternational.com/sec-filings/sec-filing/10-k/0001103982-19-000005

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