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Emerging Benchmark Interest Rates: Accounting and Valuation Observations on Libor Replacement

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Agenda

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- SOFR Derivatives Activity
- SOFR Issuance Activity
- SOFR Issuer Perspective
- Accounting Considerations
- LIBOR transition beyond the US
- Developing a LIBOR Transition Plan

Emerging Benchmark Interest Rates

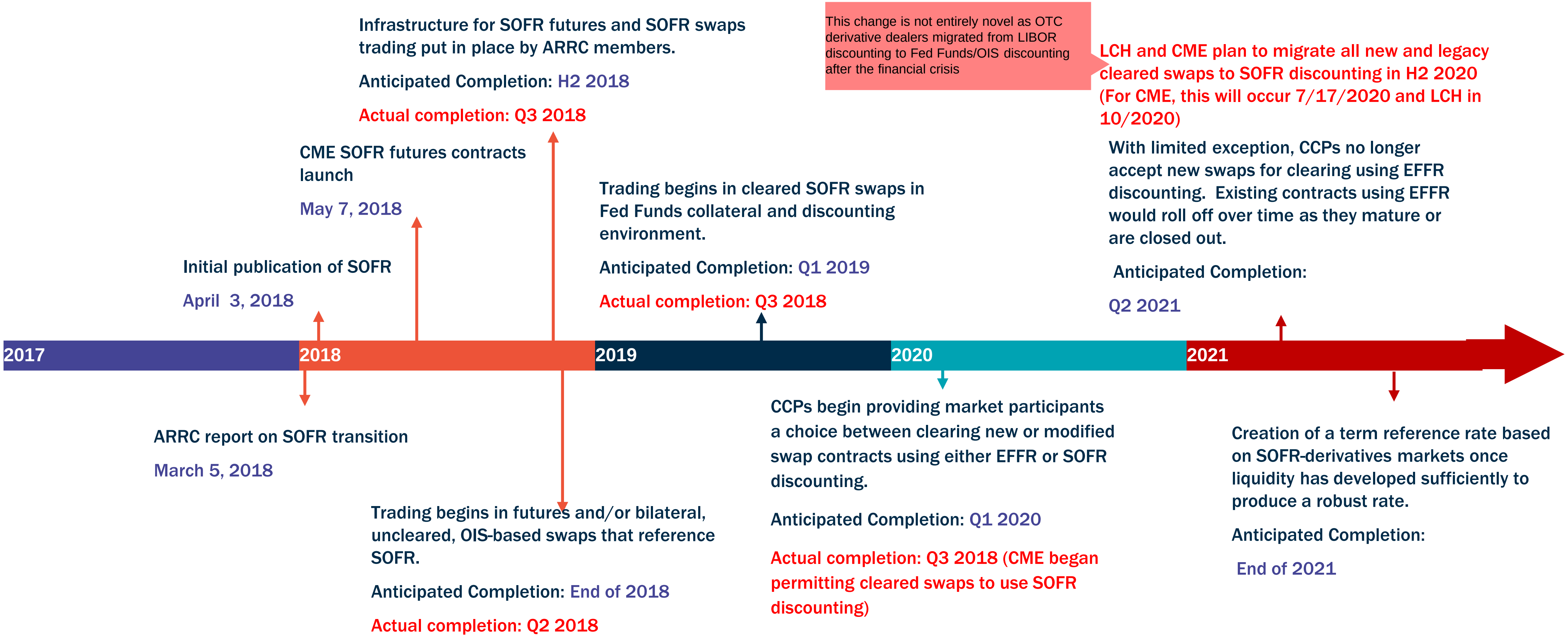
Introductions

Emerging Benchmark Interest Rates

LIBOR Transition Timeline/Key Milestones

ARRC's Paced Transition Plan & Key Milestones

Milestones within ARRC's paced transition plan have been achieved well ahead of schedule



Source: https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2018/ARRC-Second-report

Emerging Benchmark Interest Rates

What is SOFR?

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Benchmark Rates

Compared to USD LIBOR and EFFR, SOFR excludes credit risk and is more transparent as it is derived from actual transactions in three liquid repo markets

Benchmark Rates

Benchmark Rates	Key Characteristics
USD LIBOR	• Inter-bank unsecured term lending rate • Constructed by aggregating indicative rates at which contributing banks can obtain unsecured funding in the London interbank market for a specified time period with certain adjustments made to exclude outliers • Often theoretical as most banks don't lend to bank counterparties for term on an unsecured basis • Relatively deep liquidity in OTC and exchange-traded derivatives markets
EFFR	• Overnight unsecured bank lending rate • The EFFR is the weighted-average rate at which depository institutions trade balances held at Federal Reserve Banks with each other overnight • Reflects rates based on actual lending transactions with modestly deep liquidity (though market activity has lessened since the recent financial crisis) • Relatively deep liquidity in short and medium-term derivative tenors; EFFR swaps also called Overnight Indexed Swaps ("OIS") • Influenced by monetary policy (Fed Funds target rate set by FOMC)
SOFR	• Overnight secured lending rate • Calculated from the volume-weighted median of three segments of the Treasury repo market: (1) tri-party, (2) general collateral financing, and (3) cleared bilateral; bottom quartile of certain transactions is excluded • Reflects rates observed from markets with relatively deep liquidity • Unlike the Fed Funds or reverse repo rates, SOFR will not constrain Fed's existing monetary policy tools

Seasonal Effects on SOFR

Seasonal factors account for one third of the daily volatility in SOFR and include quarter-end balance sheet positioning by banks and T-Bill settlements (would be mitigated by daily averaging)

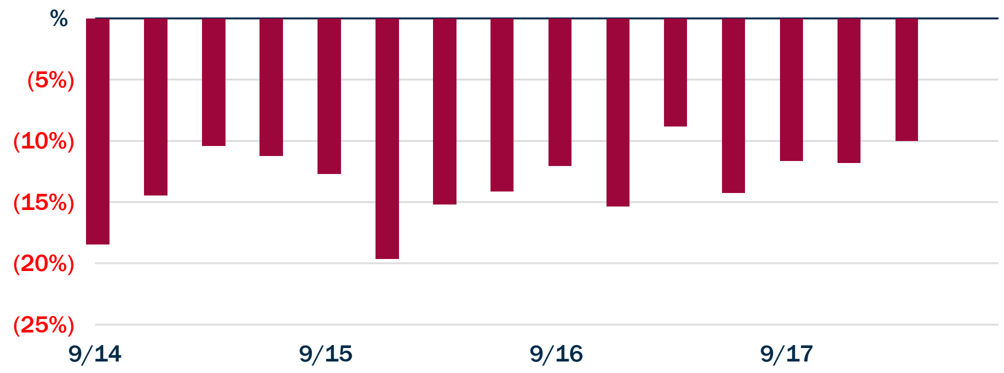
Overview

Seasonality factors inherent in SOFR reflect the tendency for banks and dealers whose leverage ratio reporting is done on an end-of-quarter basis to reduce their repo activity sharply ahead of quarter-end

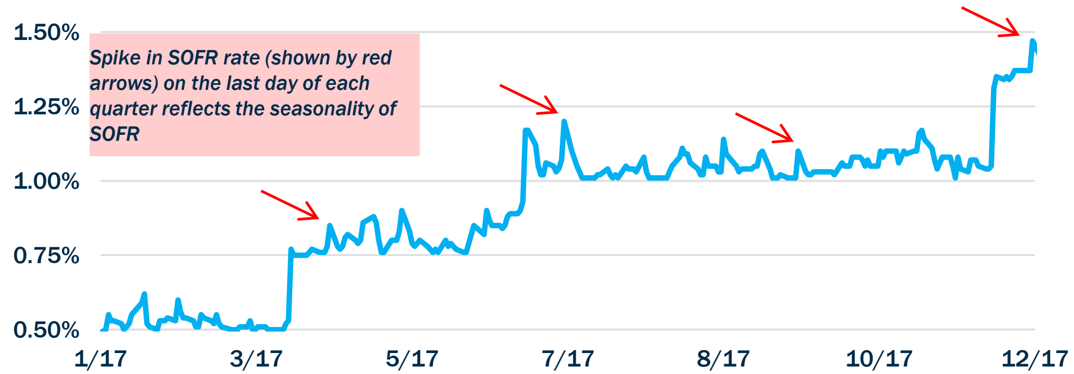
Since 2014, SOFR trading volumes on the last day of a quarter are about 13% lower than their average over the two weeks at the start of the same month

This generally results in an increase in SOFR yields at quarter-end. Averaging of the daily rate mitigates this effect. Another material seasonal effect is T-Bill issuance and coupon settlements

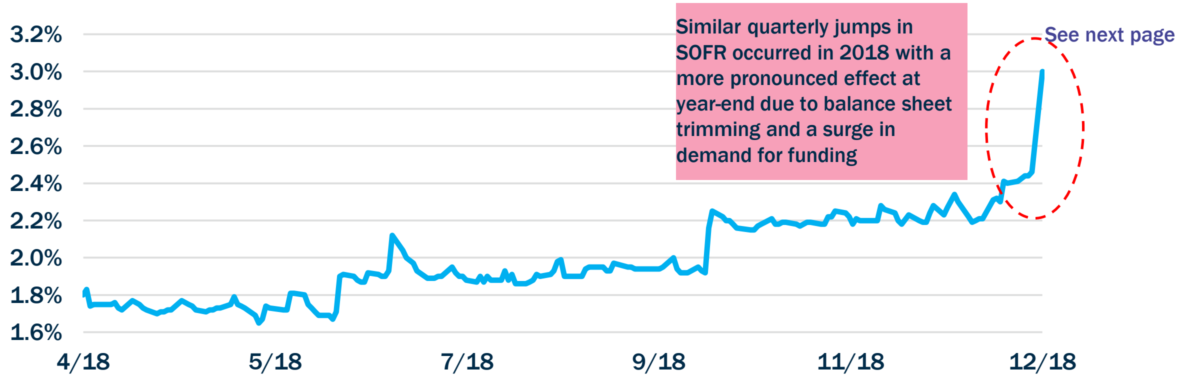
SOFR Quarter-End Volume Decline (%)[1]



Daily SOFR Rate (2017)[2]



Daily SOFR Rate (2018)[2]



While seasonal factors can cause volatility in SOFR on discrete dates, average measures of SOFR (e.g., quarterly average of daily compounded average SOFR) generally smooth-out such effects

1. *Source: Bloomberg*
2. *Source: Federal Reserve Bank of New York, Bank of New York Mellon, JPMorgan Chase, DTCC Solutions, LLC., Staff Calculations, Barclays Research*

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SOFR: Price Volatility at Year-end 2018

- **The overnight SOFR rate increased from ~2.45% to 3.0% on 12/31/2018**
  - SOFR remained elevated for several days into the new year

SOFR spiked to 3.0% on 12/31/2018; however, SOFR averaged 2.35% in December and 2.25% in Q4 2018

- **So, what happened?**
  - Year-end window dressing caused banks and dealers to shrink their balance sheets
  - GSIB risk score is calculated as of year-end
  - Some non-US banks report their net exposures on an end-of-period basis for the leverage ratio

- **These effects regularly occur at quarter-end**
  - SOFR volumes typically fall 10% in the final two weeks of a quarter
  - The overnight SOFR rate rises by 8 to 10bp, in general

- **As corporations seek funding and execute hedges for periods longer than overnight, we examined how daily average SOFR would perform over a typical interest accrual period and how that compares to 3M LIBOR**
  - We calculated 3M average SOFR (compounded in arrears) over a series of historical three month periods for which 3M LIBOR (set in advance) would apply
  - Our calculation demonstrated that the daily average SOFR over three months (i) produces a relatively smooth rate and (ii) is relatively correlated to 3M LIBOR

Emerging Benchmark Interest Rates

ARCC (Cash Instruments) Fallback Language

ARRC Cash Instruments Fallback

In late April 2019, ARRC published its final recommendations for how newly issued syndicated business loans and floating rate notes would address the impending transition away from USD LIBOR

Fallback Triggers

- Contractual provisions incorporated into loan agreements / bond indentures that would specify when LIBOR component of instrument's floating interest rate would be replaced with alternative rate
- Generally, there are only minor differences in key provisions for syndicated business loans and floating-rate notes, primarily due to operational differences between loans and publicly traded notes
- Fallback triggers universally address permanent cessation in LIBOR's publication as well as a "pre-cessation" trigger to address situations where applicable regulatory body judges LIBOR to be "no longer representative" of a relevant, liquid benchmark

Fallback Rates

- Contractual provisions incorporated into loan agreements / bond indentures that would specify the interest rate that would replace the LIBOR component of interest rate should a trigger event occur
- Fallback provisions provide for separate adjustments to account for term and credit risk differentials between LIBOR and SOFR (the replacement rate)
- Provisions set forth operative "waterfalls" for identifying replacement benchmark rate and spread adjustment to be applied when modifying the instrument
- Waterfalls/mechanics for identifying replacement benchmark rate between syndicated business loans and floating-rate loans can differ in certain cases

ISDA Consultations on LIBOR Fallbacks

In July 2018, ISDA published an initial consultation on LIBOR fallbacks and subsequently published a supplemental consultation on USD LIBOR fallbacks in July 2019

Overview

- The International Swaps and Derivatives Association (ISDA) has been leading the effort globally on the eventual transition of LIBOR-indexed over-the-counter (OTC) derivatives contracts to new benchmark rates once there is a permanent discontinuation in LIBOR
- On July 12, 2018, ISDA published a consultation on various alternative fallback methodologies for 6 benchmark rates across different markets (including 3 LIBORs); the consultation did not address USD LIBOR or EUR LIBOR/EURIBOR but did seek preliminary feedback on USD LIBOR
    - The consultation proposed that the applicable LIBOR index be replaced at the time of a permanent discontinuation of LIBOR with a risk-free rate (RFR) plus a spread; an array of methodologies for determining the adjustments to convert LIBOR to the applicable RFR was proposed
    - Consultation solely addressed OTC derivatives and was not intended to apply to cash instruments
- In May 2019, ISDA published a supplemental consultation on fallbacks for USD LIBOR (as well as certain other IBORs not addressed in the July 2018 consultation)
    - Scope of this consultation was broadly similar to the July 2018 consultation
    - ISDA noted that a separate supplemental consultation will be published to address fallbacks for EUR LIBOR and EURIBOR at a later date
- Additionally, in May 2019 ISDA published a consultation that sought input on including pre-cessation triggers in ISDA-based derivative contracts indexed to LIBOR that would allow for orderly migration to RFRs based on, among other things, lack of representativeness
- Prior to finalizing the fallback adjustments, ISDA will publish a consultation for public comment on implementation and parameters. The ISDA Board Benchmark Committee will have the ultimate responsibility for this determination.
- ISDA's plan is to finalize its fallback language and publish a protocol for counterparties to adopt/adhere in late Q4 2019 or early Q1 2020

Fallback Rates – Floating Rate Notes

Revisions to LIBOR component of floating rate notes' interest rate are subject to a narrowly defined set of parameters and involve limited discretion for how the fallback rate is determined

Priority	Benchmark Replacement Waterfall
1	• Term SOFR (e.g., 3-month SOFR) selected/recommended by Relevant Governmental Body + Adjustment[1]
2	• Compounded [or Simple] Average SOFR + Adjustment
3	• Replacement rate recommended by Relevant Governmental Body + Adjustment
4	• Fallback rate in ISDA Definitions at such time* + Adjustment **with respect to SOFR, the current ISDA definitions would look first to the Relevant Governmental Body recommended replacement rate for SOFR, then to the Overnight Bank Funding Rate and then to the FOMC Target Rate, with each of the latter two rates as published on the Federal Reserve's website.*
5	• Replacement rate determined by issuer or its designee + Adjustment

Priority	Adjustment Waterfall – Term & Credit Spread Component
1	• ARRC selected adjustment
2	• Spread established by ISDA for relevant benchmark replacement • *This step 2 is applicable only where the Unadjusted Replacement Benchmark is equivalent to the ISDA Fallback Rate (priority 4 above)*
3	• Spread determined by issuer or its designee

1. *ARRC's final recommended fallback language permits issuers of floating rate notes that have or intend to hedge them with standard derivatives to remove Term SOFR (and make conforming changes to fallback language in legal agreements).*

Fallback Rates – Syndicated Loans

Revisions to LIBOR benchmark component of syndicated loans' interest rate can be either (i) amended in streamlined fashion or (ii) subject to "hardwired" waterfall adjustment mechanics

Priority	"Hardwired" Benchmark Replacement Waterfall
1a	• Term SOFR (e.g., 3-month SOFR) selected/recommended by Relevant Governmental Body + Adjustment[1]
1b	• Next Available Term SOFR + Adjustment (nearest proximate tenor shorter than existing interest rate tenor)
2	• Compounded Average SOFR + Adjustment
2'	• Simple Average SOFR + Adjustment[2]
3	• Borrower and Administrative Agent Selected Rate + Adjustment (consistent with "Streamlined Amendment Approach")* **This approach requires the parties to the loan to give due consideration to an alternative rate of interest selected or recommended by the Federal Reserve or the ARRC or any evolving or then-prevailing syndicated loan market conventions for determining interest rates.*

Priority	Adjustment Waterfall – Term & Credit Spread Component
1	• ARRC selected adjustment
2	• Spread established by ISDA for relevant benchmark replacement *This step is applicable only when no such spread adjustment selected or recommend by the Relevant Governmental Body is available*
3	• Spread determined by Borrower and Administrative Agent

1. *Syndicated business loans fallback provisions permit borrowers that hedge their loans with LIBOR-based swaps to remove Term SOFR from the fallback waterfall in order to avoid potential mismatches between the loan and hedging derivative*
2. *2' permits parties to the loan to replace compounded SOFR within the waterfall with simple average SOFR*

Replacement Benchmark Rate Definitions

Below are the definitions of benchmark rate adjustment alternatives in the final ARRC recommendations for floating-rate notes and syndicated loans

	Benchmark Rates
Term SOFR	• Defined as a forward-looking term SOFR for the Corresponding Tenor (meaning a period equivalent to the LIBOR tenor, e.g. 1-month SOFR, 3-month SOFR) that is selected or recommended by the Relevant Governmental Body* *Means the Federal Reserve Board and/or the Federal Reserve Bank of New York, or a committee officially endorsed or convened by the Federal Reserve Board and/or the Federal Reserve Bank of New York (e.g., the ARRC), or any successor thereto
Compounded SOFR	• Compounded average of SOFRs for the applicable Corresponding Tenor, with the rate, or methodology for this rate, and conventions for this rate (which will be compounded in arrears with a lookback and/or suspension period as a mechanism to determine the interest amount payable prior to the end of each Interest Period) being established by the issuer or its designee in accordance with: (1) the rate, or methodology for this rate, and conventions for this rate selected or recommended by the Relevant Governmental Body for determining compounded SOFR; provided that: (2) if, and to the extent that, the issuer or its designee determines that Compounded SOFR cannot be determined in accordance with clause (1), then the rate, or methodology for this rate, and conventions for this rate that have been selected by the issuer or its designee giving due consideration to any industry-accepted market practice for U.S. dollar denominated floating rate notes at such time.
Example of Compounded SOFR[1]	$\left[\prod_{i=1}^{d_o}\left(1+\frac{SOFR_i \times n_i}{360}\right)-1\right] \times \frac{360}{d}$ The formula above for calculating the periodic variable cash flows of a financial instrument that is indexed to SOFR represents a geometric mean whereby the product of the daily SOFR rates in the period are compounded at SOFR over the number of days in the calculation period (e.g., month or quarter)

1. *Based on current definition of Compounded USD SOFR in ISDA Definitions*

Replacement Benchmark Rate Definitions (con't)

Below are the definitions of benchmark rate adjustment alternatives in the final ARRC recommendations for floating-rate notes and syndicated loans

	Benchmark Rates
Simple Average SOFR	• Simple average of daily spot SOFR during the applicable Corresponding Tenor (i.e., length of interest period), with the conventions for this rate (which will be in arrears with a lookback and/or suspension period as a mechanism to determine the interest amount payable prior to the end of each Interest Period) being established by the issuer or its designee in accordance with: (1) the conventions for this rate selected or recommended by the Relevant Governmental Body for determining simple average SOFR; provided that: (2) if, and to the extent that, the issuer or its designee determines that Simple Average SOFR cannot be determined in accordance with clause (1), then the conventions for this rate that have been selected by the issuer or its designee giving consideration to any industry-accepted market practice for U.S. dollar denominated floating rate notes at such time
Government-Selected Rate	• Alternate rate of interest that has been selected or recommended by the Relevant Governmental Body as the replacement for the then current Benchmark for the applicable Corresponding Tenor
Issuer-Selected Rate	• Alternate rate of interest that has been selected by the issuer or its designee as the replacement for the then current interest rate benchmark for the applicable Corresponding Tenor that gives consideration to any industry-accepted rate of interest as a replacement for the then current interest rate benchmark for U.S. dollar denominated floating rate notes at such time
Borrower and Administrative Agent-Selected Rate	• the sum of: (a) the alternate rate of interest that has been selected by the Administrative Agent and the Borrower as the replacement for the then-current interest rate benchmark for the applicable Corresponding Tenor giving consideration to (i) any selection or recommendation of a replacement rate or the mechanism for determining such a rate by the Relevant Governmental Body at such time or (ii) any evolving or then-prevailing market convention for determining a rate of interest as a replacement for the then current interest rate benchmark for U.S. dollar-denominated syndicated credit facilities at such time and (b) the Benchmark Replacement Adjustment

Spread Adjustment Definitions

Below are the spread adjustment alternatives in order of priority in the final ARRC recommendations for floating rate notes

	Spread Adjustments
ARRC-Selected Adjustment	• Spread adjustment or method for calculating or determining such spread adjustment (which may be positive, negative, or zero) that has been selected or recommended by the Relevant Government Body for the applicable Unadjusted Benchmark Replacement • This spread adjustment does not yet exist but is expected to be developed and published after the liquidity in SOFR futures deepens and a term SOFR rate is developed
ISDA Fallback Adjustment	• If Benchmark Replacement for floating rate note is equivalent to the ISDA Fallback Rate, then the ISDA Fallback Adjustment • ISDA has finalized a framework for how it would adjust LIBOR to be equivalent to the applicable replacement reference rate for a number of currencies (but has not published guidance for USD LIBOR). ISDA's approach would provide for a term premium component based on the time a permanent discontinuation of the applicable LIBOR arises and a credit spread component based on a historical mean/median over a lengthy period of time. • Details regarding ISDA's spread adjustment methodology have not yet been published
Issuer-Selected Adjustment	• Spread adjustment (which may be positive, negative, or zero) that has been selected by the issuer or its designee giving consideration to any industry-accepted spread adjustment, or method for calculating or determining such spread adjustment, for the replacement of the then-current interest rate benchmark with the applicable Unadjusted Benchmark Replacement for U.S. dollar denominated floating rate notes at such time
Borrower and Administrative Agent-Selected Adjustment	• Spread adjustment, or method for calculating or determining such spread adjustment, (which may be a positive or negative value or zero) that has been selected by the Administrative Agent and the Borrower for the applicable Corresponding Tenor giving consideration to (i) any selection or recommendation of a spread adjustment…by the Relevant Governmental Body at such time or (ii) any evolving or then-prevailing market convention for determining a spread adjustment…for U.S. dollar-denominated syndicated credit facilities at such time

Emerging Benchmark Interest Rates

ISDA (Derivatives) Fallback Language

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ISDA Consultations on LIBOR Fallbacks

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	  • The consultation proposed that the applicable LIBOR index be replaced at the time of a permanent discontinuation of LIBOR with a risk-free rate (RFR) plus a spread; an array of methodologies for determining the adjustments to convert LIBOR to the applicable RFR was proposed
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	• ISDA's plan is to finalized its fallback language and publish a protocol for counterparties to adopt/adhere in late Q4 2019 or early Q1 2020

Source: ISDA.org; Barclays Research

ISDA's Proposed LIBOR Fallback Alternatives

Term Adjustment

Alternative	Description	Pros	Cons
1) Spot overnight rate	Use the RFR as of 1/2 business days prior to the beginning of IBOR leg	Simple, easy to implement	Ignores RFR term structure Volatile since only 1 day observation of RFR is used Does not mirror OIS
2) Convexity-adjusted overnight rate	Alternative 1 modified for daily compounding over the IBOR term	**More comparable to OIS than alternative 1**	Ignores RFR term structure Volatile Complex
3) Compounded setting in arrears	Daily compounded RFR over IBOR tenor	**Reflects actual interest rate movements** **Less volatile than 1 & 2** **Mirrors OIS perfectly**	Cash flow uncertainty Difference between ex-ante pricing and ex-post realization of daily rate
4) Compounded setting in advance	Same as 3 but observed over previous IBOR period	**Sets in advance** **Less volatile than 1 & 2**	Backward looking Timing mismatch Difficult to hedge

Credit Spread Adjustment

Alternative	Description	Pros	Cons
1) **Forward approach**	**Market forward spread between IBOR and RFR for every future date out to 30-60y is observed, on the day the fallback is triggered, and frozen for that future date thereafter**	**Prevents significant value transfers at the time of trigger.**	**Requires functioning RFR OIS curve, ideally out to 60y**
2) **Historical mean/median approach**	**Historical spread between IBOR and adjusted RFR over a long, static look back period, with a transitional period**	**Based on readily available information.** **Transition avoids a potential cliff**	**Ignores term structure of spread** **Could cause value transfer**
3) **Spot spread**	**Last day's observation of the spot spread between IBOR and RFR before fallback is triggered**	**Simple to implement**	**Dependency on one-day of observation. Likely to cause value transfer**

Source: ISDA.

Results of ISDA Consultation on LIBOR Fallbacks

In December 2018 ISDA published the results of its July 2018 consultation on LIBOR fallbacks and subsequently published preliminary consultation results on USD LIBOR fallbacks in July 2019

Results of ISDA Consultations on Fallbacks	• ISDA received 152 responses on its July 2018 consultation from 164 entities encompassing a broad-range of stakeholders and industries.
	  • Final results of the May 2019 consultation are in the process of being compiled but preliminary results have been published
	• The overwhelming majority of respondents to both the July 2018 and May 2019 consultations preferred the "compounded setting in arrears rate" alternative for the adjusted RFR, and a significant majority of respondents preferred the "historical mean/median approach" for the credit spread adjustment
	  • Compounded setting in arrears approach would involve daily compounding of the RFR over the relevant Libor tenor (likely using a geometric average) to account for term premium
	  • Historical mean/median credit spread adjustment would involve measuring the mean/median spot LIBOR-adjusted RFR differential (reflecting credit risk, liquidity, and other factors) for each LIBOR tenor calculated over a significant, static look-back period
	• The majority of respondents to both the July 2018 and May 2019 consultations preferred to use a uniform approach for both the adjusted RFR and spread adjustment across all benchmarks covered by the May consultation

Preliminary Results of ISDA Consultation on Pre-Cessation Triggers	• Respondents to ISDA's consultation on the inclusion of pre-cessation triggers in standard ISDA documentation expressed a wide range of views regarding whether and how to implement a precessation trigger related to "non-representativeness" for derivatives. Feedback fell into the following categories **with no clear majority** 1. Those that support incorporating a pre-cessation trigger into the ISDA 2006 Definitions and related protocol. 2. Those that support use of a pre-cessation trigger, provided there is an option to include/exclude 3. Those who oppose use of a pre-cessation trigger

Source: ISDA.org; Barclays Research

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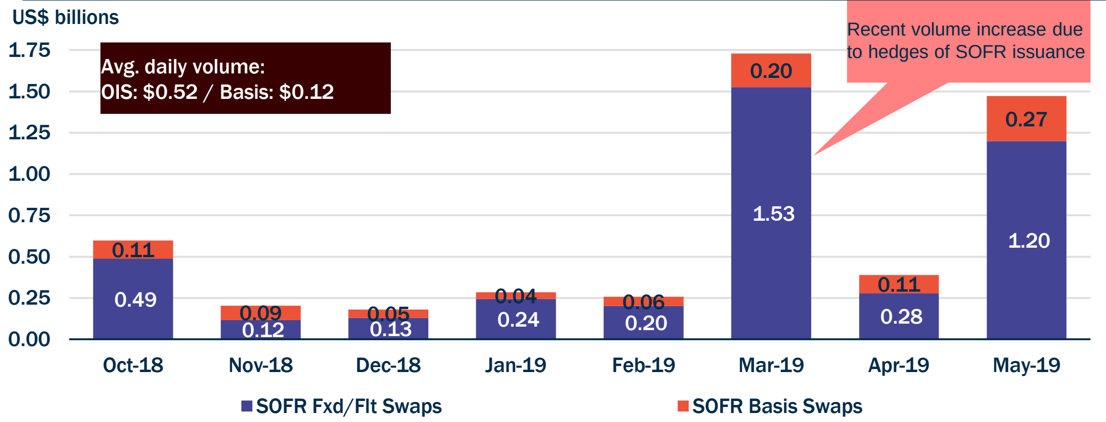
SOFR Derivatives Activity

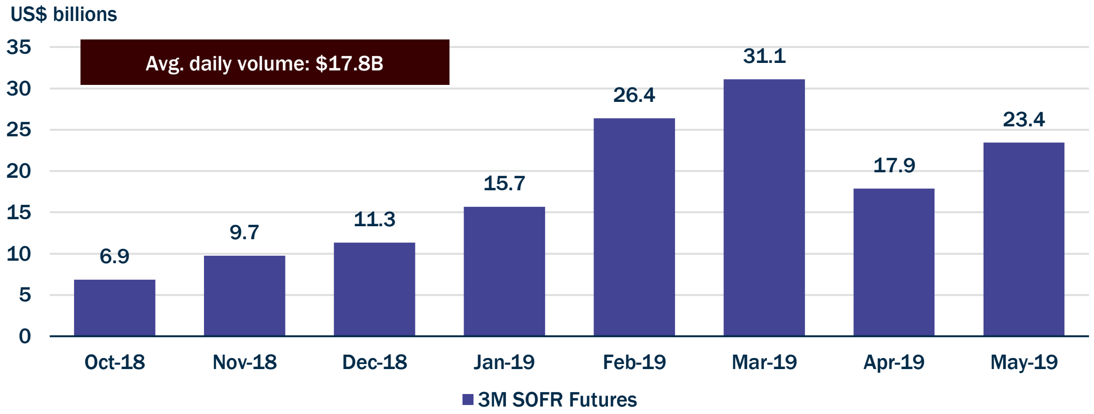
Derivatives Trading Volumes

Though SOFR futures and swaps volumes have gained momentum, their liquidity significantly lags trading in Eurodollar (3M LIBOR) and Fed Funds futures

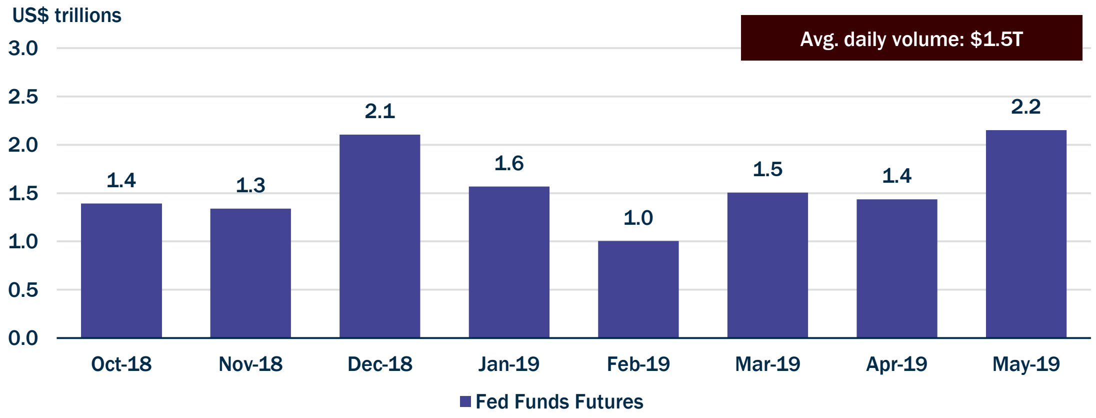
SOFR OTC Swaps Volume



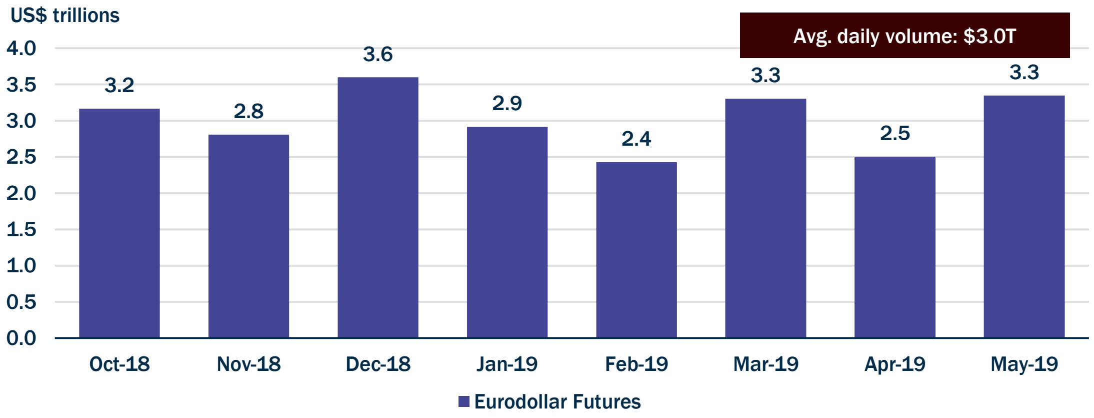
3M SOFR Futures Volume



Fed Funds Futures Volume



Eurodollar Futures Volume

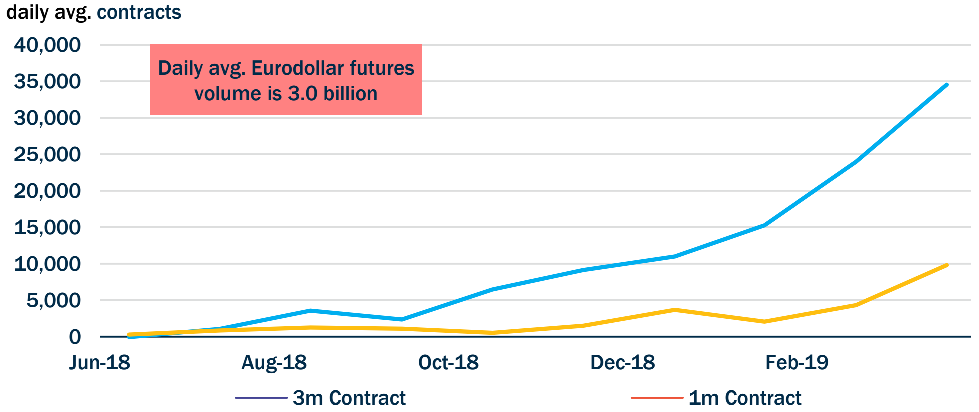


Source: Bloomberg, DTCC SDR. Amounts presented in bar charts represent average daily volumes

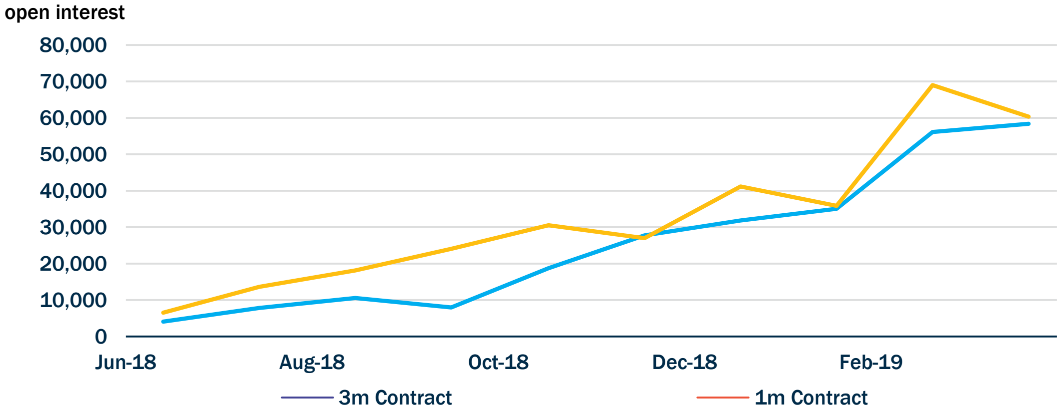
SOFR Futures & Swaps; Liquidity Begets Liquidity

Liquidity in the SOFR derivatives market continues to develop

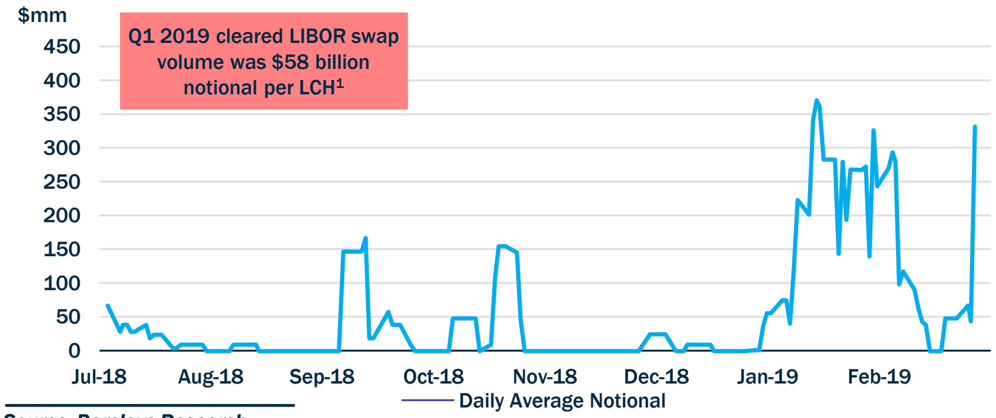
SOFR Futures Volumes Growing Sharply



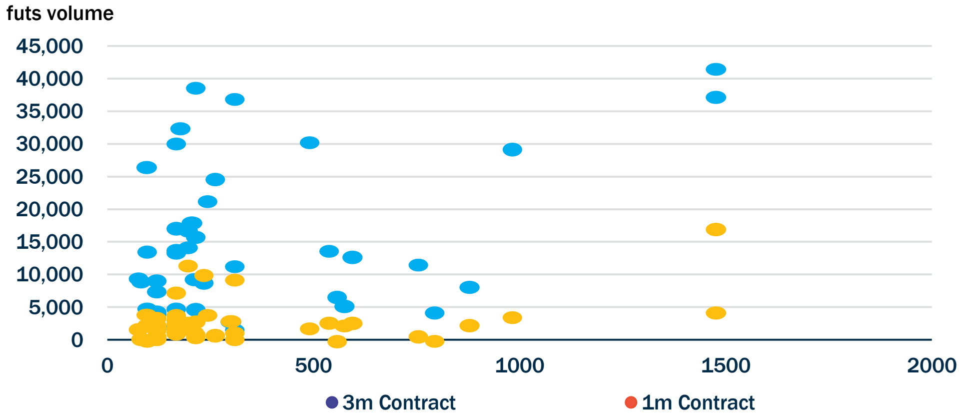
Open Interest in SOFR Futures Is Comparable



Increasing Activity in SOFR-Linked Swaps



Swap Trading Complements Futures Trading



Source: Barclays Research

1. Per Working Group on Sterling Risk-Free Reference Rates March newsletter

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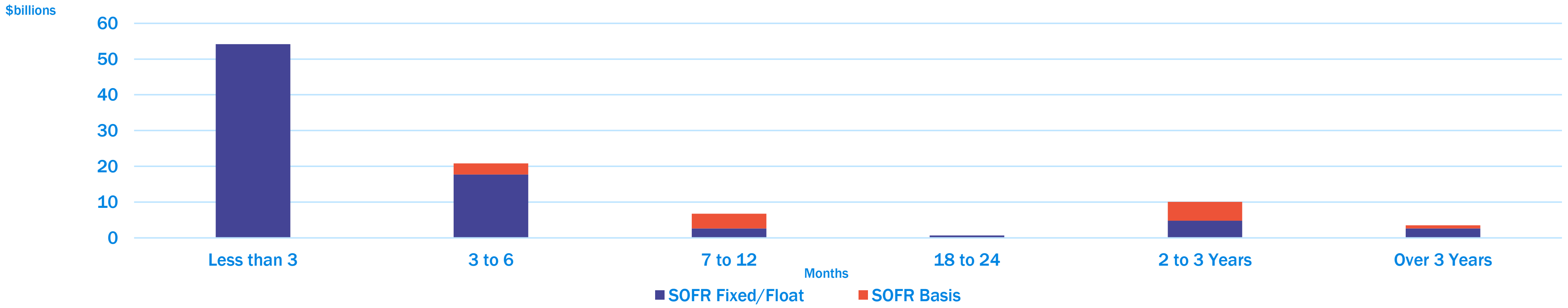
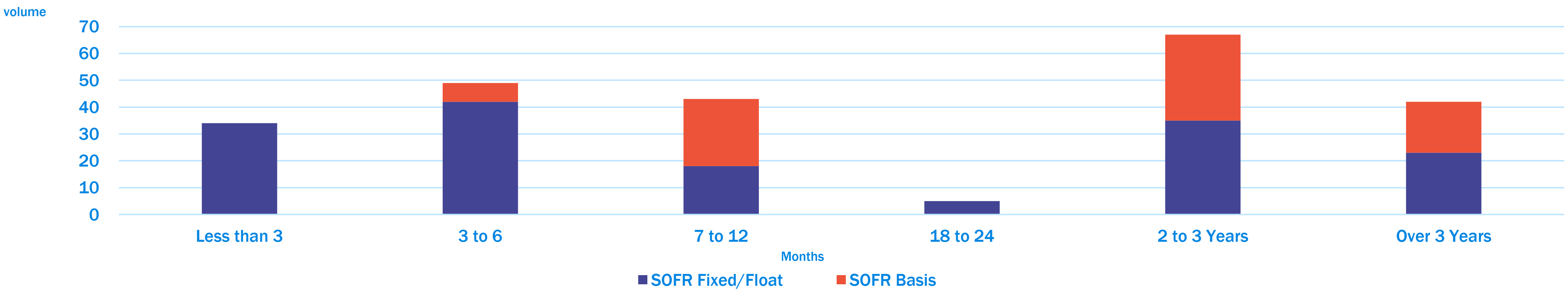
Swap Maturity Profile by Notional and Trade Count

Substantially all SOFR swaps executed to date (as measured by notional volume) have a tenor of less than 6 months. The number of individual trades varies across tenors.

SOFR Swap Volume – Gross Notional



SOFR Swap Volume – Number of Trades



Source: Bloomberg SDR (through May 31, 2019)

SOFR Forward Curve Development

Curves used to price SOFR-indexed swaps are based on a number of assumptions and inputs continue to emerge as liquidity builds

Overview

Execution of OTC swaps indexed to SOFR continues to increase with the total aggregate notional executed in the year-to-date period ended August 30, 2019 was $177.7 billion (compared to ~$6 billion for all of 2018)[1]

Notional-wise, SOFR-OIS (fixed/floating) swaps account for most (~80%) of the total volume of SOFR swaps executed to date, with basis swaps vs Fed Funds Effective accounting for most of the remainder (~9%)

- Majority of maturities are less than 2 years

Vendor solutions providing price discovery are also emerging

- Bloomberg has the capability to price SOFR basis swaps and fixed/floating swaps but market precision declines for swap tenors >18 months to 2 years (and relies heavily on LIBOR-based inputs for swaps >5 years)

Bloomberg Methodology

Bloomberg uses a multi-faceted process to develop SOFR yield curves for pricing of SOFR-indexed swaps

Approach follows market practice: Bloomberg approach is to maintain flexibility in order to adapt to evolution in market practice

Inputs vary based on portion of the curve corresponding to rate tenor and relevant tenor liquidity

		Summary of Bloomberg SOFR Curve Inputs
"Level 2" Inputs	1 day	• Eurodollar Futures convexity adjusted-SOFR cash market spot rate
"Level 2" Inputs	2 days to 18 months	• Eurodollar Futures convexity adjusted-3M SOFR futures from contracts with nearest maturity dates
"Level 2" Inputs	18 Months – 5 years	• Relevant OIS (Fed Funds) swap rate plus an annualized spread derived from current SOFR and Fed Funds futures
"Level 3"?	> 5 years	• Relevant LIBOR swap rate plus (i) annualized spread derived from current SOFR and Fed Funds futures and (ii) annualized spread based on current 3M LIBOR/Fed Funds basis

1. *As reported by ISDA*

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SOFR Issuance Activity

SOFR FRN Issuance

Issuance of SOFR-FRNs began in July 2018

- Most of this issuance has had short-final maturities
- A significant portion has been bought by money funds
- Repeat issuance by the GSEs and Federal Home Loan Banks

Most of the issuance has used the trailing simple average SOFR rate over the reference period; a few recent issuances utilized compound SOFR

- There is no forward-looking term SOFR rate available yet
- The 3M SOFR futures contract uses a compound expected daily average

Through Sept, 1, 2019, over $190 billion of cumulative issuance of SOFR-indexed debt securities (excluding bank CDs and commercial paper)

SOFR FRN Issuance

- **Issuance of SOFR-FRNs began in July 2018**
  - Most of this issuance has had short-final maturities
  - A significant portion has been bought by money funds
  - Repeat issuance by the GSEs and Federal Home Loan Banks

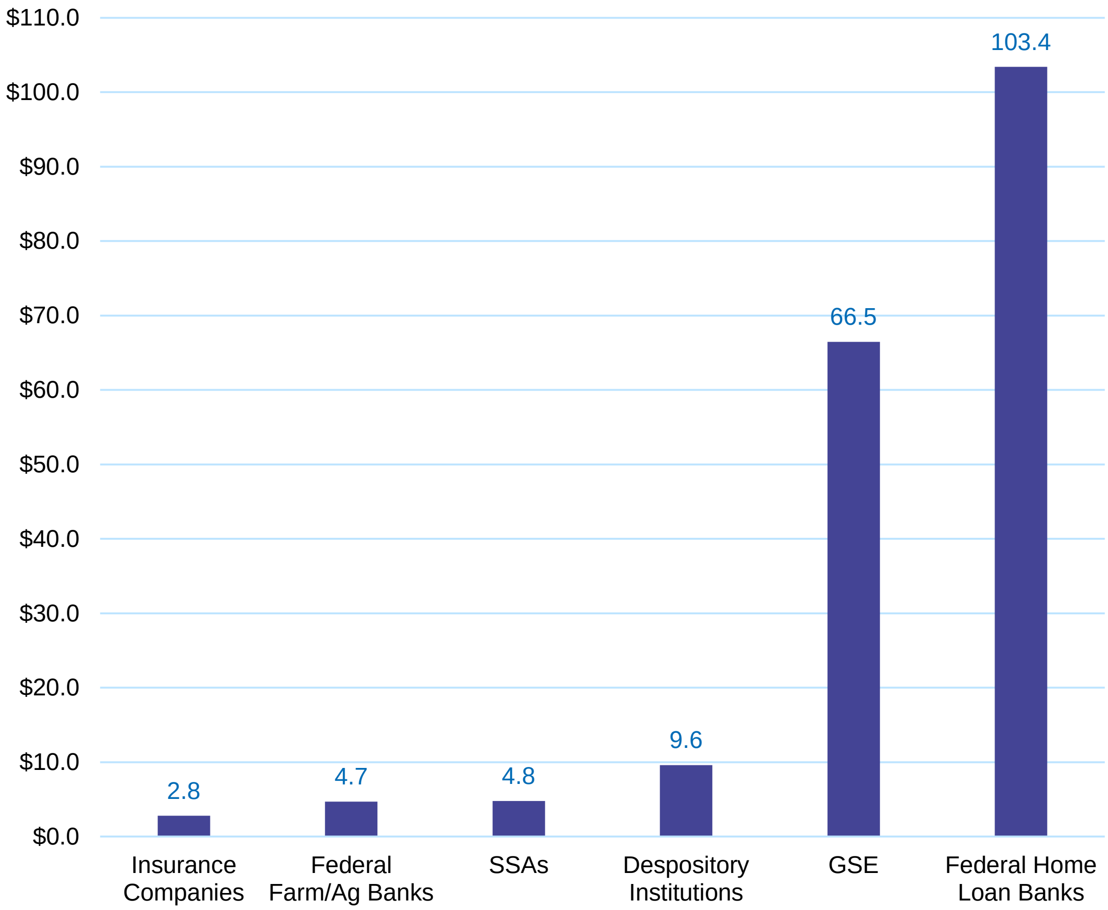
Through June 1, 2019, over $100 billion of cumulative issuance of SOFR-indexed debt instruments

SOFR FRN Issuance (con't)

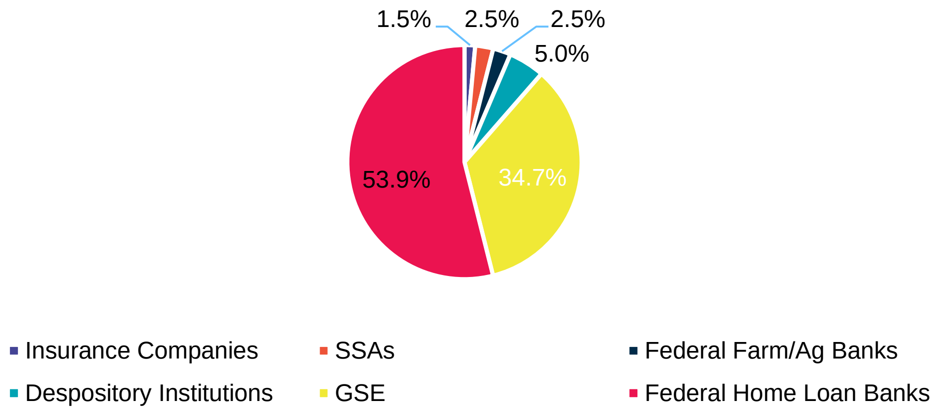
- **Most of the issuance has used the trailing simple average SOFR rate over the reference period; a few recent issuances utilized compound SOFR**
  - There is no forward-looking term SOFR rate available yet
  - The 3M SOFR futures contract uses a compound expected daily average

SOFR Issuance Since July 2018[1]

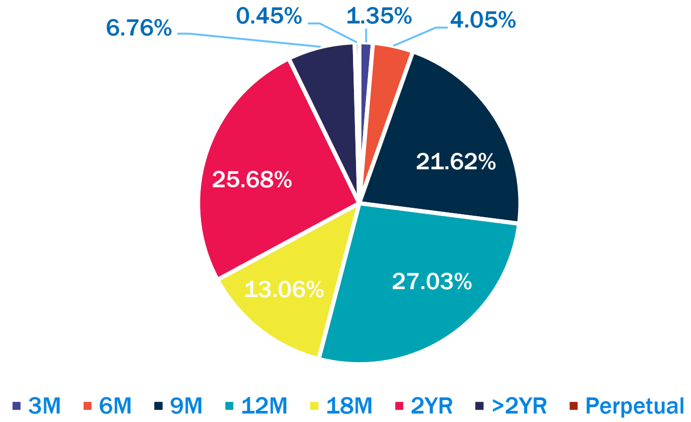
USD Amounts By Issuer Type ($bn)



SOFR Issuer Breakdown



SOFR Debt Tenor Distribution



To date, floating-rate notes have accounted for 92% of all SOFR issuance. Tenors fall predominantly between 9 months and 2 years

Source: Bloomberg
1. Issued and outstanding as of 9/1/2019; excludes certificates of deposit and commercial paper

Emerging Benchmark Interest Rates

SOFR Issuer Perspective

Why Issue a SOFR-Floater Bond?

- **Meet investor demand**
  - Swapped SOFR issuance to fixed-rate and LIBOR was more attractive than other structures
- **Develop swap market between SOFR and LIBOR**
- **Support ARRC and other GSE SOFR issuances**

Launching a SOFR-Issuance Program

- **Operational Considerations**
  - Systems had to be modified to accommodate SOFR
  - Daily-weighted average – Simple and Compounded
  - Derivatives – Cleared or Non-cleared
  - Offering Circular or Issue Prospectus
- **Dealer and Investor Communication**
  - Syndicate or Window/Reverse Inquiry
  - Set up swap conventions with dealers

Lessons Learned from SOFR Issuance

- Do not shortcut systems and work within the Company's framework
- Communicate with investors and dealers
- Do not deviate from market conventions

SOFR Issuance Hurdles

- **Lack of market consensus between simple and compounded daily-weighted average calculation**
- **Disconnect between debt and derivative market**
  - Lockout versus Lookback
  - Payment Delay
- **Term rate market development**

Emerging Benchmark Interest Rates

Accounting Considerations

Accounting Considerations

- **Impact of LIBOR discontinuation – How it's impacting hedging now**
  - SEC guidance
  - FASB guidance
  - IASB guidance

Effectiveness Testing

- Difference in timing
- Historical data
- Other practical considerations

What Corporations can do NOW to Prepare?

- Educate organization
  - Purchasing, legal, etc.
- Identify all contracts with LIBOR (be sure to look for contingency/penalty language)
- Look at your fall back provisions
- Start talking to your banks

Emerging Benchmark Interest Rates

LIBOR transition beyond the US

AFP 2019

LIBOR Transition Beyond the US

UK – SONIA	Sterling Overnight Index Average – Currently trading, replacing GBP LIBOR
EUR –ESTER	Euro Short Term Rate – debuted recently, replacing EURIBOR & EUR LIBOR
JPY – TONAR	Tokyo Overnight Average Rate – pre-existing rate, replacing JPY LIBOR
CHF –SARON	Swiss Average Rate Overnight – pre-existing rate, replacing CHF LIBOR

Transaction based, overnight, some are secured

Existing Alternative Rates

USD – OIS

AUD – BBSW

CAD – CDOR

JPY – TIBOR

Emerging Benchmark Interest Rates

Developing a LIBOR Transition Plan

Developing a LIBOR Transition Plan

- **Exposure identification and impact assessment**
  - Legal documents review
  - Survey
- **Cross-functional considerations**
  - Legal
  - Shareholder/investor
  - Board
  - Others

Key Take Aways

- The transition to SOFR has begun. LIBOR reporting is guaranteed through December 2021.
- Start communicating early – with investors, dealers and internally within your entity
- Educate internally – include cross-functional teams

Emerging Benchmark Interest Rates

Thank you

AFP 2019

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