

CME Conversion for USD LIBOR Cleared Swaps

August 2022

Subject to Discussion and Regulatory Review

The contents of this document are for informational purposes only and provide an overview of CME's approach to the USD LIBOR transition for CME cleared swaps. The plan is subject to change at any time without prior notice. Any implementation of the points discussed is subject to regulatory review and to any necessary internal and external approvals.

Agenda

1 Introduction to Conversion Plan

2 ISDA Fallback Pricing Protocol

3 Basis Swap Splitting

4 Primary USD Swap Conversion Methodology

5 Secondary USD Swap Conversion Methodology - Zero Coupon Swaps

6 Operational Processing

Finalized Conversion Methodology

Following the period for market feedback that closed on July 15th, 2022, CME has finalized its methodology for the conversion of cleared USD LIBOR swaps. There were four primary considerations that CME discussed with respondents and the content has been updated throughout to reflect the feedback received:

1. Dress Rehearsals and Indicative Analysis Reporting

- CME will conduct dress rehearsals for clearing member testing on the following dates:
 - January 27, 2023 – Basis swap splitting dress rehearsal
 - February 10, 2023 – Primary conversion dress rehearsal
 - March 3, 2023 – Secondary conversion dress rehearsal (ZCS and any remaining in-scope USD LIBOR swaps)
- The initial publication of "indicative analysis reports" is targeted for January 23, 2023 and will be available for both clearing members and clients

2. Basis Swap Splitting – including the treatment of trades referencing Fed Funds averaging

- Finalized plan: Fed Funds (avg) vs LIBOR Basis Swaps will be converted into Fed Funds (avg) vs SOFR Basis Swaps as a part of the primary conversion
- The mandatory splitting exercise for LIBOR-LIBOR and LIBOR-SOFR Basis Swaps will move to March 24, 2023

3. Primary USD Swap Conversion Date

- Finalized plan: In order to limit the amount of operational risk and processing throughput challenges faced by firms, CME will conduct its primary conversion on Friday, April 21, 2023

4. Secondary USD Swap Conversion Date – Zero Coupon Swaps and Swaption Expiries

- Finalized plan: Zero coupon swaps and any remaining USD LIBOR swaps will be subject to a daily conversion process beginning on July 3, 2023

Fallback Approach for CME Cleared USD LIBOR Swaps

ICE LIBOR Phase-out

- Further to the UK FCA announcement on March 5, 2021, issued in coordination with ICE Benchmark Administration Limited (“IBA”), the authorized administrator of ICE LIBOR, all remaining USD LIBOR tenors (e.g., overnight, one-month, three-month, six-month and twelve-month) will either cease to be provided by IBA or will no longer be representative of the underlying market immediately after publication on June 30, 2023

ISDA Fallbacks

ISDA confirmed that the FCA announcement constitutes an “Index Cessation Event” for the purposes of ISDA’s IBOR Fallback Supplement and Protocol:

- As a result, on July 3, 2023, affected USD OTC IRS will fall back to the relevant credit and spread adjusted fallback SOFR rate, the relevant ISDA “Index Cessation Effective Date” (ICED)
- ISDA’s approach would compound realized SOFR daily and add a credit spread in implementing fallback to relevant SOFR rates. It is available only at the end of the interest period

CME Plan

CME incorporated ISDA IBOR fallbacks in January 2021 and the ISDA 2021 Definitions in [October 2021](#). However, based on market feedback, in December 2021 ahead of the scheduled discontinuation / non-representativeness of the GBP, JPY and CHF LIBOR rates, CME successfully converted these non-USD LIBOR cleared swap exposures into standard CME cleared Risk-Free Rate swaps, with a cash adjustment to compensate for changes in valuation. **CME will use a similar approach for USD LIBOR CME cleared swaps ahead of end-June 2023.** This conversion of USD LIBOR swaps benefits the marketplace by:

- ✓ Creation of a single transparent liquidity pool for trading SOFR swaps
- ✓ Providing participants certainty that “legacy” and “new” contracts would be fungible with one another upon transition to the SOFR fallback
- ✓ Market standard OIS are widely supported by participants and market infrastructure; this approach removes the need to operationally support “Observation Period Shift” defined in ISDA IBOR Fallbacks

Conversion Plan for CME Cleared USD LIBOR Swaps

CME Revised USD LIBOR Conversion Approach:

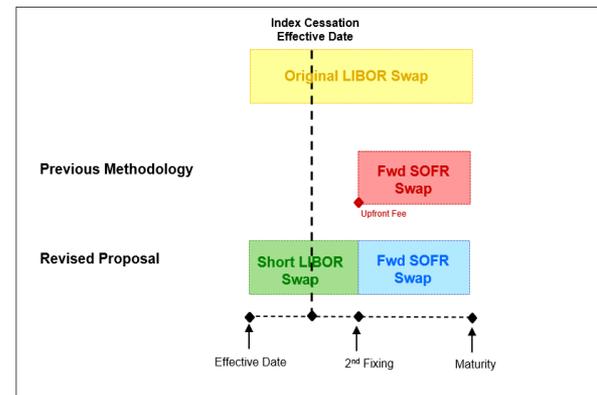
Based on feedback from clients who utilize accrual/hedge accounting, CME is implementing an operational change to our conversion process for USD LIBOR swaps compared to our prior approach for non-USD LIBOR swaps that took place in December 2021. Previously, for the non-USD LIBOR swap conversion, CME had restated the original LIBOR swap via booking a forward starting SOFR Swap with an upfront fee to capture any representative LIBOR settings that settled after the Index Cessation Effective Date (ICED).

Under the new methodology for USD LIBOR swaps, CME will be replacing the original LIBOR Swap with two swaps:

- 1) The same forward starting SOFR Swap excluding the upfront fee, and
- 2) A short-dated LIBOR swap for any representative LIBOR fixings that settle after the ICED

Please note from a cashflow and risk perspective this is unchanged from the prior methodology.

Although this methodology will result in an increased number of line items and notional outstanding, it will provide the flexibility to run the conversion process for legacy trades at any point in time during the Q2 of 2023 and makes it much easier for hedge accounting clients to capture the proper accrual amounts. Additionally, CME believes the increased number of line items and notional amounts can be significantly reduced through a well-timed compression run.



Conversion Plan for CME Cleared USD LIBOR Swaps

Summary

Scope: All ICE LIBOR swaps denominated in USD

Target Conversion Timing: Q2, 2023

- **Pre-Conversion Splitting (March 24, 2023; April 14 contingency):** Basis Swaps
- **Primary USD Swap Conversion (April 21, 2023; May 12 contingency):** All USD LIBOR products excluding Zero Coupon Swaps
- **Secondary USD Swap Conversion (July 3, 2023):** Zero Coupon Swaps and remaining USD LIBOR swaps

Conversion Process: CME plans to convert all cleared USD LIBOR swap products to Short-dated LIBOR and SOFR replacement swaps where:

- ✓ Each LIBOR swap is converted into corresponding **Short-dated LIBOR and SOFR replacement swaps**;

Resultant swap(s) will differ slightly by economic terms. Operational process will be a close-out (termination) of the original swap and establishment of new replacement contracts – however, legal characterization will be as an amendment of the original contract. The following sections will provide further details.

- ✓ Key economics are copied over to both the Short-dated LIBOR and SOFR replacement swaps;
- ✓ ISDA Fallback Spread Adjustment is applied to the floating leg of the SOFR replacement swap;
- ✓ A cash compensation is applied as an upfront fee to the SOFR replacement swap;
- ✓ CME will maintain the representative LIBOR coupons through the conversion process, restating these accrual periods as Short-dated LIBOR replacement swaps

Conversion Plan for CME Cleared USD LIBOR Swaps

Conversion Process Considerations

Maintain ICE LIBOR fixings that occur between Conversion Date and Index Cessation Effective Date:

- ✓ Allows for the majority of swaps to be converted on a single conversion date (the Primary USD Conversion Date) and settles all representative LIBOR payments
- ✓ Accounts for the compounded fixings in Compounding and Zero-Coupon swaps

Basis Swaps and FRAs:

- ✓ USD LIBOR-LIBOR and LIBOR-SOFR Basis Swaps will be converted (split) into two vanilla fixed-float swaps prior to conversion date
- ✓ Fed Funds (avg) vs LIBOR Basis Swaps will now be converted into Fed Funds (avg) vs SOFR Basis Swaps on the primary conversion date and are not in-scope for splitting
- ✓ CME has ceased clearing USD LIBOR FRAs with effective dates after June 30, 2023, removing FRAs from the conversion scope. USD LIBOR FRAs with effective dates on or prior this date remain eligible for clearing

Conversion Plan for CME Cleared USD LIBOR Swaps

Conversion Process Considerations

Continued support for USD LIBOR swaps clearing between the Primary USD Conversion Date and ICED:

- ✓ CME will continue to accept spot, seasoned, and forward starting USD LIBOR swaps during this period
- ✓ All USD LIBOR swaps cleared following the primary conversion cycle will be converted on the **Secondary USD Swap Conversion Date**

Post-ICED support of USD LIBOR Swaps / Bilateral Swaption expiries for clearing:

- ✓ CME will accept USD LIBOR swaps for clearing after the Index Cessation Effective Date if spot or forward starting
- ✓ These daily end-of-day conversion cycles will result in a forward starting SOFR Swap for each original USD LIBOR swap

Conversion Plan for CME Cleared USD LIBOR Swaps

Process for Determining Cash Compensation

Cash Compensation = Adj NPV* of LIBOR Swap – Adj NPV of all Replacement Swaps

Pricing USD LIBOR Swaps on Conversion Date

Considerations: Ensure pricing of the LIBOR swaps is fair and is not subject to manipulation to USD LIBOR marks

Plan: Price the USD LIBOR swaps using ISDA Fallback Pricing Protocol (Supplement 70)

Convert USD LIBOR Swaps to corresponding Short-dated LIBOR and SOFR Replacement Swaps

Considerations: Reduce the differences in cashflow amounts for the projected cashflows

Ensure the converted swaps are maintaining the representative LIBOR coupons that are unpaid

Plan: Account for the ISDA Fallback Spread Adj on the SOFR Leg to ensure minimal difference in future cashflows

Based on the swap effective date, book a **Short-dated LIBOR replacement swap** to account for all representative USD LIBOR fixings. For zero coupon swaps, account for compounding of representative USD LIBOR fixings through a fee settling on the future coupon payment date.

Pricing Short-dated LIBOR and SOFR Replacement Swaps on relevant Conversion Date

Price the replacement swaps on relevant conversion date consistent with current ISDA Fallback Pricing Protocol

** Adjusted NPV = NPV of Swap – Present Value of any fees or coupons due to bank the following business day*

Conversion Plan for CME Cleared USD LIBOR Swaps

Indicative Analysis Reporting

- Beginning on January 23, 2023, CME will publish a daily Indicative Analysis Report for all USD swaps in-scope for conversion
- Report will provide the NPV for each replacement swap, the cash compensation at the trade level, and the key economic terms of the replacement swaps
- Report allows firms to automatically consume replacement trades and the corresponding indicative cash compensation leading up to and on the conversion date. Reports are "indicative only" - actual values will be determined and available on the relevant conversion date
- [Additional report details](#)

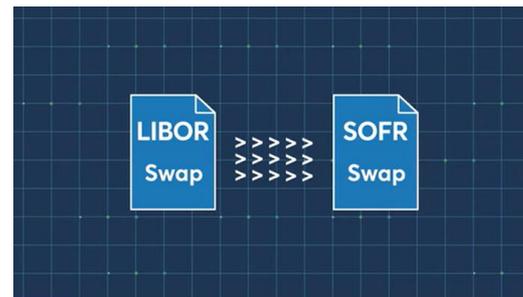
Conversion Plan for CME Cleared USD LIBOR Swaps

Educational Video Series

CME Group has published four videos summarizing the USD LIBOR swaps conversion, which can be found [here](#)

The videos discuss:

- 1. Introduction and overview of CME Group's conversion plan** – Explores key dates to know, which USD LIBOR swaps will be impacted, and how replacement swaps will function.
- 2. Conversion methodology and a detailed example** – Details the underlying methodology CME Group will leverage for the primary conversion process, including an example scenario.
- 3. Available resources and operational processing considerations** – Discusses the operational timeline for the night of the primary conversion, indicative analysis reporting (available from January 23, 2023), and dress rehearsal dates.
- 4. Special cases and conclusion** – Explores the planned basis swap splitting event, as well as the secondary conversion process for zero coupon swaps and other special cases.



Conversion Fees

Subject to regulatory review, CME will charge the following per line-item fees on SOFR replacement swaps resulting from the conversion:

| Account Type | Conversion Fee (USD) |
|--------------|----------------------|
| House | \$10 |
| Customer* | \$25 |

**Applies to both standard and alternate fee schedule customers*

- There are no additional fees associated with the mandatory splitting of LIBOR-LIBOR or LIBOR-SOFR basis swaps
- For bilateral swaption exercises that result in a cleared swap under the legacy LIBOR index, a conversion fee corresponding to the appropriate account type per converted trade will be applied to the position in addition to the new trade clearing fees
- Conversion fees do not apply to the LIBOR replacement swaps or the terminated LIBOR swaps

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2 ISDA Fallback Pricing Protocol

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3 Basis Swap Splitting

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5 Secondary USD Swap Conversion Methodology - Zero Coupon Swaps

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Fallback Pricing Approach for CME Cleared USD LIBOR Swaps

ISDA Fallback Pricing Protocol: *Computing all-in Fallback IBOR Rate*

This mechanism will be used for computing the projected IBOR Forward Rate on conversion date

The Fallback reference rate FF , with respect to a IBOR tenor f and Record/Fixing Date t is computed as:

$$FF_{f,t} = ARR_{f,t} + SA_{f,t}$$

where $ARR_{f,t}$ is the Adjusted Risk-Free Rate, $SA_{f,t}$ is the Fallback spread fixed by Bloomberg for IBOR tenor

$$ARR_{f,t} = \frac{DayCount_I}{DayCount_{RR}} \times \frac{1}{\delta_{S_{f,t}, E_{f,t}}} \times \left[\left(\prod_{u \in AP_{f,t}} (1 + RFR_u \times \delta_{u, u+1}) \right) - 1 \right]$$

where:

$DayCount_I$ is day-count convention for LIBOR index

$DayCount_{RR}$ is day-count convention for Reference Rate index

$S_{f,t}$ is the accrual start date for LIBOR tenor

$E_{f,t}$ is the accrual end date for LIBOR tenor

$\delta_{A,B}$ is the day count fraction for the Reference Rate

$AP_{f,t}$ is the Accrue Period for SOFR compounding;

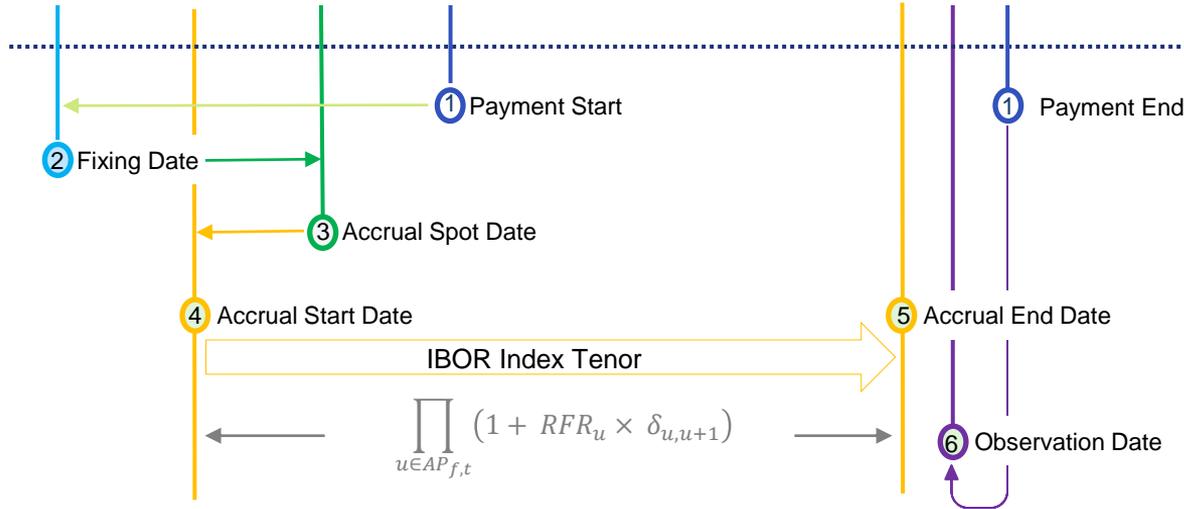
u is the business day within Accrue Period defined by Reference Rate holiday calendar

RFR_u is the daily risk-free rate

Details of the Fallback Rate adjustment are found here:
<https://data.bloomberglp.com/professional/sites/10/IBOR-Fallback-Rate-Adjustments-Rule-Book.pdf>

Fallback Pricing Approach for CME Cleared USD LIBOR Swaps

ISDA Fallback Pricing Protocol: *Determining Accrual period for RFR compounding*



Details of the Fallback Rate adjustment: <https://data.bloomberglp.com/professional/sites/10/IBOR-Fallback-Rate-Adjustments-Rule-Book.pdf>

- 1 Compute the Payment Start Date and Payment End Date based on trade attributes
- 2 Compute IBOR Fixing date from Payment Start Date using fixing offset, calendar and business convention from trade attributes
- 3 Compute Accrual Spot Date as Spot Lag number of business days from Fixing Date using calendar and Following convention
- 4 Compute Accrual Start Date as 2 business days before Accrual Spot Date on RFR calendar using Preceding convention
- 5 Compute Accrual End Date by adding IBOR Index tenor from Accrual Start Date
- 6 Compute Observation Date as 2 business days before Payment Date on trade payment calendar using Preceding convention. Ensure the Accrual End date is on or before Observation Date. If not, then adjust the Fixing Date backward until the condition is satisfied

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2 ISDA Fallback Pricing Protocol

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4 Primary USD Swap Conversion Methodology

5 Secondary USD Swap Conversion Methodology - Zero Coupon Swaps

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Basis Swap Conversion

USD LIBOR Basis Swaps will generally be converted (split) into two vanilla fixed-float swaps prior to the main conversion dates. This splitting prevents the booking of SOFR-SOFR basis swaps. The approach is similar to the one implemented by CME in 2021 for GBP and JPY basis swaps and will be characterized as an amendment of the original swap, notwithstanding the operational termination and reestablishment process. USD LIBOR-Fed Funds basis swaps will not be split and will be converted as basis swaps.

Date / Timing:

- Following the close of business on March 24, 2023

Basis Swaps in-scope for splitting:

- USD LIBOR vs SOFR
- USD LIBOR vs USD LIBOR

USD LIBOR vs Fed Funds:

- Out of scope for splitting. CME will keep these contracts as basis swaps and later convert them to SOFR vs Fed Funds Basis Swaps as a part of the Primary Conversion
- The Fed Funds leg will continue to use averaging and a rate cutoff
- The SOFR leg will use compounding and a payment offset

Methodology for Converting USD LIBOR Swaps

Conversion (splitting) of Basis Swaps

Step 1: Convert Basis Swaps to Pairs of Fixed-Float IRS

- ✓ Fixed rates are set such that the fixed payments fully offset between swap pairs
- ✓ Fixed rates will be computed based on the break-even rate of the “larger” index tenor (e.g., ‘6M’ for 3M vs. 6M basis)
- ✓ All LIBOR and SOFR floating legs are carried over to the new swap. No change to economics on these floating legs so notional, direction, spread, etc. are maintained.
- ✓ **No compensation** is included for basis swap splitting as portfolio NPV remains unchanged

Step 2: Convert Fixed-Float IRS to OIS

- ✓ At the time of conversion, the pricing and processing will follow the same methodology as fixed-float IRS outlined in the following sections

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Ex. 1) 1M vs 3M LIBOR Basis Swap converted to two Fixed-Float IRS

Splitting Date = March 24, 2023

| 1M vs 3M USD LIBOR Basis Swap | |
|--------------------------------|------------------------------|
| Currency | USD |
| Notional | 50,000,000 |
| Direction | Rec 3M LIBOR Pay 1M LIBOR |
| Effective Date | 3/15/2023 |
| Maturity Date | 3/15/2024 |
| Floating Rate Index 1 | 3M USD-LIBOR |
| Floating Rate Index 2 | 1M USD-LIBOR |
| Float Leg 1 Day count | ACT/360 |
| Float Leg 2 Day count | ACT/360 |
| Pay Bus Day Adj Conv | Mod-Following |
| Pay Adj Calendar | USNY, GBLO |
| Float Leg 1 Pay Freq | 3M |
| Float Leg 2 Pay Freq | 3M |
| Float Leg 2 Compounding Method | Flat |
| Float Leg 2 Spread | 16 bps |
| Status | Terminated |



| 3M USD LIBOR IRS- Replacement 1 | |
|---------------------------------|-------------------------------------|
| Currency | USD |
| Notional | 50,000,000 |
| Direction | Rec 3M LIBOR |
| Fixed Rate | 1.32% (3M par rate computed by CME) |
| Effective Date | 3/15/2023 |
| Maturity Date | 3/15/2024 |
| Floating Rate Index | 3M USD-LIBOR |
| Compounding Method | None |
| Float Leg Pay Freq | 3M |
| Float Leg Spread | n/a |
| Status | Cleared |

| 1M USD LIBOR IRS - Replacement 2 | |
|----------------------------------|-------------------------------------|
| Currency | USD |
| Notional | 50,000,000 |
| Direction | Pay 1M LIBOR |
| Fixed Rate | 1.32% (3M par rate computed by CME) |
| Effective Date | 3/15/2023 |
| Maturity Date | 3/15/2024 |
| Floating Rate Index | 1M USD-LIBOR |
| Compounding Method | Flat |
| Float Leg Pay Freq | 3M |
| Float Leg Spread | 16 bps |
| Status | Cleared |

- = Economic preserved
- = Economic changed/added

Agenda

1 Introduction to Conversion Plan

2 ISDA Fallback Pricing Protocol

3 Basis Swap Splitting

4 **Primary USD Swap Conversion Methodology**

5 Secondary USD Swap Conversion Methodology - Zero Coupon Swaps

6 Operational Processing

Conversion Methodology

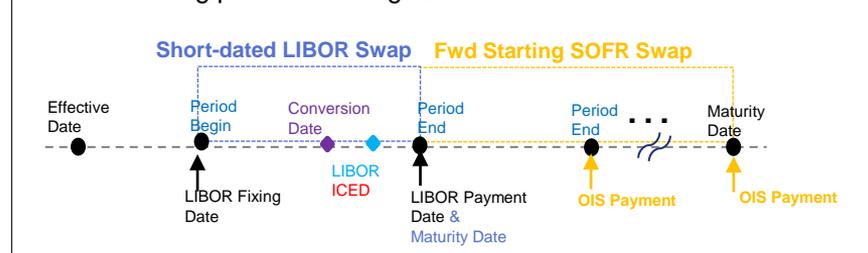
For all in-scope USD LIBOR swaps, CME will employ a **similar** approach that was used for non-USD LIBOR settings at the end of 2021. The conversion methodology will be updated to address challenges associated with accounting for representative floating and fixed coupons as fees (previous method) by applying the appropriate accrual amounts in the form of Short-dated LIBOR swaps (new method).

Under the new methodology, CME will book two replacements swaps for each **seasoned** LIBOR swap where:

- The original LIBOR swap is converted (operational termination, legal amendment)
- A **Short-dated LIBOR replacement swap** replaces the “coupon fee” used in the previous non-USD LIBOR conversion
- A **Forward starting SOFR replacement swap** captures all future cash flows and the cash compensation

1) Short-dated LIBOR replacement swap – Settles representative LIBOR floating period coupon(s). Start/end dates match the representative LIBOR floating period(s) with unsettled coupons.

2) Forward starting SOFR replacement swap – all future periods’ cash flows are covered by the SOFR OIS. Start date equals the start of the floating period following ICED.



Conversion Methodology

Additional Considerations for Seasoned Swaps

- CME will book Short-dated LIBOR replacement swaps to match floating cash flows. Fixed cash flows on the replacement swaps **may not match** the original swap in some cases. (see [seasoned swap examples](#))
- If a swap has a **single** representative LIBOR fixing that has not paid, prior to index cessation:
 - The short-dated LIBOR replacement swap will be a single period Fixed-LIBOR swap that settles the coupon payments. The forward starting SOFR replacement begins at the maturity date of the Short-dated LIBOR replacement swap.
- If a swap has **multiple** representative LIBOR fixings that have not paid, prior to index cessation:
 - The short-dated LIBOR replacement will be a multiple period Fixed-LIBOR swap that settles the coupon payments. The forward starting SOFR replacement begins at the maturity date of the Short-dated LIBOR replacement swap.

Forward Starting Swaps

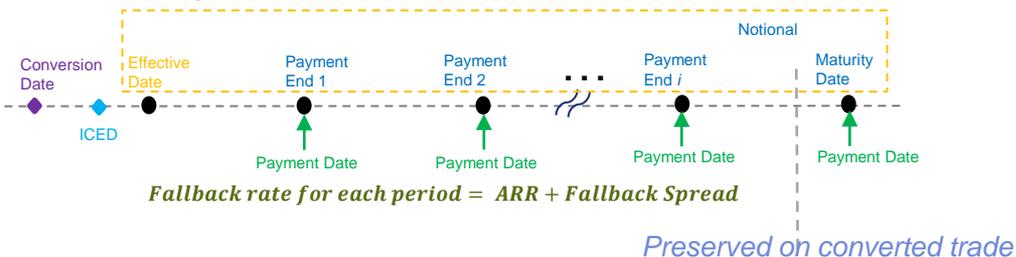
- The conversion methodology for **forward starting swaps will remain unchanged** from the previous non-USD LIBOR conversion:
 - SOFR replacement swaps will maintain the effective/maturity dates and fixed leg economic terms (excluding pay offset).
 - A single compensation fee is included and paid the following New York business day.
 - A payment offset (2D) is added to both legs of the SOFR replacement swap, consistent with market standard OIS conventions.

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Vanilla Forward Starting Swap: Effective Date of the Swap is post Index Cessation Effective Date (ICED)

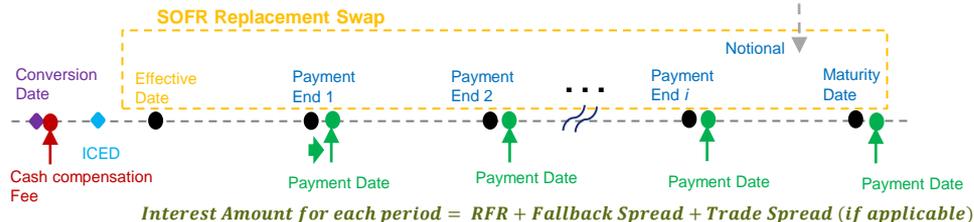
Pricing and Termination of LIBOR Swap

Compute payment period start/end date, payment date and fixing date using trade attributes



Converted Trade Attributes

Compute payment period start/end date using trade attributes same as LIBOR Trade



Conversion Methodology

- ✓ Apply ISDA Fallback pricing to each of the fixing dates. Imply compounded ARR from the bootstrapped SOFR curve.
- ✓ Price the LIBOR leg as priced currently using the Fallback rate implied for each reset
- ✓ Effective date, maturity date, notional, payment frequency, and direction are preserved from LIBOR swap
- ✓ Override the Payment Offset to standard SOFR convention on both fixed and floating legs
- ✓ Override the below attributes to market standard SOFR OIS conventions on floating leg:
 - Index Name and Tenor
 - Fixing Offset, fixing calendar, and adjustments
 - ISDA fixed spread added to compounded SOFR leg as simple interest amount
- ✓ Upfront fee is added to SOFR OIS to move the cash compensation

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Ex. 3) Forward starting LIBOR swap converted to SOFR OIS

Conversion Date = April 21, 2023

| USD 3M LIBOR IRS | |
|-------------------------------|--------------|
| Currency | USD |
| Notional | 50,000,000 |
| Trade Date | 3/15/2023 |
| Effective Date | 9/15/2023 |
| Maturity Date | 9/15/2024 |
| Fixed Direction | Payer |
| Fixed Rate | 2.125% |
| Fixed Leg Payment Freq. | 6M |
| Fixed Leg Payment Offset | n/a |
| Floating Rate Index | USD-LIBOR |
| Float Leg Index Tenor | 3M |
| Float Leg Payment Freq. | 3M |
| Float Leg Pay Adj Calendar | USNY |
| Float Leg Payment Offset | n/a |
| Float Leg Compounding Method | None |
| Reset Relative To | Begin Period |
| Float Leg Fixing Adj Calendar | GBLO |
| Date Roll | 15 |
| Status | Terminated |



| SOFR OIS Replacement | |
|-------------------------------|------------------------------------|
| Currency | USD |
| Notional | 50,000,000 |
| Trade Date | 3/15/2023 |
| Effective Date | 9/15/2023 |
| Maturity Date | 9/15/2024 |
| Fixed Direction | Payer |
| Fixed Rate | 2.125% |
| Fixed Leg Payment Freq. | 6M |
| Fixed Leg Payment Offset | 2 Days |
| Floating Rate Index | USD-SOFR-OIS Compound |
| Float Leg Index Tenor | 1D |
| Float Leg Payment Freq. | 3M |
| Float Leg Pay Adj Calendar | USNY |
| Float Leg Payment Offset | 2 Days |
| Float Leg Compounding Method | ISDA OIS Compounding |
| Reset Relative To | End of Period |
| Float Leg Fixing Adj Calendar | USGS |
| Date Roll | 15 |
| Status | Cleared |
| Upfront Fee | Cash compensation |
| Upfront Fee Payment Date | 4/24/2023 |
| Float Leg Spread | Fixed spread adjustment (0.26161%) |

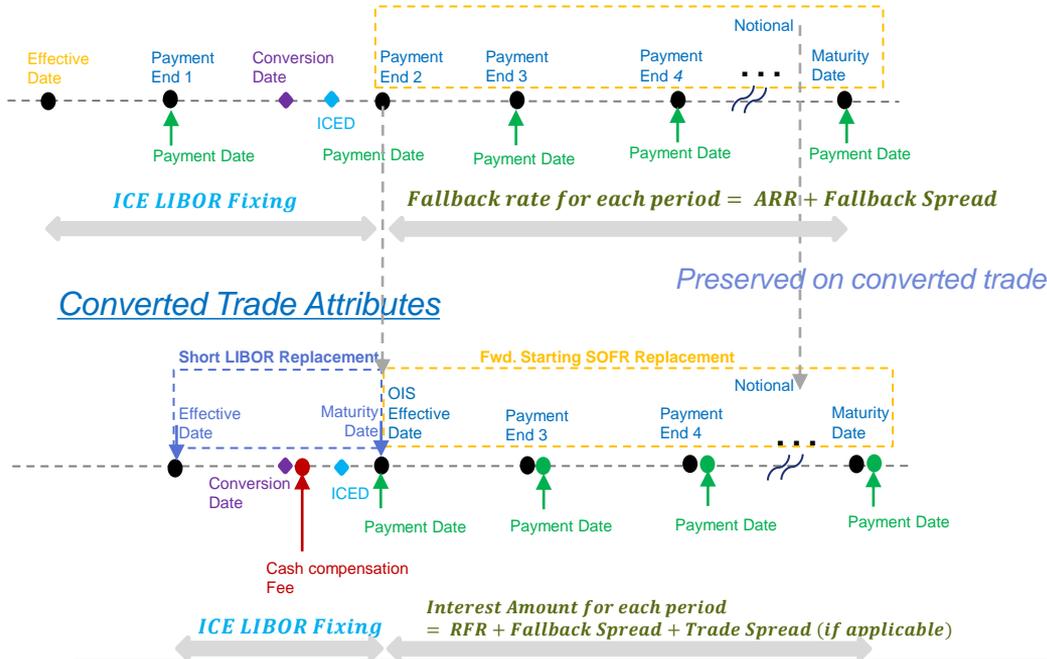
- = Economic preserved
 = Economic changed/added

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Vanilla Seasoned Swap: Effective Date of the Swap is prior to Index Cessation Effective Date (ICED)

Pricing and Termination of LIBOR Swap

Pricing and other calculations are same as the previous example



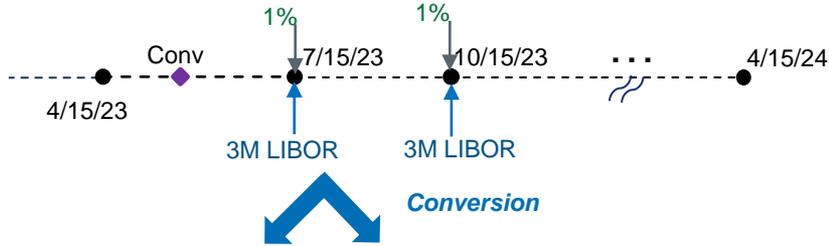
Conversion Methodology

- ✓ Book a forward starting SOFR swap with Effective date set as the next payment period start date of floating leg with fixing date following ICED. Maturity date matches the original swap.
- ✓ Any LIBOR payments or fixed coupon payments accrued will be booked as a new Short LIBOR replacement swap
 - Effective and maturity dates of the Short LIBOR swap will match the begin and end dates of unsettled coupon periods with fixing dates prior to the index cessation. This swap may be one or more periods.
 - Fixed rate remains unchanged on both replacement swaps
- ✓ **If the fixed and float coupon dates do not match, then:**
 - A stub may be needed on Fixed Leg of the Forward Starting SOFR replacement swap
 - Fixed coupon pay frequency may be adjusted to match floating leg frequency on the Short LIBOR replacement swap (see following slide and ex. 5)

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

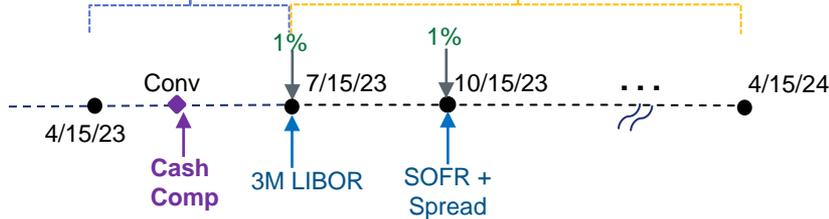
Example of Vanilla Seasoned Swap: Matching Fixed-Float Pay Freq. (left) vs Different Fixed-Float Pay Freq. (right)

Original 3M LIBOR vs 1% IRS
 Start= 4/15/23; Maturity= 4/15/24
 Fixed Pays 3m, Float Rec 3m

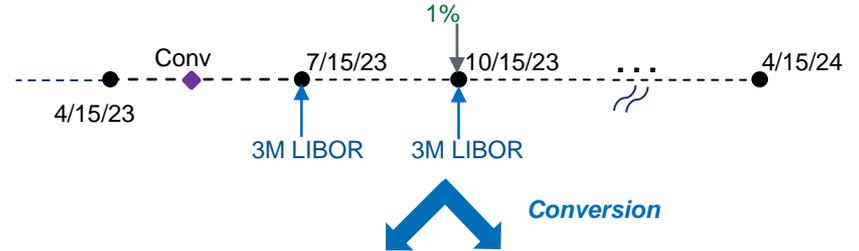


Short LIBOR Replacement
 3M LIBOR vs 1% IRS
 Start= 4/15/23; Maturity= 7/15/23
 Fixed Pays 3m, Float Rec 3m

Forward SOFR Replacement
 SOFR vs 1% OIS
 Start= 7/15/23; Maturity= 4/15/24
 Fixed Pays 3m, Float Rec 3m

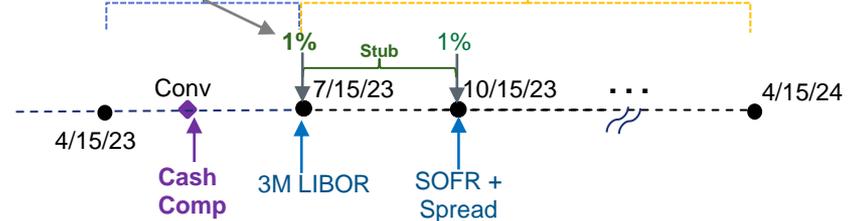


Original 3M LIBOR vs 1% IRS
 Start= 4/15/23; Maturity = 4/15/24
 Fixed Pays 6m, Float Rec 3m



Short LIBOR Replacement
 3M LIBOR vs 1% IRS:
 Start= 4/15/23; Maturity = 7/15/23
 Fixed Pays 3m, Float Rec 3m

Forward SOFR Replacement
 SOFR vs 1% OIS
 Start= 7/15/23; Maturity = 4/15/24
 Fixed Pays 6m, Float Rec 3m



Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Ex. 5) **Seasoned** LIBOR swap with **different** fixed + floating coupon dates converted to a **LIBOR IRS and SOFR OIS**

Conversion Date = April 21, 2023

| USD 3M LIBOR IRS | |
|-------------------------------|--------------|
| Currency | USD |
| Notional | 200,000,000 |
| Trade Date | 4/12/2023 |
| Effective Date | 4/15/2023 |
| Maturity Date | 4/15/2024 |
| Fixed Direction | Payer |
| Fixed Rate | 1.00% |
| Fixed Leg Payment Freq. | 6M |
| Fixed Leg Payment Offset | n/a |
| Floating Rate Index | USD-LIBOR |
| Float Leg Index Tenor | 3M |
| Float Leg Payment Freq. | 3M |
| Float Leg Pay Adj Calendar | USNY |
| Float Leg Pay Offset | n/a |
| Float Leg Compounding Method | None |
| Reset Relative To | Begin Period |
| Float Leg Fixing Adj Calendar | GBLO |
| Date Roll | 15 |
| Status | Terminated |



| USD 3M LIBOR IRS – Short Replacement 1 | |
|--|------------------------------|
| Product Type | IRS |
| Notional | 200,000,000 |
| Effective Date | 4/15/2023 |
| Maturity Date | 7/15/2023 |
| Upfront Fee | None |
| Fixed Leg Payment Freq. | 3M |
| Float/Fixed Leg | Other economics carried over |

| SOFR OIS – Forward Starting Replacement 2 | |
|---|------------------------------------|
| Currency | USD |
| Notional | 200,000,000 |
| Trade Date | 4/12/2023 |
| Effective Date | 7/15/2023 |
| Maturity Date | 4/15/2024 |
| Fixed Direction | Payer |
| Fixed Rate | 1.00% |
| Fixed Leg Payment Freq. | 6M |
| Fixed Leg Payment Offset | 2 Days |
| Floating Rate Index | USD-SOFR-OIS Compound |
| Float Leg Index Tenor | 1D |
| Float Leg Payment Freq. | 3M |
| Float Leg Pay Adj Calendar | USNY |
| Date Roll | 15 |
| Float Leg Payment Offset | 2 Days |
| Stub Type | Short Initial |
| First Regular Period Start Date | 10/15/2023 |
| Upfront Fee | Cash compensation fee |
| Upfront Fee Payment Date | 4/24/2023 |
| Float Leg Spread | Fixed spread adjustment (0.26161%) |

- = Economic preserved
- = Economic changed/added

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Ex. 6) **Seasoned** LIBOR swap with **different** fixed + floating pay dates converted to **multi-period LIBOR IRS** and SOFR OIS

Conversion Date = April 21, 2023

| USD 1M LIBOR IRS | |
|-------------------------------|--------------|
| Currency | USD |
| Notional | 300,000,000 |
| Trade Date | 2/13/2023 |
| Effective Date | 2/15/2023 |
| Maturity Date | 2/15/2024 |
| Fixed Direction | Payer |
| Fixed Rate | 2.00% |
| Fixed Leg Payment Freq. | 3M |
| Fixed Leg Payment Offset | n/a |
| Floating Rate Index | USD-LIBOR |
| Float Leg Index Tenor | 1M |
| Float Leg Payment Freq. | 1M |
| Float Leg Pay Adj Calendar | USNY |
| Float Leg Pay Offset | n/a |
| Float Leg Compounding Method | None |
| Reset Relative To | Begin Period |
| Float Leg Fixing Adj Calendar | GBLO |
| Date Roll | 15 |
| Status | Terminated |



| USD 1M LIBOR IRS – Short Replacement 1 | |
|--|--|
| Product Type | IRS |
| Notional | 300,000,000 |
| Effective Date | 2/15/2023 (start of current period) |
| Maturity Date | 7/15/2023 (end of period with last LIBOR fixing) |
| Upfront Fee | None |
| Float Leg Payment Freq. | 1M |
| Fixed Leg Payment Freq. | 3M |
| Fixed Leg Stub Type | Short Final |

| SOFR OIS – Forward Starting Replacement 2 | |
|---|------------------------------------|
| Currency | USD |
| Notional | 300,000,000 |
| Trade Date | 2/13/2023 |
| Effective Date | 7/15/2023 |
| Maturity Date | 2/15/2024 |
| Fixed Direction | Payer |
| Fixed Rate | 2.00% |
| Fixed Leg Payment Freq. | 3M |
| Fixed Leg Payment Offset | 2 Days |
| Fixed Leg Stub Type | Short Initial |
| Floating Rate Index | USD-SOFR-OIS Compound |
| First Regular Period Start Date | 8/15/2023 |
| Float Leg Index Tenor | 1D |
| Float Leg Payment Freq. | 1M |
| Float Leg Pay Adj Calendar | USNY |
| Date Roll | 15 |
| Float Leg Payment Offset | 2 Days |
| Upfront Fee | Cash compensation |
| Upfront Fee Payment Date | 4/24/2023 |
| Float Leg Spread | Fixed spread adjustment (0.11448%) |

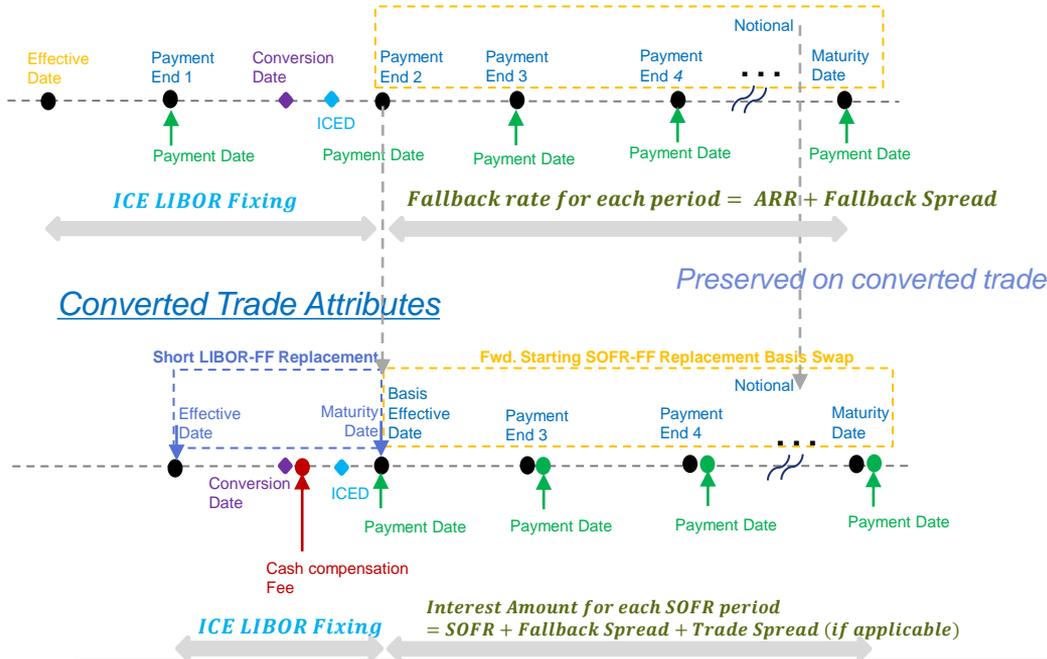
- = Economic preserved
- = Economic changed/added

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Fed Funds vs USD LIBOR Basis Swap: Remains a basis swap after conversion

Pricing and Termination of LIBOR Swap

Pricing and other calculation same as previous example



Conversion Methodology

- ✓ Open LIBOR payment period is replaced with Short-dated LIBOR vs Fed Funds Basis Swap
- ✓ Short-dated swaps will have effective and maturity dates to match the current LIBOR period begin and end dates.
- ✓ LIBOR and Fed Funds economics are otherwise unchanged.
- ✓ Book a forward starting Fed Funds-SOFR basis swap with Effective date set as the next payment period start date of original swap's LIBOR leg. Maturity date matches the original swap.
- ✓ Fed Funds leg continues to reference averaging and 2 day rate cutoff.
- ✓ SOFR leg is compounded and has a 2 day payment offset. SOFR leg follows the same OIS market standards as fixed/float swaps noted in previous sections.

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Ex. 7) **3M LIBOR vs Fed Funds Basis Swap** converted to a **SOFR vs Fed Funds Basis Swap**

Conversion Date = April 21, 2023

| USD LIBOR vs Fed Funds Basis Swap | |
|-----------------------------------|------------------------|
| Currency | USD |
| Notional | 100,000,000 |
| Direction | Rec 3M LIBOR |
| Effective Date | 1/15/2023 |
| Maturity Date | 1/15/2024 |
| Floating Rate Index 1 | 3M USD-LIBOR |
| Floating Rate Index 2 | USD-Federal Funds-H.15 |
| Leg 2 Averaging Method | Weighted |
| Float Leg 1 Day count | ACT/360 |
| Float Leg 2 Day count | ACT/360 |
| Pay Bus Day Adj Conv | Mod-Following |
| Pay Adj Calendar | USNY, GBLO |
| Float Leg 1 Pay Freq | 3M |
| Float Leg 2 Pay Freq | 3M |
| Float Leg 1 Spread | 12 bps |
| Status | Terminated |



| USD LIBOR vs Fed Funds Basis Swap – Replacement 1 | |
|---|------------------------|
| Currency | USD |
| Notional | 100,000,000 |
| Direction | Rec 3M LIBOR |
| Effective Date | 4/15/2023 |
| Maturity Date | 7/15/2023 |
| Floating Rate Index 1 | 3M USD-LIBOR |
| Floating Rate Index 2 | USD-Federal Funds-H.15 |
| Leg 2 Averaging Method | Weighted |
| Pay Adj Calendar | USNY, GBLO |
| Float Leg 1 Pay Freq | 3M |
| Float Leg 2 Pay Freq | 3M |
| Float Leg 1 Spread | 12 bps |
| Status | Cleared |

| SOFR vs Fed Funds Basis Swap – Replacement 2 | |
|--|--|
| Currency | USD |
| Notional | 100,000,000 |
| Direction | Rec SOFR |
| Effective Date | 7/15/2023 |
| Maturity Date | 1/15/2024 |
| Floating Rate Index 1 | USD-SOFR-OIS Compound |
| Floating Rate Index 2 | USD-Federal Funds-H.15 |
| Leg 2 Averaging Method | Weighted |
| Day count | ACT/360 |
| Pay Adj Calendar | USNY |
| Float Leg 1 Pay Offset | 2D |
| Float Leg 1 Pay Freq | 3M |
| Float Leg 2 Pay Freq | 3M |
| Float Leg 1 Spread | .38161% (trade spread + fallback spread) |
| Status | Cleared |
| Upfront Fee | 4/24/2023 (cash compensation) |

- = Economic preserved
- = Economic changed/added

Conversion Methodologies for Special Cases

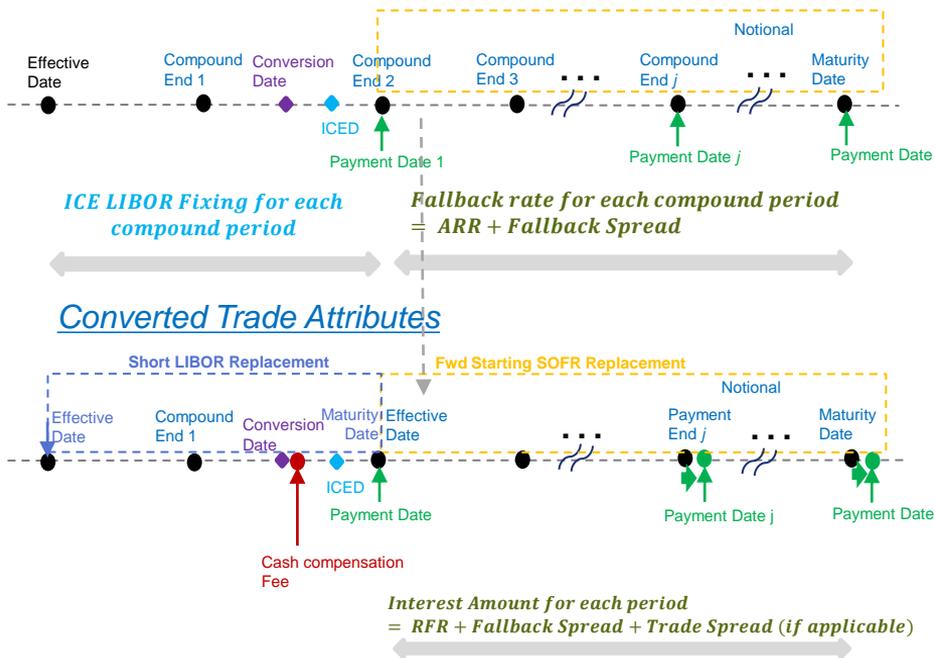
- **Compounding Swaps:** CME will respect the representative LIBOR fixings of any seasoned compounding swaps. A short-dated LIBOR swap is booked to settle the representative LIBOR floating and fixed accruals. The SOFR replacement swap will be effective at the end of the next floating coupon period and the daily compounded rate applied to all future floating periods.
 - Fixed and float cash flows on the Short-dated LIBOR replacement swap **may not match** the original LIBOR swap
 - If the compounding swap is forward starting, with an effective date after the Index Cessation Date, then only a forward starting SOFR replacement swap is created with the original payment frequencies on both legs
- **Stub Periods:** Stubs require special processing when creating short-dated LIBOR replacement swaps as there are different methods used to specify the original floating rate. All current stub periods will be restated as a LIBOR zero coupon swap. Forward starting stub periods will maintain the period start and end dates with a daily compounded overnight rate.
- **Swaps in Final Floating Period:** All LIBOR swaps in their final floating period (last fixing is representative but not settled) will be left to mature and will not undergo conversion.

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Conversion of Compounding Swap: Trade has different compounding frequency vs payment frequency e.g., 3M vs 6M

Pricing and Termination of LIBOR Swap

Pricing and other calculation same as previous slides



Conversion Methodology

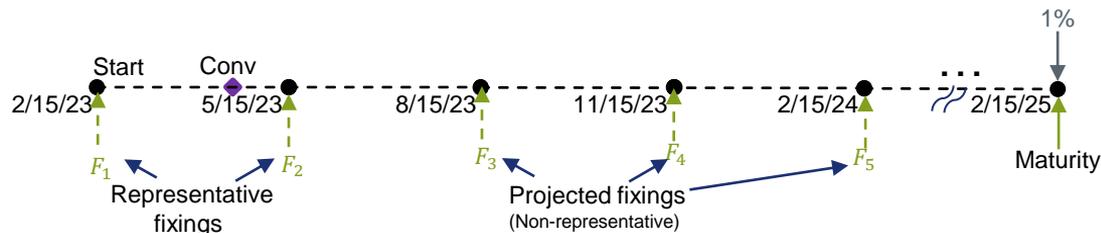
- ✓ Book a forward starting SOFR swap with Effective date set as the next compound period start date immediately following ICED. Note the payment accruals are preserved. SOFR by default compounds every 1D.
- ✓ Notional for the SOFR swap is the same notional as LIBOR trade
- ✓ Change floating spread to ISDA Fallback spread + Trade spread (if applicable)
- ✓ Any representative but not paid LIBOR or fixed coupon payments are settled as a short-dated LIBOR replacement swap. The payments are settled at the end of the next compounding period. All subsequent periods are added to the SOFR replacement swap.
 - The LIBOR replacement swap will accrue all representative LIBOR fixings inclusive of any trade spread using the compounding convention on LIBOR trade
 - ISDA Fallback spread will NOT be added to the LIBOR replacement swap

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Example of Compounding swaps when all LIBOR fixings are representative in current payment period

Original LIBOR Swap:

3M LIBOR vs 1% fixed IRS
 Start= 2/15/23; Maturity = 2/15/25
 Fixed Pays 6M, **Float Receives 6M with 3M compounding**

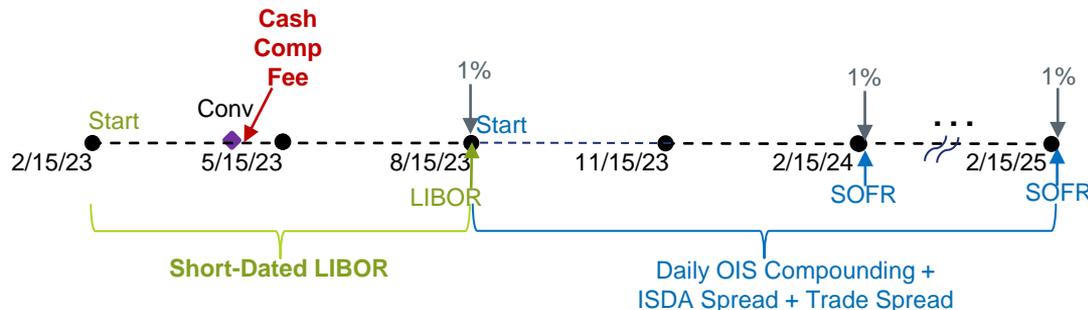


Replacement Swap 1:

LIBOR vs 1% fixed IRS
 Start= 2/15/23; Maturity = 8/15/23
 Fixed Pays 1T, **Float Receives 1T Payment with 3m compounding**

Replacement Swap 2:

SOFR vs 1% fixed OIS
 Start= 8/15/23; Maturity = 2/15/25
 Fixed Pays 6M, **Float Receives 6M with ISDA OIS compounding**



Methodology for Converting LIBOR Swaps

Ex. 8) Seasoned **Compounding** LIBOR swap to SOFR OIS

Conversion Date = April 21, 2023

| USD 3M LIBOR IRS | |
|-------------------------------|--------------|
| Currency | USD |
| Notional | 50,000,000 |
| Trade Date | 2/13/2023 |
| Effective Date | 2/15/2023 |
| Maturity Date | 2/15/2025 |
| Fixed Direction | Payer |
| Fixed Rate | 1% |
| Fixed Leg Payment Freq. | 6M |
| Fixed Leg Payment Offset | n/a |
| Floating Rate Index | USD-LIBOR |
| Float Leg Index Tenor | 3M |
| Float Leg Payment Freq. | 6M |
| Float Leg Accrual Freq. | 3M |
| Float Leg Pay Adj Calendar | USNY |
| Float Leg Payment Offset | n/a |
| Float Leg Compounding Method | Flat |
| Reset Relative To | Begin Period |
| Float Leg Fixing Adj Calendar | GBLO |
| Date Roll | 15 |
| Status | Terminated |



| USD 3M LIBOR IRS – Replacement 1 | |
|----------------------------------|------------|
| Product Type | IRS |
| Notional | 50,000,000 |
| Start Date | 2/15/2023 |
| Maturity Date | 8/15/2023 |
| Float/Fixed Leg Payment Freq | 1T |
| Float Leg Compounding Method | Flat |
| Float Leg Index Tenor | 3M |

| SOFR OIS – Replacement 2 | |
|-------------------------------|------------------------------------|
| Currency | USD |
| Notional | 50,000,000 |
| Trade Date | 5/2/2023 |
| Effective Date | 8/15/2023 |
| Maturity Date | 2/15/2025 |
| Fixed Direction | Payer |
| Fixed Rate | 1% |
| Fixed Leg Payment Freq. | 6M |
| Fixed Leg Payment Offset | 2 Days |
| Floating Rate Index | USD-SOFR-OIS Compound |
| Float Leg Index Tenor | 1D |
| Float Leg Payment Offset | 2 Days |
| Float Leg Payment Freq | 6M |
| Reset Relative To | End Period |
| Date Roll | 15 |
| Float Leg Fixing Adj Calendar | USGS |
| Status | Cleared |
| Upfront Fee | Cash compensation |
| Upfront Fee Payment Date | 4/24/2023 |
| Float Leg Spread | Fixed spread adjustment (0.26161%) |

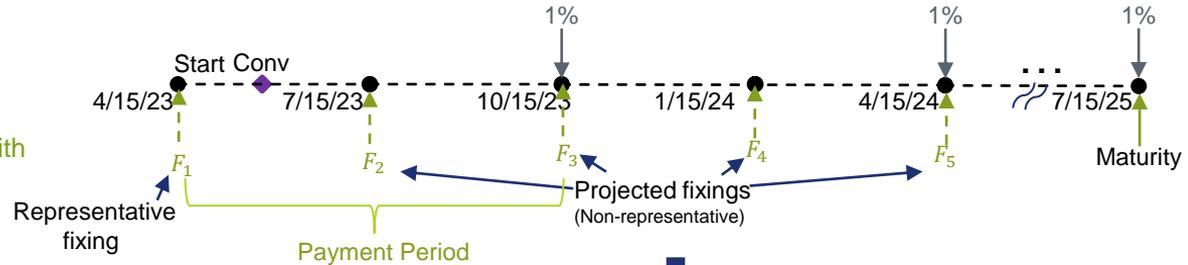
- = Economic preserved
- = Economic changed/added

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Example of Compounding swaps when some LIBOR fixings are non-representative in current payment period

Original LIBOR Swap:

3M LIBOR vs 1% fixed IRS
 Start= 4/15/23; Maturity = 4/15/25
 Fixed Pays 6M, Float Receives 6M with
 3M compounding

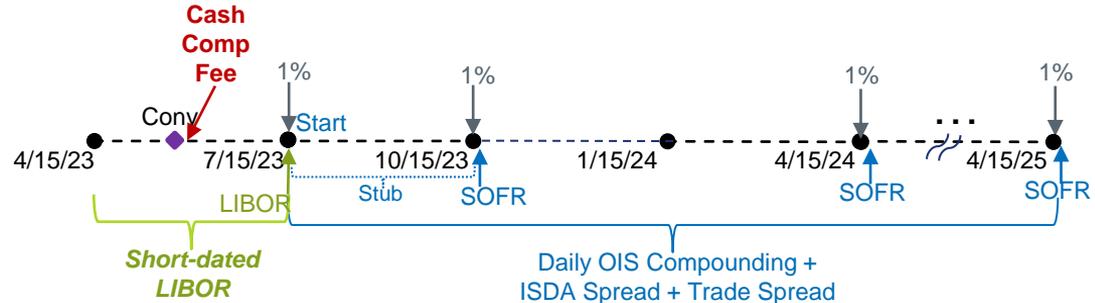


Replacement Swap 1:

LIBOR vs 1% fixed IRS
 Start= 4/15/23; Maturity = 7/15/23
 Fixed Pays 1T, Float Receives 1T
 Current period settled as short-dated LIBOR swap

Replacement Swap 2:

SOFR vs 1% fixed OIS
 Start= 7/15/23; Maturity = 4/15/25
 Fixed Pays 6M, Float Receives 6M
 Stub = Short Initial
 First Reg. Period start date = 11/15/23



Methodology for Converting LIBOR Swaps

Ex. 9) Seasoned **Compounding** LIBOR swap to replacement swaps

Conversion Date = April 21, 2023

| USD 3M LIBOR IRS | |
|-------------------------------|--------------|
| Currency | USD |
| Notional | 75,000,000 |
| Trade Date | 5/12/2023 |
| Effective Date | 5/15/2023 |
| Maturity Date | 5/15/2025 |
| Fixed Direction | Payer |
| Fixed Rate | 1% |
| Fixed Leg Payment Freq. | 6M |
| Fixed Leg Payment Offset | n/a |
| Floating Rate Index | USD-LIBOR |
| Float Leg Index Tenor | 3M |
| Float Leg Payment Freq. | 6M |
| Float Leg Accrual Freq. | 3M |
| Float Leg Pay Adj Calendar | USNY |
| Float Leg Payment Offset | n/a |
| Float Leg Compounding Method | Flat |
| Reset Relative To | Begin Period |
| Float Leg Fixing Adj Calendar | GBLO |
| Date Roll | 15 |
| Status | Terminated |



| USD 3M LIBOR IRS – Replacement 1 | |
|----------------------------------|------------|
| Product Type | IRS |
| Notional | 75,000,000 |
| Start Date | 5/15/2023 |
| Maturity Date | 8/15/2023 |
| Float/Fixed Leg Payment Freq | 1T |
| Float Leg Compounding Method | Flat |
| Float Leg Index Tenor | 3M |

| SOFR OIS – Replacement 2 | |
|---------------------------------|------------------------------------|
| Currency | USD |
| Notional | 75,000,000 |
| Trade Date | 5/12/2023 |
| Effective Date | 8/15/2023 |
| Maturity Date | 2/15/2025 |
| Stub Type | Short Initial |
| First Regular Period Start Date | 11/15/2023 |
| Fixed Direction | Payer |
| Fixed Rate | 1% |
| Fixed Leg Payment Freq. | 6M |
| Fixed Leg Payment Offset | 2 Days |
| Floating Rate Index | USD-SOFR-OIS Compound |
| Float Leg Index Tenor | 1D |
| Float Leg Payment Freq. | 6M |
| Float Leg Payment Offset | 2 Days |
| Reset Relative To | End Period |
| Float Leg Fixing Adj Calendar | USGS |
| Date Roll | 15 |
| Status | Cleared |
| Upfront Fee | Cash compensation |
| Upfront Fee Payment Date | 4/24/2023 |
| Float Leg Spread | Fixed spread adjustment (0.26161%) |

- = Economic preserved
- = Economic changed/added

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Conversion of Vanilla Swap with Stubs

Pricing of Terminated LIBOR

- ✓ Stub periods with a representative LIBOR fixing where coupons remain unsettled at ICED will respect the LIBOR fixing and payment dates. These stubs are priced the same way as regular LIBOR coupon periods
- ✓ Forward starting stub periods are priced using ISDA Fallback pricing protocol i.e., compound the SOFR by backward shifting the stub period by 2 business day and add the respective ISDA fallback spread
- ✓ ISDA Fallback spread is derived by interpolating the ISDA Fallback Spread for the stub LIBOR index tenors (stub tenors are supported on all LIBOR products at CME, excluding OIS)
- ✓ All regular periods in the swap are priced using the methodology outlined in previous slides

Converted Trade Attributes

- ✓ **Current stub periods** with representative LIBOR fixings but unsettled coupons are replaced by a zero-coupon swap to settle the stub payment. The initial rate or the same tenor of LIBOR are carried over
- ✓ **Forward starting stub periods** retain the stub period's start date and end date
 - ✓ Daily compounded SOFR is used to calculate the stub rate
- ✓ For forward starting stub, the difference of ISDA Fallback Spread for the stub and the ISDA Fallback spread for regular swap index will be cash settled as part of cash compensation
- ✓ All non-representative (future) coupon periods in the swap are converted using the methodology outlined in previous slides

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Ex. 10) LIBOR swap in stub period converted to SOFR OIS

Conversion Date = April 21, 2023

| USD 6M LIBOR IRS | |
|---------------------------------|---------------|
| Currency | USD |
| Notional | 50,000,000 |
| Trade Date | 4/2/2023 |
| Effective Date | 5/2/2023 |
| Maturity Date | 7/15/2024 |
| Stub Type | Short Initial |
| First Regular Period Start Date | 7/15/2023 |
| Stub Index 1 | 1M LIBOR |
| Stub Index 2 | 3M LIBOR |
| Stub Payment Offset | n/a |
| Fixed Direction | Payer |
| Fixed Rate | 2.055% |
| Fixed Leg Payment Freq. | 6M |
| Fixed Leg Payment Offset | n/a |
| Floating Rate Index | USD-LIBOR |
| Float Leg Index Tenor | 3M |
| Float Leg Payment Freq. | 3M |
| Float Leg Pay Adj Calendar | USNY |
| Float Leg Payment Offset | n/a |
| Float Leg Compounding Method | None |
| Reset Relative To | Begin Period |
| Float Leg Fixing Adj Calendar | GBLO |
| Status | Terminated |



| USD 3M LIBOR IRS – Short Replacement 1 | |
|--|----------------------------------|
| Product Type | IRS |
| Notional | 50,000,000 |
| Start Date | 5/2/2023 (stub begin date) |
| Maturity Date | 7/15/2023 (stub end date) |
| Float/Fixed Leg Payment Freq | 1T |
| Float Leg Initial Rate | Equal to stub float rate |
| Float Leg Index Tenor | 3M (Longest interpolation tenor) |

| SOFR OIS – Forward Starting Replacement 2 | |
|---|------------------------------------|
| Currency | USD |
| Notional | 50,000,000 |
| Trade Date | 5/2/2023 |
| Effective Date | 7/15/2023 |
| Maturity Date | 7/15/2024 |
| Stub Type | None |
| Fixed Direction | Payer |
| Fixed Rate | 2.055% |
| Fixed Leg Payment Freq. | 6M |
| Fixed Leg Payment Offset | 2 Days |
| Floating Rate Index | USD-SOFR-OIS Compound |
| Float Leg Payment Freq. | 3M |
| Float Leg Index Tenor | 1D |
| Float Leg Payment Offset | 2 Days |
| Reset Relative To | End Period |
| Float Leg Fixing Adj Calendar | USGS |
| Status | Cleared |
| Upfront Fee | Cash compensation |
| Upfront Fee Payment Date | 4/24/2023 |
| Float Leg Spread | Fixed spread adjustment (0.26161%) |

Agenda

1 Introduction to Conversion Plan

2 ISDA Fallback Pricing Protocol

3 Basis Swap Splitting

4 Primary USD Swap Conversion Methodology

5 Secondary USD Swap Conversion Methodology - Zero Coupon Swaps

6 Operational Processing

Methodology for Converting Zero Coupon Swaps

Key Considerations for Zero Coupon Swaps (ZCS)

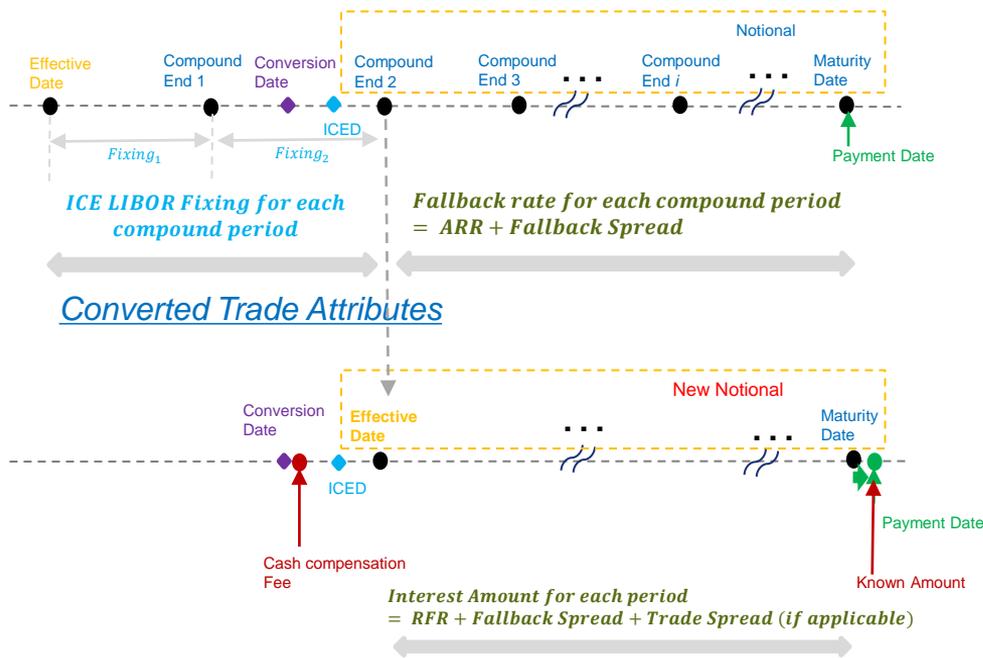
- **Seasoned** ZCS have representative LIBOR fixings and compounded floating legs that need to be accounted for in the replacement swap
 - CME will keep the payment at maturity for both floating and fixed leg (if applicable). A 2-day payment offset is applied to both coupon payments to stay consistent with standard SOFR OIS conventions.
 - Any accrued interest from past and current periods is settled at maturity by **adjusting the “known amount”** on the fixed leg
 - The replacement SOFR OIS will have **adjusted notional** to account for the previous compounding periods. Please see the next slide for detailed calculations of notional and payment amounts.
- **Forward starting** ZCS will be converted in a method identical to vanilla swaps and are replaced by a single SOFR OIS with payment at maturity
- Both seasoned and forward starting ZCS are converted on the same Secondary Conversion date

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Conversion of Zero-Coupon Swap: Trade compounds more frequently but only pays once at maturity

Pricing and Termination of LIBOR Swap

Pricing and other calculation same as previous slides



Conversion Methodology

- ✓ Book a forward starting SOFR swap with Effective date set as the next compound period start date. Note the payment accruals are preserved.
- ✓ Fixed Rate is removed (if applicable), and the compounded interest is set to pay as Known Amount on the maturity date
- ✓ Notional for the Swap adjusted as notional accrued based on the LIBOR fixing inclusive of trade spread (if applicable) using the Swap compounding convention. E.g., Notional for a SOFR swap where two LIBOR fixings are representative, and trade has no spread and FLAT compounding convention will be computed as

$$\text{New Notional} = \text{Notional} * (1 + \text{Fixing}_1 * t_1) * (1 + \text{Fixing}_2 * t_2)$$

- ✓ Change Leg Spread as ISDA Fallback spread + Trade spread (if applicable)
- ✓ Any representative LIBOR payments that are accrued but not paid are settled as part of the Known Amount

$$\text{Adjustment} = \text{New Notional} - \text{Notional}$$

Methodology for Converting USD LIBOR Swaps to SOFR Swaps

Ex. 11) Zero Coupon LIBOR Swap converted to SOFR OIS

Conversion Date = July 3, 2023

| USD 6M LIBOR IRS | |
|-------------------------------|--------------|
| Currency | USD |
| Notional | 100,000,000 |
| Trade Date | 9/13/2022 |
| Effective Date | 9/15/2022 |
| Maturity Date | 9/15/2047 |
| Fixed Direction | Payer |
| Fixed Rate | 1% |
| Fixed Leg Payment Freq. | 1T |
| Fixed Leg Payment Offset | n/a |
| Floating Rate Index | USD-LIBOR |
| Float Leg Index Tenor | 3M |
| Float Leg Payment Freq. | 1T |
| Float Leg Accrual Freq. | 3M |
| Float Leg Pay Adj Calendar | USNY |
| Float Leg Payment Offset | n/a |
| Float Leg Compounding Method | None |
| Reset Relative To | Begin Period |
| Float Leg Fixing Adj Calendar | GBLO |
| Date Roll | 15 |
| Status | Terminated |



| SOFR OIS - Replacement | |
|------------------------------------|------------------------------------|
| Currency | USD |
| Notional (adjusted) | 102,325,845 |
| Trade Date | 9/13/2022 |
| Effective Date | 9/15/2023 |
| Maturity Date | 9/15/2047 |
| Fixed Direction | Payer |
| Known Amount (replaces fixed rate) | 3,325,845 |
| Fixed Leg Payment Freq. | 1T |
| Fixed Leg Payment Offset | 2 Days |
| Floating Rate Index | USD-SOFR-OIS Compound |
| Float Leg Index Tenor | 1D |
| Float Leg Payment Freq. | 1T |
| Float Leg Accrual Freq. | 1T |
| Float Leg Pay Adj Calendar | USNY |
| Float Leg Payment Offset | 2 Days |
| Reset Relative To | End Period |
| Float Leg Fixing Adj Calendar | USGS |
| Status | Cleared |
| Date Roll | 15 |
| Upfront Fee | Cash compensation |
| Upfront Fee Payment Date | 7/5/2023 |
| Float Leg Spread | Fixed spread adjustment (0.26161%) |

- = Economic preserved
 = Economic changed/added

Agenda

1 Introduction to Conversion Plan

2 ISDA Fallback Pricing Protocol

3 Basis Swap Splitting

4 Primary USD Swap Conversion Methodology

5 Secondary USD Swap Conversion Methodology - Zero Coupon Swaps

6 Operational Processing

Operational Processing: End-of-Day Timeline

Tentative EOD Timeline for USD Swap Conversion on relevant conversion date



7:00 pm ET: CME end-of-day close. CME will begin a full clearing cycle with conversion processing included

7:10 – 7:20 pm ET: CME completes netting/blending for all cleared LIBOR swaps. This process finalizes the swap population for conversion. Corresponding FpML confirmations are sent.

7:20 – 8:00 pm ET: Conversion processing begins to terminate the original LIBOR swaps and book Short LIBOR and SOFR replacements with cash compensation fees. All corresponding FpML terminations and clearing confirmed messages are sent.

- *CME runs settlements to compute VM and PAA on all swaps*

8:00 – 8:30 pm ET: CME publishes the end-of-day IRS Trade Register showing all new and terminated trades

Conversion Date + 1 (following NY Business day) – USD compensation fees are settled

Please note:

- *All times are estimates and may vary on each conversion date (UAT processing times are ~1 hour earlier)*
- *Beginning July 3, 2023, the conversion processing will continue daily on US business days*

Operational Processing: Sequencing of Events

Steps to Convert LIBOR Swaps to Replacement Short LIBOR and Market Standard SOFR OIS

The below conversion steps are performed by CME during the USD LIBOR conversion cycle **and daily** after index cessation

Step 1: Price LIBOR Swaps on relevant Conversion Date

- Eligible LIBOR swaps are valued using the ISDA Fallback Pricing Protocol (Supplement 70)

Step 2: Convert LIBOR Swaps to Replacement Swaps

- New SOFR OIS replacement swaps are created, and the fixed spread adjustment is applied to the SOFR leg
- Where applicable, fixed and representative LIBOR floating accruals are booked as short-dated USD LIBOR replacement swaps

Step 3: Price Short-dated LIBOR and SOFR Replacement Swaps on Conversion Date

- End-of-day pricing curves are leveraged to price all replacement swaps (LIBOR and OIS)

Step 4: Compute Cash Compensation and Add as Upfront Fee

- Cash compensation is calculated to account for NPV change between the terminated LIBOR swap and replacement swaps
- All compensation amounts are settled as upfront fees on the replacement SOFR OIS
 - *Cash Compensation = Adj. NPV of LIBOR Swap – Adj. NPV of all Replacement Swaps*

Step 5: Publish all Messaging and Reporting to Clearing Firms

- Termination messages are sent for all terminated LIBOR swaps. A unique “terminating event” is applied to these swaps
- Clearing Confirmed messages are sent for all replacement swaps. A unique “originating event” is applied to these swaps
- IRS Trade Register report is published with all terminated and new swaps, as well as relevant upfront fees

Operational Processing: Variation Margin and Cash Compensation

Variation Margin and Cash Compensation Example (IRS Trade Register view)

| Value Date | Cleared Trade ID | Floating Rate Index | Status | NPV | NPV Adj.* | Previous NPV Adj. | Variation | Upfront Payment | FEE_TYPE | Payment Date | Net Cash Flow |
|------------|------------------|-----------------------|------------|-----------|-----------|-------------------|------------|-----------------|-------------|--------------|---------------|
| 04/21/2023 | 11224 | USD-LIBOR | TERMINATED | 0 | 0 | 59,000.00 | -59,000.00 | - | - | - | -59,000.00 |
| 04/21/2023 | 34563 | USD-LIBOR | CLEARED | 5,000.00 | 5,000.00 | 0 | 5,000.00 | - | - | - | 5,000.00 |
| 04/21/2023 | 67896 | USD-SOFR-OIS Compound | CLEARED | 55,000.00 | 53,000.00 | 0 | 53,000.00 | 2,000.00 | UPFRONT_FEE | 04/24/2023 | 55,000.00 |

| | | | | | | |
|-------------------|----------------------|-----------|--|----------------------|------------|-----------|
| Cash Compensation | LIBOR Swap Valuation | 60,000.00 | Replacement LIBOR Valuation + SOFR OIS Valuation | 5,000.00 + 53,000.00 | PnL Change | -2,000.00 |
|-------------------|----------------------|-----------|--|----------------------|------------|-----------|

| Value Date | Cleared Trade ID | Floating Rate Index | Status | NPV | NPV Adj. | Previous NPV Adj. | Variation | Upfront Payment | FEE_TYPE | Payment Date | Net Cash Flow |
|------------|------------------|-----------------------|---------|-----------|-----------|-------------------|-----------|-----------------|----------|--------------|---------------|
| 04/24/2023 | 34563 | USD-LIBOR | CLEARED | 5,500.00 | 5,500.00 | 5,000.00 | 500.00 | - | - | - | 500.00 |
| 04/24/2023 | 67896 | USD-SOFR-OIS Compound | CLEARED | 53,500.00 | 53,500.00 | 53,000.00 | 500.00 | - | - | - | 500.00 |

Calculation Breakdown (April 21st)

$$\begin{aligned} \text{LIBOR Swap VM} &= \text{NPV Adj.} - \text{Previous NPV Adj.} \\ &= 0 - 59,000.00 = -59,000.00 \end{aligned}$$

$$\begin{aligned} \text{PnL Change} &= [\text{NPV Adj. (SOFR OIS)} + \text{NPV Adj. (Repl. LIBOR swap)}] - \text{NPV Adj. (LIBOR swap)} \\ &= (53,000.00 + 5,000.00) - 60,000.00 = -2,000.00 \end{aligned}$$

$$\begin{aligned} \text{Compensation Amount} &= (\text{NPV Adj. of LIBOR Swap} - [\text{NPV Adj. (Repl. LIBOR Swap)} + \text{NPV Adj. (SOFR OIS)}]) \\ &= 60,000.00 - (5,000.00 + 53,000.00) = 2,000.00 \end{aligned}$$

$$\begin{aligned} \text{NPV Adj. (SOFR OIS)} &= \text{NPV} - \text{Upfront Payment} \\ &= 55,000.00 - (5,000.00) = 53,000.00 \end{aligned}$$

* NPV Adj. reflects the value of the swap removing any fee payments to be made the following business day

Note: In the event of multiple replacement swaps, all Adj NPVs are added to calculate the cash compensation

Operational Processing: Clearing Firm Messaging

FpML Messaging (Key Elements)

For each LIBOR swap, a termination message will be sent to clearing firms along with 1 to 2 clearing confirmed messages for the resultant SOFR swap(s):

LIBOR Swap Termination

Trade IDs:

```
<partyTradeIdentifier>
  <partyReference href = "clearing_service"/>
  <tradeId tradeIdScheme = "cme_trade_id">12226701</tradeId>
  <tradeId tradeIdScheme = "client_trade_id">1234567</tradeId>
  <tradeId tradeIdScheme = "platform_trade_id">2226701</tradeId>
  <tradeId tradeIdScheme = "platform_side_id">2226701</tradeId>
  <tradeId tradeIdScheme = "block_trade_id">1666011</tradeId>
</partyTradeIdentifier>
```

- A subset of trade IDs on the original LIBOR swap will be carried over to the replacement swaps. The CME Trade ID and USI/UTI are not carried over.

Short-Dated LIBOR Replacement Swap

Trade IDs:

```
<partyTradeIdentifier>
  <partyReference href = "clearing_service"/>
  <tradeId tradeIdScheme = "cme_trade_id">14356753</tradeId>
  <tradeId tradeIdScheme = "client_trade_id">1234567</tradeId>
  <tradeId tradeIdScheme = "platform_trade_id">2226701</tradeId>
  <tradeId tradeIdScheme = "platform_side_id">2226701</tradeId>
  <tradeId tradeIdScheme = "block_trade_id">1666011</tradeId>
</partyTradeIdentifier>
```

Replacement SOFR Swap

```
<partyTradeIdentifier>
  <partyReference href = "clearing_service"/>
  <tradeId tradeIdScheme = "cme_trade_id">14356754</tradeId>
  <tradeId tradeIdScheme = "client_trade_id">1234567</tradeId>
  <tradeId tradeIdScheme = "platform_trade_id">2226701</tradeId>
  <tradeId tradeIdScheme = "platform_side_id">2226701</tradeId>
  <tradeId tradeIdScheme = "block_trade_id">1666011</tradeId>
</partyTradeIdentifier>
```

Operational Processing: Clearing Firm Messaging

FpML Messaging (Key Elements)

For each LIBOR swap, a termination message will be sent to clearing firms along with two clearing confirmed messages for the Short-dated LIBOR and SOFR replacement swaps:

LIBOR Swap Termination

- Terminating Event and Status

```
<tradeDate>2019-05-12</tradeDate>
<clearedDate>2019-05-12</clearedDate>
<cme:originatingEvent>INDEX_CONVERSION</cme:originatingEvent>
<cme:status>TERMINATED</cme:status>
```

- Floating Index

```
<floatingRateCalculation>
  <floatingRateIndex>USD-LIBOR</floatingRateIndex>
  <indexTenor>
    <periodMultiplier>3</periodMultiplier>
    <period>M</period>
```

- Terminated and replacement trade(s) are linked through the history element:

```
<cme:history>
  <cme:replacementTradeId tradelIdScheme = "cme_trade_id">14356753</cme:replacementTradeId>
  <cme:replacementTradeId tradelIdScheme = "cme_trade_id">14356754</cme:replacementTradeId>
  <cme:originalTradeId tradelIdScheme = "cme_trade_id">12226701</cme:originalTradeId>
</cme:history>
```

Replacement Swaps

- Originating Event and Status

```
<tradeDate>2019-05-12</tradeDate>
<clearedDate>2023-04-21</clearedDate>
<cme:originatingEvent>INDEX_CONVERSION</cme:originatingEvent>
<cme:status>CLEARED</cme:status>
```

- Floating Index

```
<floatingRateCalculation>
  <floatingRateIndex>USD-LIBOR</floatingRateIndex>
  <indexTenor>
```

```
<floatingRateCalculation>
  <floatingRateIndex>USD-SOFR-OIS Compound</floatingRateIndex>
</floatingRateCalculation>
```

- Original LIBOR swap is referenced through the history element on each replacement swap:

```
<cme:history>
  <cme:originalTradeId tradelIdScheme = "cme_trade_id">12226701</cme:originalTradeId>
</cme:history>
```

Operational Processing: Trade Register Reporting

IRS Trade Register on Conversion Date

Terminated LIBOR Swaps

- All terminated swaps are shown on the conversion date in a “TERMINATED” status
- Impacted swaps can be identified by “INDEX_CONVERSION” value in the IRSTR column “TERMINATING_EVENT”

| Value Date | Cleared Trade ID | Platform ID | Client ID | CONVERTED_TRADE_ID | LEG2_INDEX | PRODUCT_TYPE | Status | NPV | Upfront Payment | FEE_TYPE | TERMINATING_EVENT |
|------------|------------------|-------------|-----------|--------------------|------------|--------------|------------|-----|-----------------|----------|-------------------|
| 04/21/2023 | 12345 | 101234 | Client123 | - | USD-LIBOR | SWAP | TERMINATED | - | - | - | INDEX_CONVERSION |

Replacement SOFR OIS

- All replacement swaps are shown on the conversion date in a “CLEARED” status
- Cash compensation amounts are shown as upfront fees
- Replacement swaps can be identified by “INDEX_CONVERSION” value in the IRSTR column “ORIGINATING_EVENT”
- “CONVERTED_TRADE_ID” column will show the CME Trade ID of the original trade that was converted (**primary link**)

| Value Date | Cleared Trade ID | Platform ID | Client ID | CONVERTED_TRADE_ID | LEG2_INDEX | PRODUCT_TYPE | Status | NPV | Upfront Payment | FEE_TYPE | ORIGINATING_EVENT |
|------------|------------------|-------------|-----------|--------------------|-----------------------|--------------|---------|---------|-----------------|-------------|-------------------|
| 04/21/2023 | 20456 | 101234 | Client123 | 12345 | USD-LIBOR | SWAP | CLEARED | 57,000 | - | - | INDEX_CONVERSION |
| 04/21/2023 | 20457 | 101234 | Client123 | 12345 | USD-SOFR-OIS Compound | OIS | CLEARED | 160,000 | 5,000 | UPFRONT_FEE | INDEX_CONVERSION |

Operational Processing: Indicative Analysis Reporting

Report Specification

- Shows the NPV for each replacement swap, the cash compensation at the trade level, and key economic terms of the replacement swaps
- Initial publication of "indicative reports" is targeted for **January 23, 2023**
- Report uses CME valuation curves for projected LIBOR fixings and to value all swaps. Actual values will vary and are not known until the time of conversion.
- CSV formatted report delivered to clearing firm and client sFTP folders
- All parties receiving Trade Registers today, who have USD LIBOR exposure, will receive this report

Publication Details:

- Report values assume the conversion dates as listed in this deck
- Trade population includes Production portfolios only
- Report figures are updated on New York business days
- Any USD LIBOR swap that has been converted or is in the final floating period are not included
- The last publication date of this report is July 3, 2023
- Each row shows identifiers of the original swap and then the trade details of a replacement swap. Swaps converted to two replacement swaps are shown on two separate rows.
- File name:** IRS_IBORCONV_FFF_YYYYMMDD_EOD.csv

Original Swap Identifiers & Cash Compensation Fields

| Column Header | Description | Sample Value |
|---------------------|---|------------------------|
| Value Date | Business Date | 03/02/2023 |
| Position Account ID | Id of the Position (Clearing) Account | 3TTNN7 |
| Cleared Trade ID | CME Trade ID of Original LIBOR trade | 9355844 |
| Platform ID | SEF/Platform ID | 7897868G9H |
| Client ID | Client reference ID | 1423523IS |
| REG_TRADE_ID | USI | CCCIRS9355844 |
| Firm ID | 3-digit Clearing Firm ID | 998 |
| ORIGIN | HOUS or CUST | CUST |
| PRODUCT_TYPE | Type of IRS product | SWAP; ZCS |
| Currency | 3-digit currency code | USD |
| NPV_NEW_INDEX | NPV of Replacement Swap | 2,266.34 |
| NPV_PRIOR_INDEX | NPV of Original LIBOR Swap | 2,244.28 |
| NPV_ADJ_NEW_INDEX | ADJ NPV of Replacement Swap | 2,266.34 |
| NPV_ADJ_PRIOR_INDEX | ADJ NPV of Original LIBOR Swap | 2,244.28 |
| NPV_ADJ_DIFF | Replacement Swap(s) ADJ NPV minus Original LIBOR ADJ NPV | 22.06 |
| OFFSET_ADJ_AMT | Cash Compensation Amount / Original LIBOR ADJ NPV minus Replacement Swap(s) ADJ NPV | -22.06 |
| UTI | Universal Trade Identifier (<i>new!</i>) | NCHDOP39CCCIRS19711099 |
| ... | ... | ... |

➤ See next slide for replacement swap economics

Note: The OFFSET_ADJ_AMT may not always be equal and opposite to the NPV_ADJ_DIFF due to coupon(s) banking the following business day on the original LIBOR swap

Operational Processing: Indicative Analysis Reporting

Report Specification

Short LIBOR and Replacement SOFR Swap Terms – Summary & Leg 1

| Column Header (Cont.) | Description | Sample Value |
|----------------------------------|---|---------------|
| Effective Date | Start date of the Replacement swap | 06/15/2023 |
| Maturity Date | Maturity date of the Replacement swap | 06/15/2033 |
| Notional | Notional of the Replacement swap; | 36,856,000.00 |
| Direction | Direction of the Replacement swap from the position account's perspective | P |
| Fixed Rate | Fixed rate of the Replacement swap | 0.05112 |
| LEG1_TYPE | Fixed/floating leg of the Replacement swap | FIXED |
| LEG1_START_DATE_ADJ_BUS_DAY_CONV | Business day convention applied to the Effective Date of the Replacement swap | NONE |
| LEG1_START_DATE_ADJ_CAL | Calendar(s) applied to the Effective Date of the Replacement swap | USNY |
| LEG1_PAY_FREQ | Coupon payment frequency applied to the Replacement swap | 3M |
| LEG1_DAYCOUNT | Day count convention applied to the Replacement swap | ACT/360 |
| LEG1_CALC_FREQ | Calculation (accrual) frequency applied to the Replacement swap | 3M |
| LEG1_ROLL_CONV | Roll convention applied to the Replacement swap | 21 |
| LEG1_STUB_TYPE | Type of stub applied to the Replacement swap | ShortInitial |
| LEG1_PAYMENT_DAYS_OFFSET | Number of business days the coupon settlement is delayed after the period end date for the Replacement swap | 2D |
| LEG1_NEXT_ACCRUED | Accrued interest of fixed leg (<i>new!</i>) | 1000.00 |

Short LIBOR and Replacement SOFR Swap Terms – Leg 2

| Column Header (Cont.) | Description | Sample Value |
|----------------------------------|--|--|
| LEG2_TYPE | Fixed/floating leg of the Replacement swap | FLOAT |
| LEG2_START_DATE_ADJ_BUS_DAY_CONV | Business day convention applied to the Effective Date of the Replacement swap | NONE |
| LEG2_START_DATE_ADJ_CAL | Calendar(s) applied to the Effective Date of the Replacement swap | USNY |
| LEG2_PAY_FREQ | Coupon pay frequency applied to the Replacement swap | 6M |
| LEG2_DAYCOUNT | Day count convention applied to the Replacement swap | ACT/360 |
| LEG2_CALC_FREQ | Calculation (accrual) frequency applied to the Replacement swap | 6M |
| LEG2_INDEX | Floating index (FRO) assigned to the Replacement swap | USD-SOFR-OIS Compound; USD-LIBOR |
| LEG2_FIXING_DATE_BUS_DAY_CONV | Business day convention applied to the fixing date of the Replacement swap | PRECEDING |
| LEG2_FIXING_DATE_CAL | Holiday calendar(s) applied to the fixing date of the Replacement swap | USGS; USNY |
| LEG2_ROLL_CONV | Roll convention applied to the Replacement swap | 21 |
| LEG2_SPREAD | Spread adjustment applied to the Replacement swap | 0.26161 |
| LEG2_STUB_TYPE | Type of stub applied to the Replacement swap | LongInitial |
| LEG2_PAYMENT_DAYS_OFFSET | Number of business days the coupon settlement is delayed after the period end date for the Replacement swap | 2D |
| FEE_AMOUNT | The representative LIBOR or Fixed coupon that is added to the Replacement swap as an upfront fee | 2,500.25 |
| FEE_PAYMENT_DATE | Payment date of the representative LIBOR or Fixed coupon that is added to the Replacement swap as an upfront fee | 7/15/2023 |
| LEG2_NEXT_ACCRUED | Accrued interest of floating leg (<i>new!</i>) | 1000.00 |

Contact Information

Please contact ClearedSwapConversion@CMEGroup.com if you would like to raise any questions, provide feedback, and/or discuss the USD LIBOR swap conversion in further detail.

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