

Eurodollar Fallbacks Implementation

CME Group confirms April 14th, 2023* as the planned date to convert Eurodollar futures and options to corresponding SOFR contracts

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Fallback approach for CME Eurodollar futures and options (“F&O”)

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.

CME Eurodollar F&O fallback rules

- Effective March 29, 2021, CME amended its rulebook for Eurodollar F&O to add fallback event procedures for three-month USD LIBOR, with relevant conversion processes currently scheduled to take place following publication of USD LIBOR on June 30, 2023, reflecting market feedback at the time.

CME Group Update

- Based on latest market feedback and to be more closely aligned with recently published industry OTC IRS transition timelines, CME Group will amend those Eurodollar F&O fallback rules to set the Eurodollar F&O conversion date to April 14, 2023*, and to implement the necessary operational steps to promote an orderly industry-wide transition.

Key principles for fallbacks for CME Eurodollar futures and options

SOFR-based fallbacks: client feedback driven, economically accurate, operationally simple, and aligned with the economics of the ISDA's fallback methodology for OTC swaps

- Effective March 29, 2021, CME added fallback procedures to our rulebook for Eurodollar futures and options.
- Proposed update preserves these principles and promotes broad alignment with wider industry transition timelines.

Key principles for Eurodollar futures and options fallback conversion

- Eligible open positions at the time of conversion would be terminated and replaced by an equal number of corresponding SOFR contracts.
- Futures are handled by adding the ISDA fallback spread of 26.161 bps to final Eurodollar futures settlement prices, creating an onset price for the new positions in 3-month SOFR contracts while the original Eurodollar position is closed out at the same settlement price.
- Options follow a two-step process whereby SOFR strikes are mapped to temporary non-standard strikes of Eurodollars at the exact spread of 26.161bps, these instruments are then compared to the nearest standard strike Eurodollar option to calculate the correct premium adjustment for replacement SOFR options. In all cases the new SOFR option will be 25bps higher than the original Eurodollar option.
- Only positions in futures and options with underlying futures expiring after June 30, 2023 will be in scope and eligible for conversion.
 - Post conversion, April 2023, May 2023 and June 2023 Eurodollar futures, and associated options will be the only remaining listed Eurodollar contracts and will be available for trading until expiration.

Eurodollar F&O conversion date - April 14, 2023

Confirmed by client validation, CME Group intends to convert all eligible Eurodollar F&O to SOFR equivalent contracts on April 14, 2023*

- April 2023, May 2023 and June 2023 Eurodollar futures, and associated options will be excluded from the conversion and will continue to be available for trading until expiration.
- Feedback from customers with respect to the conversion of cleared OTC USD derivatives has indicated a strong desire to manage operational work and timelines.
- As a result, CME intends to convert OTC USD cleared derivatives on April 21, 2023*, maintaining broad industry alignment and mindful of the proposed LCH main conversion on May 20, 2023.
- The planned conversion date of April 14, 2023* for Eurodollar F&O conversion accounts for OTC market plans and timing, in response to market participant feedback. This proposal is now final and will be implemented in the relevant contract Rulebook terms by CME.

Additional Eurodollar F&O conversion actions

- **Margin efficiency**

- Margin offsets between same month Eurodollar and SOFR contracts maximized to represent post transition offset

- **Inclusion of SOFR options into portfolio margining with OTC Swap Clearing**

- Scheduled to be live on December 12, 2022
- Customers already benefitting from SOFR futures in portfolio margining

- **Transition functionality**

- [SED reduced tick spreads](#) allow trading between Eurodollar and SOFR futures at 1/10th basis point increments based on fallback spread
- [Exchange defined LS spreads](#) allow SOFR vs Eurodollar options trades at \$1.25/contract price increments equal to 1/20th basis points

- **Fee Waivers for reduced tick Inter-commodity spreads**

- From November 2022* CME will begin implementing fee waivers for SED and LS inter-commodity spread further reducing any frictional costs for customers who are transitioning to SOFR

SOFR futures and options are now the leading liquidity pool

ADV and OI growth

SOFR futures and options volumes are now consistently higher than Eurodollars:

Q3 2022	ADV	Current OI (Oct. 10)
Futures		
SOFR	2.1M	7.8M
Eurodollar	1.3M	8.1M
SOFR % of ED	169%	96%
Options		
SOFR	585k	15.0M
Eurodollar	512k	22.6M
SOFR % of ED	114%	66%

Expiring Options OI going into SOFR

OI at Expiry	ED Options OI	SOFR Options OI
Dec-21	38.4M	3k
Mar-22	40.5M	1.2M
Jun-22	37.0M	4.8M
Sep-22	28.3M	13.1M
Current (10/10)	22.6M	15.0M

Expiring Eurodollar options OI continues to rebuild into SOFR Options

Upcoming Expiries	ED Options OI	SOFR Options OI
Dec-22	11.8M	8.5M

CME Term SOFR

With the growth of CME Term SOFR usage, significant hedging activity is expected to go into SOFR derivatives, further augmenting liquidity.

CME Term SOFR Usage	
OTC Derivatives Referencing Term SOFR*	\$533 Billion
Loans Referencing Term SOFR**	\$2.3 Trillion
	4,050 Loans
Licenses Issued	6,500+
# of Firms under License	1,650+

Inter-Commodity Spread (ICS) Instruments: Liquid standard and reduced-tick ICS instruments for both futures and options are available. The [SED Spread for futures](#) and [LS Spread for options](#) allow reduced-tick trading to enable efficient voluntary conversion of Eurodollar Open Interest to SOFR in our markets.

- CME expects to waive exchange fees for these spreads beginning in November 2022, to help facilitate further transition.

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Fallback process for Eurodollar futures



SR3 Onset Price for conversion:

All existing Three-Month Eurodollar (ED) futures contracts will be converted into the corresponding 3-month SOFR (SR3) futures as follows:

$$\text{SOFR futures Onset Price} = \underset{\text{Final settlement price}}{\text{3-month Eurodollar futures Settlement}} + \underset{\text{Fixed at 26.161 bps}}{\text{Fallback Spread Adjustment}}$$

** Final settlement price of Eurodollars will be to 4 decimal places to conform with existing client infrastructure, with the impact of the additional 0.001bp being handled by a balancing cash flow between longs and shorts (cash residual amount)*

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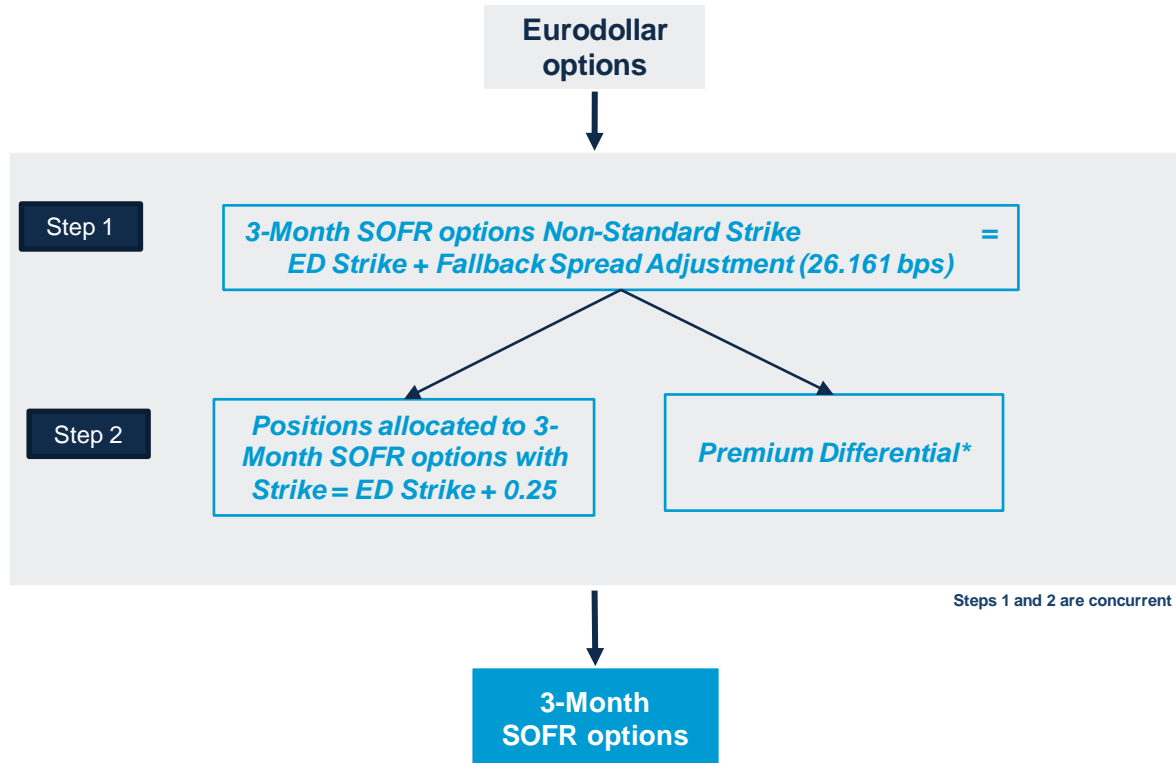
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Fallback flow chart – options on Eurodollar futures



* Premium differential corresponds to premium differences between ED Option premium corresponding to Strike K vs. SR3 Option premium corresponding to Strike (K + 25 bps)

Fallback process for options on Eurodollar futures

SOFR as the Independent price source

- Based on current observations and trends of volume and open interest, SOFR options will be the primary source of market data at the point of conversion
- SOFR options are deemed the **Independent Option**, and Eurodollar as the **Dependent Option**
- SOFR options premiums will be used as independent prices in order to determine the premium of ED options for the purpose of conversion
- Option premium for the Independent SOFR option would be observed from end of day settlement prices¹
- Equivalent option premium for the outgoing Dependent Eurodollar option would be calculated using the prices of the Independent SOFR option

¹<https://www.cmegroup.com/confluence/display/EPICSANDBOX/CME%2C+CBOT%2C+NYMEX%2C+COMEX+Daily+Option+Settlement+Procedures>

Fallback process for options on Eurodollar futures

All remaining eligible options on Three-Month Eurodollar (ED) futures will be converted into corresponding options on 3-Month SOFR (SR3) futures

- o With the linear fallback adjustment of 26.161 bps we note that:

ED option price (for an ED Strike K) = SR3 option price (for ED Strike $K + 26.161\text{bps}$)

Similarly, since SOFR options will be the independent price source we have:

ED option price (for a SOFR Strike $K - 26.161\text{bps}$) = SR3 option price (for SOFR Strike K)

- o CME lists ED options and SR3 options at specific strike intervals (6.25, 12.50, or 25 bps), strikes are not listed at intervals matching the exact 26.161bps fallback spread
- o The nearest standard strike option in SR3 will be 25bps higher than the original ED strike

Open positions on each Eurodollar option strike will be converted to the nearest standard strike on the corresponding listed SOFR option contract using the following formula:

Rearranging the second equation from above

*SR3 option price (for a given SOFR Strike K) = ED option price (for SOFR Strike $K - 25\text{bps}$) + Premium Differential**

**Premium Differential represents the difference in option premium corresponding to SR3 Strike $K - 26.161\text{bp}$ and SR3 Strike $K - 25\text{bp}$.*

Fallback process for options on Eurodollar futures

Premium Differential

$$\text{Option Premium} = \text{Intrinsic Value} + \text{Time Value}$$

- Replacement SOFR options and their equivalent ED options will have different Option Premium values due to differences in Intrinsic and Time Value.
- Replacement SOFR options will be at strikes that are 25 bps above the original ED Options. The difference between the fallback spread of 26.161bps and 25 bps will be accounted for.
- Quarterly SOFR options will have expiry dates that are not perfectly aligned with the original quarterly ED option (Friday 2:00PM SOFR vs. Monday 5:00 AM ED). Given the small difference in time to expiry and based on market participant feedback, CME will not adjust for this technical variation. Mid Curve options expiration dates are aligned.
- Long ED option holder will pay the Short Position holder if the Option Premium of the converted SR3 option is higher than that of the corresponding ED option. Alternatively, Short ED option will pay the Long Position holder if the Option Premium of the converted SR3 option is lower than the active ED option.
- **CME approach is designed to avoid winners or losers driven by this conversion.**

Fallback process for options on Eurodollar futures

Use of out of the money options

- Consistent with daily settlement process, CME will use out of the money (OTM) options to derive a single volatility surface which will be used in the pricing adjustments of both OTM and in the money (ITM) options.

Determining prices for standard strikes from non-standard strikes

- Use settlement price of OTM SOFR options with strike K as the price for OTM ED options with strike $K - 26.161\text{bps}$ for the next steps.
- Imply lognormal volatility for the non-standard adjusted strikes (OTM) of the Dependent Eurodollar Option (SOFR Strike $K - 26.161\text{bps}$).
- Determine the implied lognormal volatility of the listed standard strikes for Dependent Eurodollar Options (SOFR strike $K - 25\text{bps}$) by interpolating the implied lognormal volatility of the non-standard strikes from above.
- Price the standard strikes of the Dependent Eurodollar Option under Whaley model using the interpolated volatility from above.

Fallback process for options on Eurodollar futures

Illustration of Pricing Impact

Assumption: SOFR option is Independent Option and ED option is Dependent Option

SOFR Futures Price: 99.00

ED Futures Price: 98.7384

Fallback Spread: 26.161 bps

Option Type	SOFR Strike	Daily Settlement Price (DSP)	Whaley volatility
Put	98.5	0.4675	0.017287
Put	98.75	0.565	0.017179
Call	99	0.6675	0.016836
Call	99.25	0.565	0.017127

Prices of OTM ED options at non-standard strikes is assumed to be the same as the corresponding SOFR options

Option Type	ED Strike = SOFR Strike - 26.161bps	Price = SOFR DSP	Whaley volatility
Put	98.23839	0.4675	0.017268
Put	98.48839	0.565	0.017153
Call	98.73839	0.6675	0.016819
Call	98.98839	0.565	0.017109

Option Type	ED Standard Strike	Offset Price	Whaley volatility
Put	98.25	0.4719	0.017268
Put	98.5	0.5695	0.017137
Call	98.75	0.6618	0.016817
Call	99	0.5609	0.017131

Determine Onset Prices of outgoing ED options

Interpolated Volatility from non-standard Strikes

Implied volatility for ED option is calculated using price copied from SOFR settlement

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Operational processing – Eurodollar F&O conversion and delisting

Pre-Conversion Activities

- Complete all Fallback setups for in-scope ED F&O to be effective on Conversion Date, including:
 - Establishing product relationships between the corresponding Eurodollar and SOFR contracts
 - Conduct testing (timeline will be forthcoming) with industry to ensure readiness by all parties and their systems
- Clearing Advisory notification provided to FCMs with all operational processing details

Conversion Date Processing

- Identify all Eurodollar F&O positions to be converted to SOFR
- Set corresponding Eurodollar F&O contracts to “non-tradeable” with a Last Trade Date of April 14 and a Final Settle Date of April 17
 - Settlement on Eurodollar futures will be calculated based on the corresponding SR3 futures
- For each Eurodollar futures and options contract, generate an offset transaction and confirm message to effect removal of the position
- For each SOFR futures and options contract, generate an onset transaction and confirm message to effect migration of the position
- Offset and Onset prices for futures and options will be determined as described above
- Compute and assign the cash residual amount to the SOFR futures onset position

Post-Conversion

- Only April, May and June 2023 Eurodollar futures and associated options will remain tradeable. All other Eurodollar futures and options instruments will be removed.

Operational timeline* – Eurodollar F&O conversion

Friday
April 14, 2023

- 5:00 pm ET: Eurodollar futures and options (except April, May and June 2023 futures and associated options) are **no longer tradeable**
- End of Day (9:00 pm ET): Finalize EOD positions for April 14
- 11:00 pm ET: Cutoff for clearing firms submitting, to CME, instructions to effect customer level conversion results

Saturday
April 15, 2023

No processing

Sunday
April 16, 2023

- Start of Day: Establish SOD positions for Monday, April 17
- 8:00 am ET: Open window for final upload of conversion files used in conversion
- 10:00 am ET: Run conversion processing for Eurodollar futures and options; establish resulting SOFR futures and options positions
- 11:00 am ET: Generate conversion transactions and clearing firm messaging using customer level instructions as provided on Friday
- 12:00 pm ET: Notify FCMs of conversion completion
- 6:00 pm ET: CME opens markets for trading

* Times provided above are estimates

Eurodollar conversion example: Futures reporting

Eurodollar futures conversion will take place through offsetting each start of day position at an equal and opposite quantity using the Final Settlement Price for the position. An onset will be used to re-establish the position in the corresponding SR3 futures contract, as shown below.

Position Type	Long Qty	Short Qty	Settlement Price	Offset/Onset Price	Cash Residual Amt
SOD position – Eurodollar (ED) Futures	50	0	99.45		
Offset position – Eurodollar (ED) Futures	0	50		99.45*	
EOD position – Eurodollar (ED) Futures	0	0			
<hr/>					
SOD position – SOFR (SR3) Futures	0	0	99.71		
Onset position – SOFR (SR3) Futures	50	0		99.7116**	-1.25***
EOD position – SOFR (SR3) Futures	50	0			

* Eurodollar offset price will be set equal to the Final settlement price resulting in asymmetrical variation between ED and SR3.

** SOFR onset price will be calculated from the Eurodollar offset settlement price. Note that the SOFR onset price will be rounded to .0001.

*** A residual amount will be calculated as $-.00001 \times 50 \times 2500$ multiplier = -1.25 (multiply by -1 for a short)

Eurodollar conversion example: Options reporting

Eurodollar options conversion will take place in a manner like futures, with offset transactions generated based on start of day positions at an equal and opposite quantity and offset price consistent with calculation in conversion methodology. An onset will be used to re-establish the position in a corresponding SOFR option contract with onset price as SOFR settlement price, as shown below.

Position Type	Long Qty	Short Qty	Strike Price	Offset/Onset Price
Option SOD position – Eurodollar Option (ED) Call	50	0	98.5	
Offset SOD position – Eurodollar Options Call (ED)	0	50	98.5	.0525*
EOD position – Eurodollar Option (ED)	0	0	98.5	
SOD position – SOFR Option Call (SR3)	0	0	98.75	
Onset position – SOFR Option Call (SR3)	50	0	98.75	.053
EOD position – SOFR Option Call (SR3)	50	0	98.75	

* Eurodollar option offset price will be set equal to the implied price assuming SOFR option as independent option following the steps defined before

Indicative analysis reporting

Indicative Cash Flow Report

- Beginning in Q4 2022, CME will publish a daily Indicative Cash Flow Report for all Eurodollar futures and options contracts.
- Report will be pre-loaded with a mapping of all ED futures and options on ED futures contracts and corresponding prices, while also allowing FCMs to input their customer level positions if desired.
- Referencing entered positions, the fallback spread adjustment and multiplier, the report will compute all relevant cash flows and prices:
 - For futures, this includes the **cash residual amount on the onset transaction**
 - Cash residual amount will be calculated as $-.00001 \times \text{Onset Qty} \times 2500$ multiplier (multiply by -1 for a short)
 - For options, this includes the **Eurodollar and SOFR option premium amounts**, the **SOFR option precise strike** and the **net premium**
- Report will be made available directly within FCM's sFTP folders and on the cmegroup.com interest rates web page.

Eurodollar Conversion Testing and Readiness Program

- CME Clearing will conduct testing with FCM back offices on different dates leading up to the actual conversion
- Both production and test portfolios will be used for testing
- FCM's are expected to provide client level instruction files, process resulting conversion transactions, and move positions in books
- Street-wide tests have been scheduled for the following dates:
 - Wed 12/7/22 – Thu 12/8/22
 - Fri 1/20/23 - Mon 1/23/23
 - Fri 2/10/23 - Mon 2/13/23
 - Fri 3/3/23 - Mon 3/10/23
 - Fri 3/31/23 - Mon 4/3/23
- Results can be checked against the indicative cash flow report for the date of the test if desired
- Clients should reach out to their FCM to confirm availability of test outputs

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