INTEREST RATES

Spreading SOFR, FF, and ED Futures

APRIL 2018

The launch of CME One-Month SOFR (SER) futures and Three-Month SOFR (SFR) futures on 7 May 2018[1] will bring several new inter-commodity spreads (ICS) to the exchange's short-term interest rate (STIR) futures offerings. This note examines four of these new ICS, each of which will be available at launch as predefined ICS on the CME Globex electronic trading platform (CME Globex)[2] –

- One-Month SOFR/30-Day Federal Funds (SER/FF)
- Three-Month SOFR/Three-Month Eurodollar (SFR/ED)
- One-Month SOFR/Three-Month SOFR (SER/SFR)
- 30-Day Federal Funds/Three-Month SOFR (FF/SFR)

All such spread positions will be cleared by CME Clearing, and will be eligible for margin offsets/spread credits, irrespective of how they are executed.

The note begins with SER/FF and SFR/ED spreads, each of which are two-legged 1:1 spreads, then moves on to SER/SFR and FF/SFR spreads, each involving multiple legs and a weighting scheme identical to the set-up that now applies to 30-Day Federal Funds/Three-Month Eurodollar (FF/ED) inter-commodity spreads on CME Globex. (See http://www.cmegroup.com/trading/interest-rates/files/ed-ff-spread.pdf.)

One-Month SOFR/30-Day Federal Funds (SER/FF)

The SER/FF futures spread will be tradable on CME Globex as a predefined ICS entailing the purchase (sale) of one SER future and the sale (purchase) of one FF future, both for the same delivery month. The legs have identical contract sizes ($41.67 per basis point), identical last trading days, and final settlement prices that are backward-looking averages of overnight rates during the contract delivery month.

At launch, SER futures will be listed for trading in each of the nearest seven calendar months. SER/FF ICS will be available for all seven contract months. Implied pricing will link the liquidity between the CME Globex order book for any SER/FF spread and the order books for outright trades in the component SER and FF contracts.

The price display convention for the spread will be "SER price minus FF price". The spread values typically will be positive, because on most days the SOFR values underlying the SER contract will be less than daily effective federal funds rate values underlying the FF contract. For example, the hypothetical SER contract final settlement price and the actual FF final settlement price for the September 2017 contract month imply a price spread of 9.9 basis points:

SERU7 minus FFU7 = 98.946 minus 98.847 =
0.099 price points = 9.9 basis points.

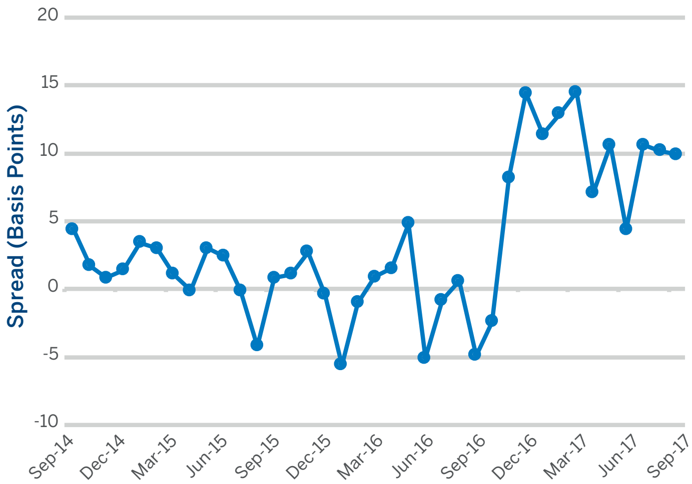
Exhibit 1 depicts spreads between hypothetical SER final settlement prices (based on currently available historical SOFR data) and actual FF final settlement prices for the 37 contract months from September 2014 through September 2017, inclusive. Please see the Appendix for technical details of the SER/FF spread.

1 Pending certification of contract terms and conditions with the US Commodity Futures Trading Commission (CFTC) and completion of all regulatory review periods. Throughout this note, "SOFR" refers to the Secured Overnight Financing Rate benchmark, for which the Federal Reserve Bank of New York (FRBNY) is scheduled to begin regular daily production and publication on Tuesday, 3 April 2018. See: https://www.newyorkfed.org/markets/opolicy/operating_policy_180228.

2 Throughout, the contract symbols – ED for Three-Month Eurodollar futures, FF for 30-Day Federal Funds futures, SER for One-Month SOFR futures, and SFR for Three-Month SOFR futures – are Bloomberg product codes.Source: Bloomberg LLC.

Exhibit 1: Spread Values for Hypothetical SER Final Settlement Prices versus Actual FF Final Settlement Prices, September 2014 through September 2017 (Basis Points per Annum)

One-Month SOFR (SER) Price minus 30-Day Federal Funds (FF) Price



Source: FRBNY

Three-Month SOFR/Three-Month Eurodollar (SFR/ED)

SFR futures will have contract size of $25 per basis point, equal to ED futures, and will have contract critical dates organized around the IMM calendar, just like ED futures. Accordingly, predefined SFR/ED spreads with 1:1 spread ratios will be tradable on CME Globex. Here too, implied pricing will link the liquidity in the SFR/ED ICS to liquidity in the outright markets for the corresponding SFR futures and ED futures.

Initially, SFR futures will be listed for trading in each of the nearest 20 March Quarterly delivery months (March, June, September, or December), from June 2018 through March 2023, inclusive. SFR/ED ICS will be available for trading for each of these 20 months.

The spread price scheme will be "SFR price minus ED price". As with the SER/FF spread, displayed values for SFR/ED typically will be positive, because the SFR leg customarily will have a higher price (ie, a lower contract interest rate) than the ED leg. Please see the Appendix for technical details of the SFR/ED spread.

The "contract month" convention for naming SFR futures mirrors the established convention for ED futures, in the sense that the three-month period of interest rate exposure is essentially identical for any SFR and ED pair with identical contract months. ***This simplifies spreading between SFR and ED for spread pairs at any remote date***, including spreading between SFR packs or bundles versus ED packs or bundles.

To see this, consider the September 2020 SFR/ED spread (ie, the price spread between SFRU0 minus EDU0) –

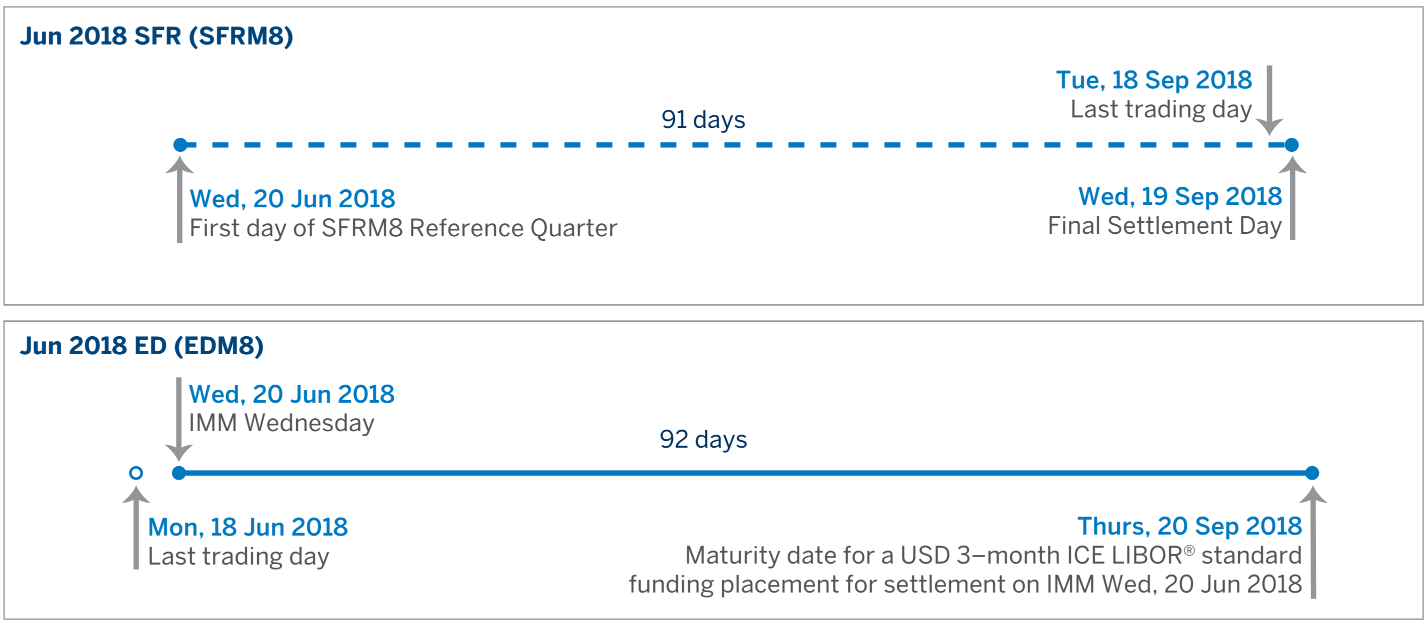
SFRU0's final settlement price will be determined by daily compounded SOFR rates during the interval from (and including) Wednesday, 16 September 2020, through (and not including) Wednesday, 16 December 2020.

EDU0's final settlement price will be determined by the USD three-month ICE LIBOR® determined on Monday, 14 September 2020, corresponding to a three-month unsecured bank funding transaction that settles on the third Wednesday of September, 16 September 2020, and that matures three months later, on Wednesday, 16 December 2020.

Unlike deferred-month SFR/ED spread positions, ***management of the near-dated SFR/ED spread will require keeping an eye on differences in last trading days between the two legs***. For the ED contract, termination of trading and final settlement occur on the Monday before the third Wednesday of the contract month. For the SFR contract, they occur three months later. The hypothetical June 2018 SFR/ED spread schematized below (ie, the price spread between SFRM8 minus EDM8) illustrates:

For SFRM8, the contract Reference Quarter – the interest rate exposure period that informs the final settlement price – starts on the third Wednesday of June 2018, but the contract remains tradable until Tuesday, 18 September 2018, with final settlement scheduled for Wednesday, 19 September 2018.

By contrast, EDM8 is scheduled to cease trading and to come to final settlement on Monday, 18 June 2018. Its final settlement price is based on USD three-month ICE LIBOR® corresponding to an unsecured bank funding transaction that settles on the third Wednesday of June (20 June 2018) and matures three months later on Thursday, 20 September 2018.



The futures on both legs are referenced as "June" contracts, and their respective intervals of interest rate exposure are approximately the same. Notably, the settlement date for the notional three-month term bank funding rate underlying the ED contract matches the start date of the SFR contract's Reference Quarter, the period over which daily SOFR interest is compounded for determination of the contract final settlement price.

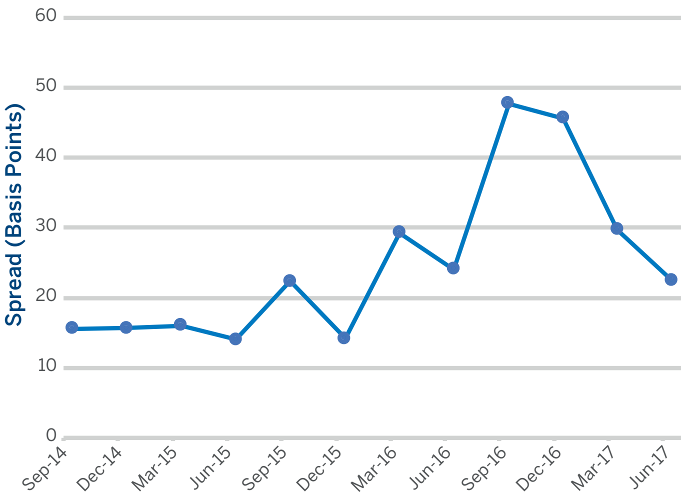
The crucial difference is that the SFR contract remains alive and tradable for three months after the ED contract has expired. Thus, ***anyone holding a nearby SFR/ED spread position must decide how to monitor and manage the SFR leg***. Doing nothing will result in an outright position in an expiring SFR contract.

Exhibit 2 depicts SFR/ED spreads implied by hypothetical SFR final settlement prices and actual ED final settlement prices for each of the 12 March Quarterly months between September 2014 and June 2017, inclusive.[3]

3 A companion whitepaper, What is SOFR?, provides detailed description of the naming convention for SFR contract months. It also makes a useful complement to the data depicted in Exhibit 2 by displaying rolling daily spreads between three-month daily compounded SOFR and USD three-month ICE LIBOR®. For more information, please visit: http://www.cmegroup.com/education/articles-and-reports/what-is-sofr.html

Exhibit 2: Spread Values for Hypothetical SFR Final Settlement Prices versus Actual ED Final Settlement Prices, September 2014 through June 2017 (Basis Points per Annum)

Three-Month SOFR (SFR) Price minus Three-Month Eurodollar (ED) Price



Sources: FRBNY, ICE Benchmark Administration, Ltd.

In addition to the two 1:1 spreads described above, the exchange will enable CME Globex trading in predefined ICS for weighted, multi-legged futures spreads between SER and SFR and between FF and SFR. Similar to the FF/ED ICS introduced on CME Globex in early March,[4] the spread ratio in each case will be 6:10, as depicted below for a hypothetical September 2018 SER/SFR spread —

Contract Month	SER Leg Quantity (Contracts)	SFR Leg Quantity (Contracts)
September		10
October	3	
November	3	
December		
DV01 per Contract	$41.67	$25.00
DV01 per Leg	$250.02	$250.00

Generally, for a given three-month futures product aligned to IMM dates — either SFR or ED — the predefined ICS will assign specified quantities of two one-month futures products that are aligned with calendar months (either SER or FF). The one-month futures contracts will be chosen so that their contractual interest rate exposure periods span the central two months within the contractual interest rate exposure period for the three-month futures leg. Each such ICS comprises a total of 16 contracts, the smallest number that achieves the joint objectives of (i) DV01 balance between the spread's long and short legs and (ii) maximum overlap of periods of interest rate exposure spanned by each leg.

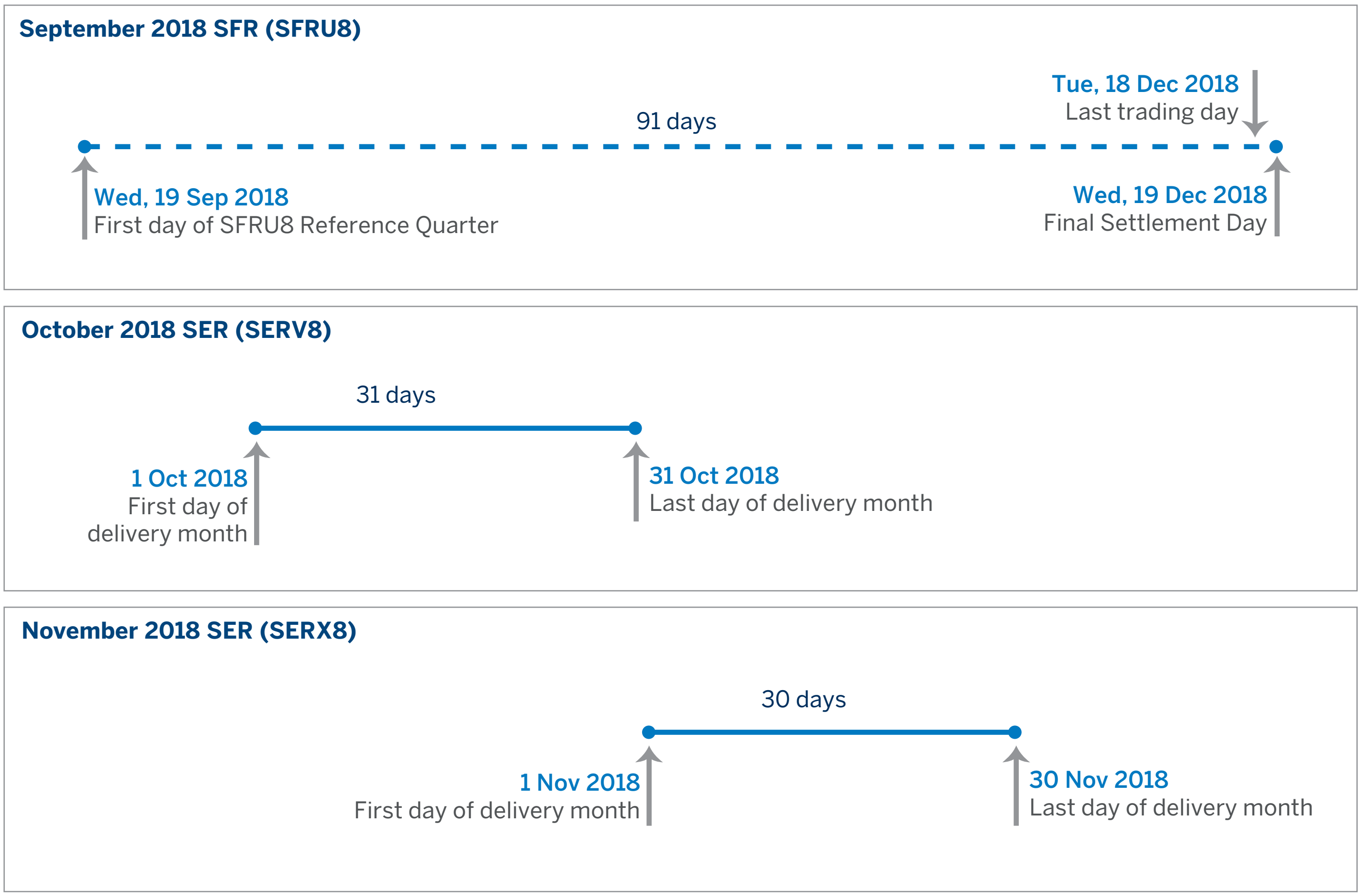
For the hypothetical September 2018 ICS shown above, the legs comprise 10 SFRU8 long (short) versus three SERV8 short (long) and three SERX8 short (long). The price display convention will be "average of one-month leg prices minus three-month leg price":

[(Oct SER + Nov SER) / 2] minus Sep SFR

4 *For more information, please visit CME Group, Short-Term Interest Rate Intercommodity Spreads at: http://www.cmegroup.com/trading/interest-rates/stir-intercommodity-spreads.html*

One-Month SOFR/Three-Month SOFR

Initially, the exchange will list three combinations of predefined SER/SFR ICS on CME Globex. Executing any such predefined spread will result in contract positions in three legs, each with a different last trading date, The schematic below illustrates the anatomy of a hypothetical Sep 2018 SER/SFR spread.



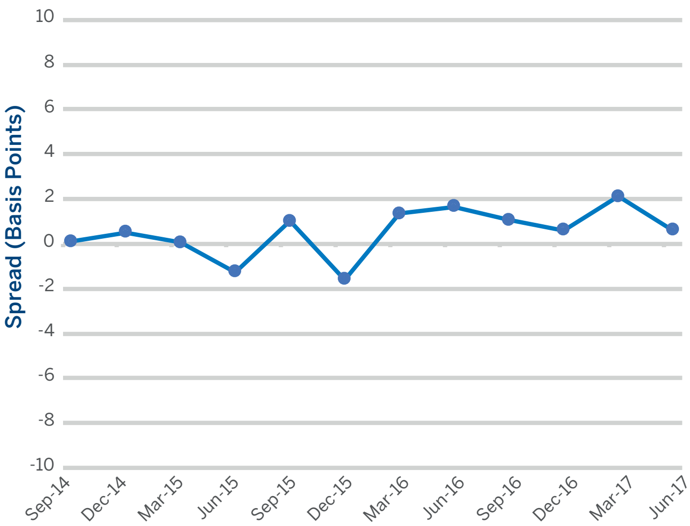
The convention for representing the spread price is "average of one-month legs minus three-month leg". For example, if contract prices were 99.58 for SERV8, 99.675 for SERX8, and 99.62 for SFRU8, then the Sep 2018 SER/SFR spread price would be:

0.75 basis points = 0.0075 contract price points =
[(99.58 + 99.675) / 2] minus 99.62.

The hypothetical historical SER/SFR spread values plotted in Exhibit 3 below are determined in accordance with this convention. All are as implied by hypothetical futures final settlement prices for each of the 12 March Quarterly months between September 2014 and June 2017, inclusive. Within this short historical span, the hypothetical SER/SFR spreads occupy a narrow range, less than 4 basis points wide, centered on an average value of 0.51 basis points, with no discernable trend or regular cyclicity.

Exhibit 3: SER/SFR Spread Values for Hypothetical Futures Final Settlement Prices, September 2014 through June 2017 (Basis Points per Annum)

Average SER Price - SFR Price



Source: FRBNY

30-Day Federal Funds (FF) futures/Three-Month SOFR (SFR) futures

Upon launch of SOFR futures, the exchange also will list four predetermined FF/SFR ICS on CME Globex, for which the composition and weighting scheme is essentially identical to the SER/SFR spreads described above. Here too, the convention for quoting the FF/SFR spread is "average of one-month legs minus three-month leg." For instance, for hypothetical contract prices of 98.93 for SFRM8, 98.85 for FFN8, and 98.845 for FFQ8, a June 2018 FF/SFR spread would be priced at:

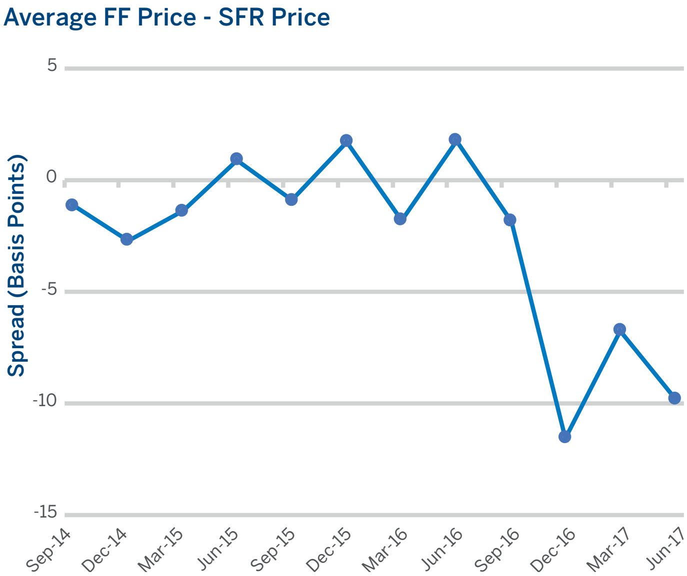
-8.25 basis points = -0.0825 contract price points = [(98.85+98.845) / 2] minus 98.93.

Hypothetical historical FF/SFR spreads plotted in Exhibit 4 adhere to this convention. All are as implied by final settlement prices – actual for FF contracts, hypothetical for SFR contracts — for each of the 12 March Quarterly months between September 2014 and June 2017, inclusive.

Given the volatility of the basis spread between daily SOFR and the daily effective federal funds rate, holders of nearby FF/SER spreads are well advised to keep a weather eye on schedules for termination of trade in the spread's component futures.

The average spread for the full period is -2.8 basis points. The drop to around -9.4 basis points during the spell from December 2016 to June 2017 approximately mirrors the jump to around +10.3 basis points in the SER/FF spread, shown above in Exhibit 1, owing to the reversal of FF's position between the two spreads: FF plays the role of "front" leg in FF/SFR, while serving as "back" leg in SER/FF.

Exhibit 4: **FF/SFR Spread Values for Hypothetical SFR Final Settlement Prices versus Actual FF Final Settlement Prices, September 2014 through June 2017 (Basis Points per Annum)**



Source: FRBNY

Appendix

Technical Details of SOFR Inter-Commodity Spreads on CME Globex

Globex Symbol Example	Front Leg	Back Leg	Leg Ratio	Implied Y/N	Minimum Tick	Matching Algorithm	Spreads Listed
SR1N8-ZQN8*	SR1	ZQ	1:1	N	0.25	Pro-Rata	1**
				Y	0.50		6
SR3U8-GEU8*	SR3	GE	1:1	N	0.25	Pro-Rata	1**
				Y	0.50		19
SR1V8X8-SR3U8	SR1	SR3	(3+3) : 10	N	0.25	Pro-Rata	3
ZQV8X8-SR3U8	ZQ	SR3	(3+3) : 10	N	0.25	Pro-Rata	4

** GE is the CME Globex symbol for ED. ZQ is the CME Globex symbol for FF. SR1 is the CME Globex symbol for SER. SR3 is the CME Globex symbol for SFR.*

*** Implied pricing is disabled when the minimum price increments in the nearby futures and in the spread are reduced from 0.5 basis points to 0.25 basis points.*

Product	MDP 3.0: tag 6937-Asset	iLink: tag 55-Symbol MDP 3.0 tag 1151 – Security Group	Future Tag 762-SecuritySubType	MDP 3.0 Market Data Channel
30-Day Fed Funds future vs 1-Month SOFR Inter-Exchange Spread	SR1	SY	IS	312
Eurodollar vs 3-Month SOFR Inter-Commodity Spread	SR3	SS	IS	312
1-Month SOFR future vs 3-Month SOFR future Reduced Tick Inter-Commodity Ratio Spread	SR1	SS	EF	312
30-Day Fed Funds futures vs 3-Month SOFR Reduced Tick Inter-Exchange Ratio Spread	ZQ	SY	EF	348

For more information about SOFR and CME SOFR futures, please visit www.cmegroup.com/sofr or contact.

Nick Johnson
+1 312 338 2407
nick.johnson@cmegroup.com

Jonathan Kronstein
+1 312 930 3472
jonathan.kronstein@cmegroup.com

Frederick Sturm
+1 312 930 1282
frederick.sturm@cmegroup.com

CME Group

CME GROUP HEADQUARTERS

20 South Wacker Drive
Chicago, Illinois 60606
cmegroup.com

CME GROUP GLOBAL OFFICES

Chicago
+1 312 930 1000

New York
+1 212 299 2000

London
+44 20 3379 3700

Singapore
+65 6593 5555

Bangalore
+91 80 3323 2300

Beijing
+86 10 5913 1300

Belfast
+44 28 9089 6600

Calgary
+1 403 444 6876

Hong Kong
+852 2582 2200

Houston
+1 713 658 2347

São Paulo
+55 11 2787 6279

Seoul
+82 2 6336 6700

Sydney
+61 8051 3210

Tokyo
+81 3 3242 6233

Washington D.C.
+1 202 638 3838

PM2398/0518