

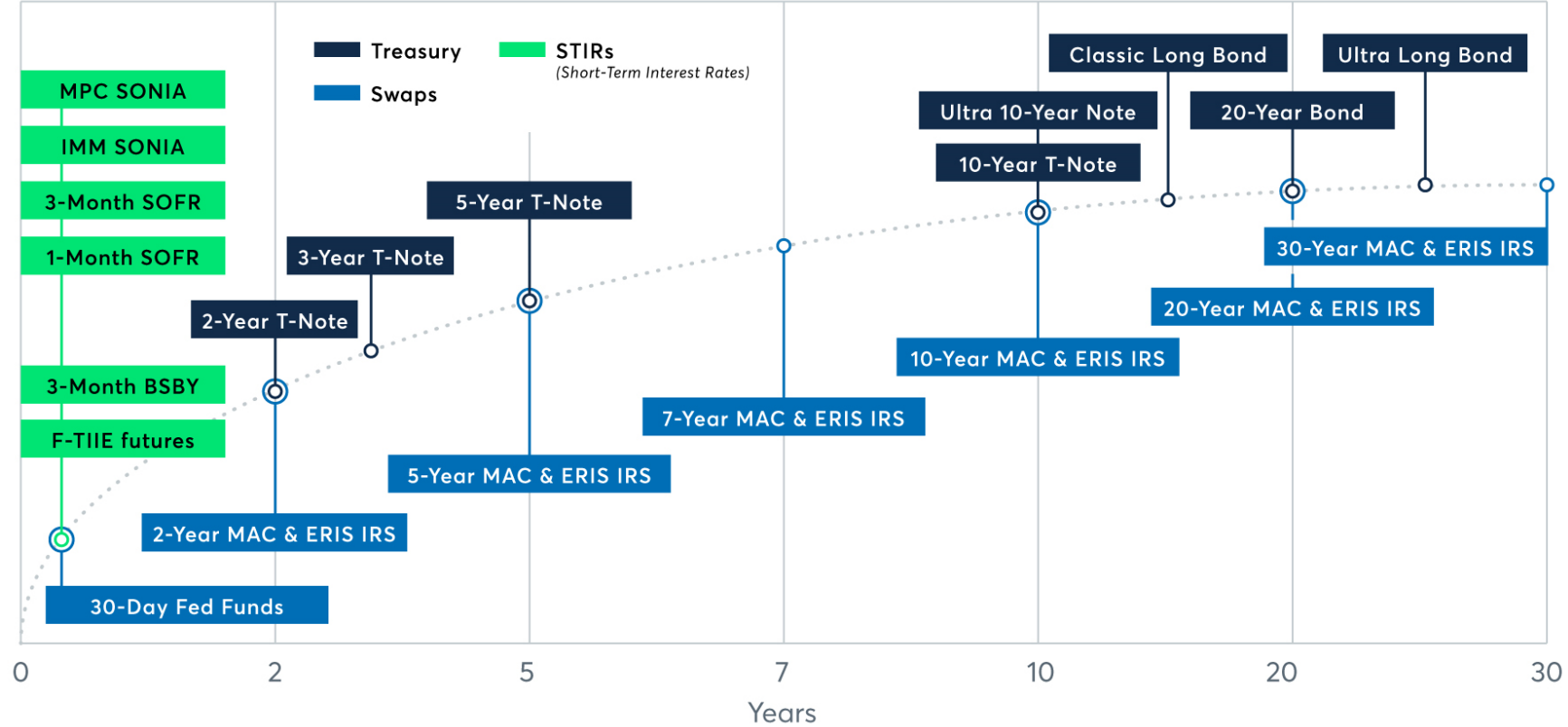
# 3-Month SOFR Packs

January 2023

# Disclaimer

Neither futures trading nor swaps trading are suitable for all investors, and each involves the risk of loss. Swaps trading should only be undertaken by investors who are Eligible Contract Participants (ECPs) within the meaning of Section 1a(18) of the Commodity Exchange Act. Futures and swaps each are leveraged investments and, because only a percentage of a contract's value is required to trade, it is possible to lose more than the amount of money deposited for either a futures or swaps position. Therefore, traders should only use funds that they can afford to lose without affecting their lifestyles and only a portion of those funds should be devoted to any one trade because traders cannot expect to profit on every trade. CME Group, the Globe Logo, CME, Globex, E-Mini, CME Direct, CME DataMine and Chicago Mercantile Exchange are trademarks of Chicago Mercantile Exchange Inc. CBOT is a trademark of the Board of Trade of the City of Chicago, Inc. NYMEX is a trademark of New York Mercantile Exchange, Inc. COMEX is a trademark of Commodity Exchange, Inc. All other trademarks are the property of their respective owners. The information within this communication has been compiled by CME Group for general purposes only. CME Group assumes no responsibility for any errors or omissions. Additionally, all examples in this communication are hypothetical situations, used for explanation purposes only, and should not be considered investment advice or the results of actual market experience. All matters pertaining to rules and specifications herein are made subject to and superseded by official CME, CBOT, NYMEX and COMEX rules. Current rules should be consulted in all cases concerning contract specifications. Copyright © 2023 CME Group Inc. All rights reserved

# Interest Rates Products



# 3-Month SOFR (SR3) Review

# What is an IMM quote?

Developed by IMM Division of CME in early 1970's converts a yield to a price.

---

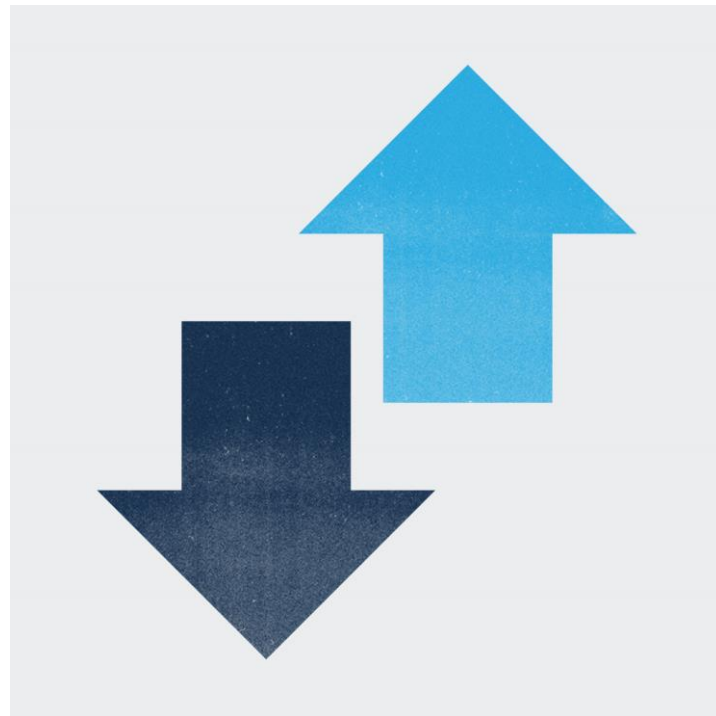
Designed to allow financial instruments that traditionally trade in yield to trade as a price, more like commodities.

---

Price moves inversely to yield, rates go up-price goes down:

$$100 - \text{yield} = \text{Price}$$

$$100 - 4.900 = 95.1000$$



# What is an IMM date?

Standard dates for expiration and settlement of certain CME Group futures contracts.

March 2023 IMM Dated Futures Contract Schedule						
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1	2	3	4
5	6	7	8	9	10	11
12	13 LTD: ED, FX, BSBY, & MAC Swaps March contracts	14 LTD: SR3 December 2022 Contract	15 Third Wednesday	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Last trading day (LTD) is generally the second London business day preceding the third Wednesday of a quarterly contract month.

For 3-month SOFR (SR3) it's one business day prior to 3rd Wednesday.

FX, ED, MAC Swap, SOFR and BSBY futures based on IMM Date schedule.

Calendar for illustrative purposes, go to [cmegroup.com](https://cmegroup.com) for more detailed expiration schedule

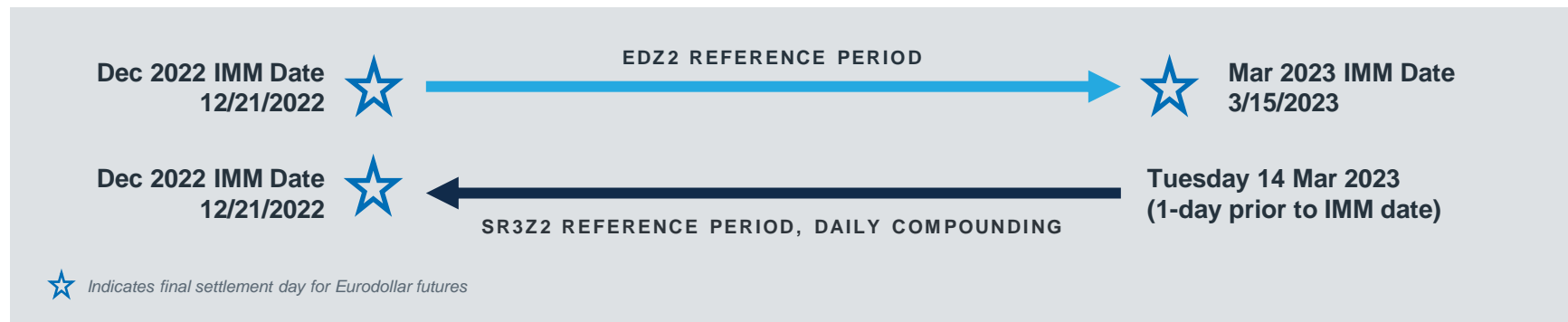
# 3-Month SOFR vs. ED futures

## Contract Months and Reference Periods

Due to the nature of their underlying rates, Eurodollar Futures are **forward looking** (using 3-month rates) while SOFR Futures are **backward looking** (using an overnight rate)

SOFR Futures are named so that each contract month's 3-month reference period begins at the same time of as the most relevant Eurodollar future

While the reference period is the same for both products, the final settlement date and last trade date differs



# Measuring Risk

## Basis point value (BPV)

Change in monetary value for  
1 basis point (0.01%) change  
in yield

.....

Often quoted in \$'s per \$1  
million face value of security

.....

Also known as “dollar value of  
01” (DV01), or “value of a  
basis point” (VBP)

DAYS	FACE VALUE			
	\$500,000	\$1 MM	\$5 MM	\$100 MM
1	\$0.14	\$0.28	\$1.39	\$27.78
7	\$0.97	\$1.94	\$9.72	\$194.44
30	\$4.17	\$8.33	<b>\$41.67</b>	\$833.33
60	\$8.33	\$16.67	\$83.33	\$1,666.67
90	\$12.50	<b>\$25.00</b>	\$125.00	\$2,500.00
180	\$25.00	\$50.00	\$250.00	\$5,000.00
270	\$37.50	\$75.00	\$375.00	\$7,500.00
360	\$50.00	\$100.00	\$500.00	\$10,000.00

# Eurodollar, SR3, and BSBY Futures

## BPV defines notional value (NV)

The BPV of Eurodollars, SR3 and BSBY contracts is constant, at **\$25.00**, regardless of where it sits on the curve.

---

### Contract Unit = \$2,500 x IMM Index

---

e.g. Eurodollar futures at IMM price = 99.8300

99.8300 x **\$2,500** = \$249,575.00 NV per contract

---

e.g. 3-Month SOFR futures at IMM price = 99.9450

99.9450 x **\$2,500** = \$249,862.50 NV per contract

---

e.g. 3-Month BSBY futures at IMM price = 99.8425

99.8425 x **\$2,500** = \$249,606.25 NV per contract

---

<https://www.cmegroup.com/education/files/amendments-whitepaper.pdf>

# STIRs Futures: Eurodollars, SR3, 3-Month BSBY

	3-MONTH EURODOLLARS	3-MONTH SOFR	3-MONTH BSBY
<b>Contract Unit</b>	\$2,500 x Contract IMM Index		
<b>Price Quotation</b>	Contract IMM Index = 100 minus R. R = the three-month London interbank offered rate for spot settlement on the 3 <sup>rd</sup> Wednesday of contract month (e.g. 2.0327% rate equals 97.9673).	Contract IMM Index = 100 minus R. R = compounded daily SOFR interest during contract reference quarter (e.g. 98.2354 IMM Index points signifies R = 1.7646% per annum).	Contract IMM Index = 100 minus R. R = three-month Bloomberg Short-Term Bank Yield Index (BSBY) on the second New York business day prior to the third Wednesday of the contract month
<b>Product Code</b>	CME Globex: GE CME ClearPort: ED Clearing: ED	CME Globex: SR3 CME ClearPort: SR3 Clearing: SR3	CME Globex: BSB CME ClearPort: BSB Clearing: BSB
<b>Minimum Price Increment</b>	Nearest expiring contract month: One quarter (1/4) of one basis point = 0.0025 price points = \$6.25 per contract. All other contract months: One half (1/2) of one basis point = 0.005 price points = \$12.50 per contract.	All contract months with four months or less until last day of trading = one quarter (1/4) of one basis point = 0.0025 price points = \$6.25 per contract. All other contract months: One half (1/2) of one basis point = 0.005 price points = \$12.50 per contract.	Nearby expiry: 0.0025 IMM Index points (0.25 basis point per annum) = \$6.25 per contract. All other expiries: 0.005 IMM Index points (0.5 basis points per annum) = \$12.50 per contract
<b>Termination of Trading (LTD)</b>	Second London business day before 3 <sup>rd</sup> Wednesday of the contract month. Trading in expiring futures terminates at 11:00 AM London time on the LTD.	LTD: exchange business day first preceding 3 <sup>rd</sup> Wednesday of delivery month. Trading in expiring futures shall terminate at the close of CME Globex trading on LTD.	Trading terminates at 8:00 a.m. ET, 2 business days prior to the 3 <sup>rd</sup> Wednesday of the contract month.
<b>Delivery</b>	Cash settled as IMM Index value against IBA 3-month LIBOR rate expressed to the 1/100 <sup>th</sup> of a basis point (fourth decimal) rounded. If 5 <sup>th</sup> digit is "5" round up.	Cash settlement, by reference to Final Settlement Price, on the first US government securities market business day following the LTD.	*see <a href="https://cmegroup.com">cmegroup.com</a> for details

See [cmegroup.com](https://cmegroup.com) for up to date contract specs

# SOFR Futures

## Three-Month contract (SR3)

**Final Settlement Price: Contract-grade IMM Index evaluated on the basis of realized SOFR values during the contract Reference Quarter:**

<b><math>R =</math></b>	<b><math>[ \prod_i \{1+(d_i/360)*(r_i/100)\} - 1 ] * (360/D) * 100</math></b>
<b><math>n =</math></b>	Number of US government securities market business days in the Reference Quarter
<b><math>i \sim</math></b>	Running variable indexing US government securities market days during the Reference Quarter
<b><math>\prod_{i=1...n}</math></b>	denotes the product of values indexed by the running variable, $i = 1, 2, \dots, n$ .
<b><math>r_i =</math></b>	SOFR value for $i^{th}$ US government securities market business day
<b><math>d_i =</math></b>	Number of calendar days to which $r_i$ applies
<b><math>D =</math></b>	$\sum_i d_i$ (i.e., number of calendar days in Reference Quarter)

# SOFR Futures

## Final settlement calculation for 3-Month SOFR futures, *In English*

**Final Settlement Price: Contract-grade IMM Index evaluated on the basis of realized SOFR values during the contract Reference Quarter:**

---

Taking the daily overnight SOFR and applying simple daily compounding math to arrive at the final value.

---

### **Simplified example:**

Day 1 = R = 1.435%, compound factor =  $[(1.435 / 100) * (1/360)] + 1 = 1.00003986$

Day 2 = R = 1.447%, CF =  $[(1.447 / 100) * (1/360)] + 1 = 1.00004019$

CF1 \* CF2 = 1.00008006

Two day compounded rate =  $(1.00008006 - 1) * 360/2 = 0.014410$ , or 1.441%

---

**Now imagine running this out over the roughly 91 days in a Reference Quarter.**

# SOFR Futures

## Final settlement calculation for 3-Month SOFR futures, June 2020, settled 15 Sep 2020

	A	B	C	D	E
1	Jun Three-Month SOFR				
2	Date	SOFR rate	Day Count	Interest Accum	
3	6/17/2020	0.09	1	1.00000250	Prior IMM Wednesday
4	6/18/2020	0.09	1	1.00000250	
5	6/19/2020	0.09	3	1.00000750	
6	6/22/2020	0.08	1	1.00000222	
7	6/23/2020	0.07	1	1.00000194	
62	9/10/2020	0.09	1	1.00000250	
63	9/11/2020	0.09	3	1.00000750	
64	9/14/2020	0.09	1	1.00000250	
65	9/15/2020	0.10	1	1.00000278	Tues before IMM Wednesday
66					
67					
68		Day Count & Rate:	91	0.0933	
69		Final Settlement:		99.9067	

Final compounded rate = 0.0933% = 100 – 0.0933 = 99.9067 final price

# SR3 Packs & Bundles

# 3-Month SOFR Packs and Bundles

Many hedging and trading strategies call for the purchase or sale of 3-month SOFR (SR3) futures in sequences of consecutive quarterly contract delivery months.

---

CME SR3 Packs and Bundles provide an alternative to cumbersome and potentially risky individual contract execution.

---

## Packs

A pack combination may comprise any sequence of four quarterlies along the term structure listed for trading. The most popular are those defined by their respective yearly color codes.

---

## Bundles

Similar to packs, bundles span integer multiples of four contracts. E.g. a two-year bundle contains one each of contracts for the nearest 8 quarterly delivery months.

# SR3 Packs and Bundles

slightly different than Eurodollars

**Bundle = buy/sell in consecutive deferred months**

- 1-, 2-, 3-, 4-, 5-, 6-, 7-, 8-, 9- & 10-year
- E.g., “red” bundle = 1st 8 quarterly futures

**Pack = buy/sell 4 consecutive quarterlies**

- E.g., “green” pack = 4 quarterlies 3 years out

**Quoted as the arithmetic average of the price levels of its constituent futures contracts.**

- minimum price increment for any SOFR pack or bundle will be 0.0025 IMM Index points

Year 1 – White
Year 2 – Red
Year 3 – Green
Year 4 – Blue
Year 5 – Gold
Year 6 – Purple
Year 7 – Orange
Year 8 – Pink
Year 9 – Silver
Year 10 – Copper

# SR3 Packs and Bundles

## Pricing mechanics

LEG MARKETS		BID	OFFER
SR3Z0	Dec-2020	99.170	99.175
SR3H1	Mar-2021	99.160	99.165
SR3M1	Jun-2021	99.140	99.145
SR3U1	Sep-2021	99.105	99.110
Average		99.14375	99.14875
STRATEGY MARKET		BID	OFFER
SR3 : 01Y Z0		99.1450	99.1475

SR3 packs and bundles trade in distinct central limit order books, separate and apart from the order books of their component contracts. Prices are neither implied into or out of the pack & bundle order books.

# SR3 Packs and Bundles

## pricing mechanics

As soon as a SOFR pack or bundle is transacted, CME Globex will assign prices to each of its constituent contracts. CME Globex will use SOFR contract price levels in place of net price changes versus corresponding previous daily settlement prices as per Eurodollar application.

---

**Consider an example based on table from previous slide. Assume buying the pack on bid side at 99.1450.**

Assignment of prices to the four constituent SOFR contracts starts with CME Globex evaluating each of the four futures at their respective C-Last prices.

---

Assume these C-Last prices are:  **$99.175 + 99.165 + 99.140 + 99.110 = 396.59$** .

The total budget of the C-Last price inputs = 396.59 while the traded budget was  $4 \times 99.145 = 396.58$ .

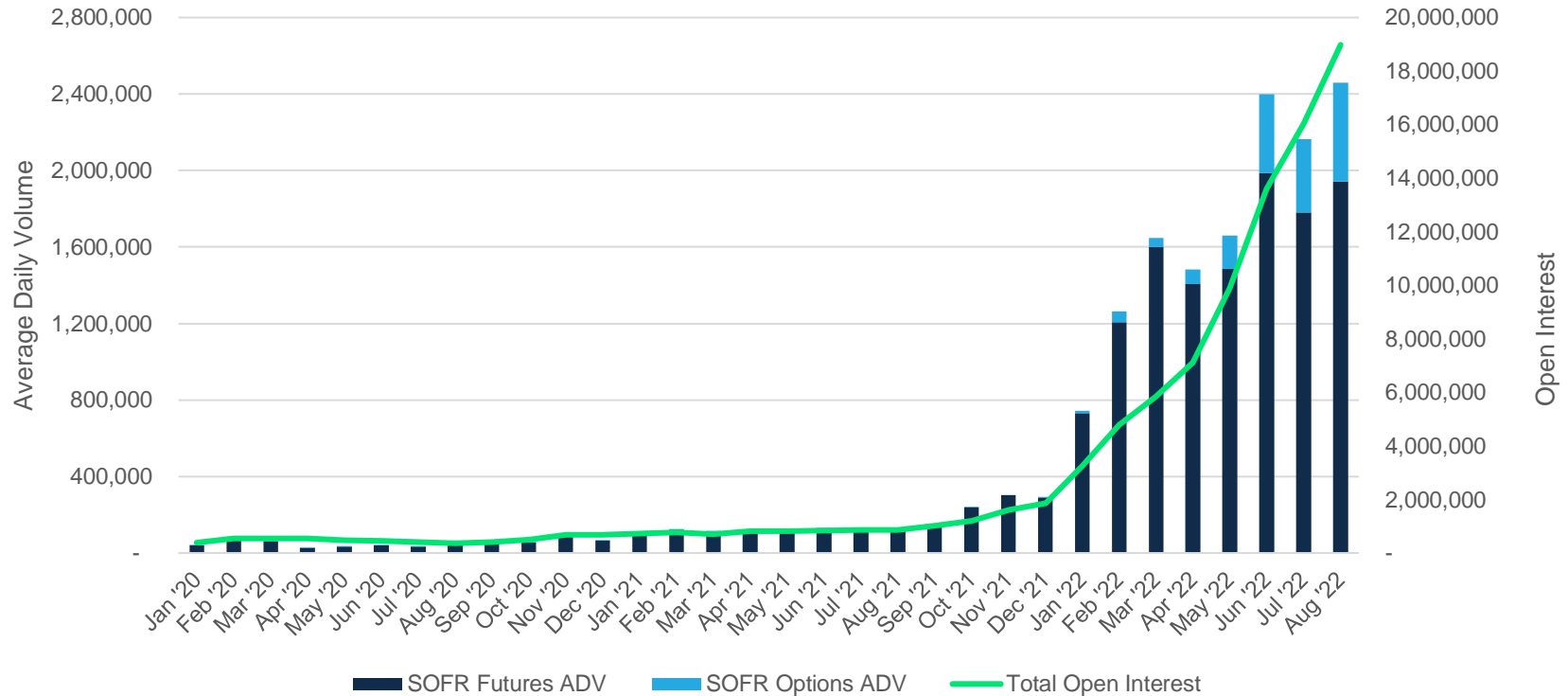
---

Therefore, CME Globex will adjust two of the four component futures prices by the contract minimum increment (0.005 price points) resulting in the correct contract pricing assignment for the trade.  **$99.175 + 99.165 + 99.135 + 99.105 = 396.58$** .

---

The price adjustment is applied to the contracts with the most remote delivery dates.

## SOFR futures and options ADV and OI

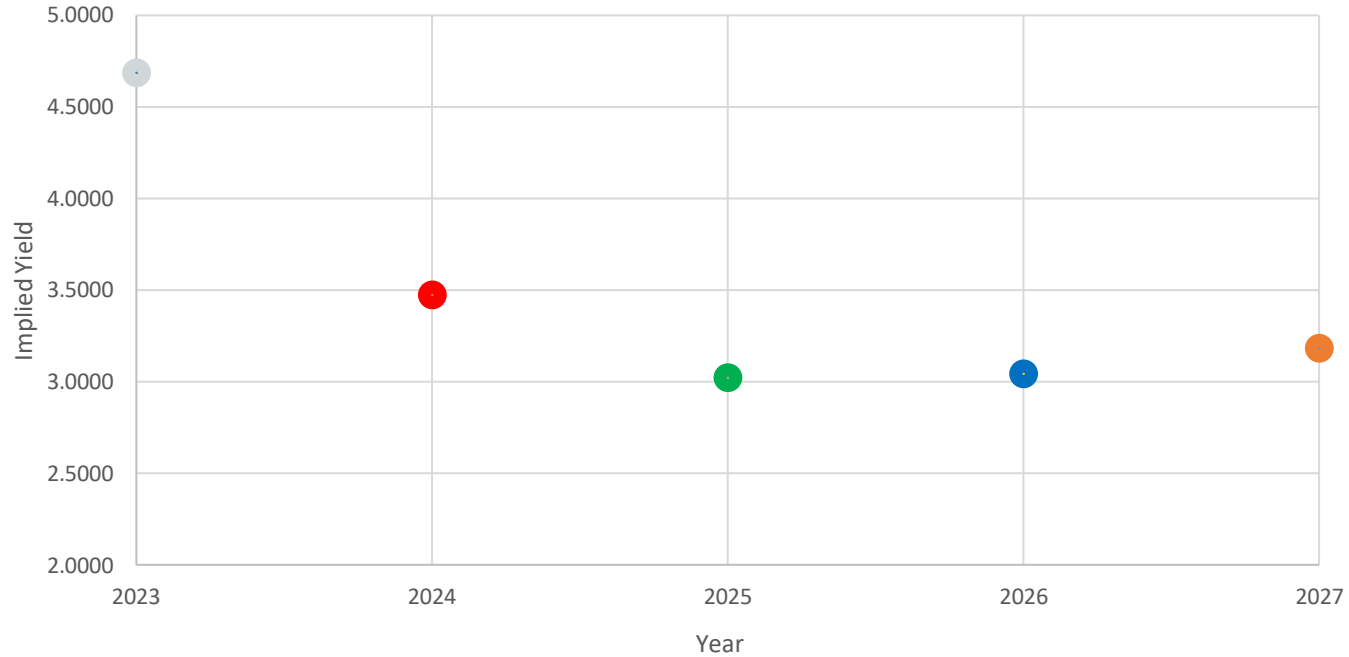


Source: CME Group

# Trading SR3 Packs

Examples of possible strategies

# 3-Month SOFR Packs



Data source: Bloomberg, 20 December 2022 settlements

# SR3 Packs on CME Direct

## SR3 Pack by Color Code and Lead Month

## Pack Price Quotation, ¼ basis point spread

- SOFR Packs																			
x	SR3	3-Month SOFR Future	Mar23 Pack	Open	+	13	H	95.3250	95.3275	L	2	□	↑ 95.3250	+0.0425	95.2825	95.3650	95.2100	14,468	
x	SR3	3-Month SOFR Future	Jun23 Pack	Open	+	8	H	95.5900	95.6025	L	3	□			95.5425				
x	SR3	3-Month SOFR Future	Sep23 Pack	Open	+	3	H	95.9875	96.0025	L	8	□			95.9225				
x	SR3	3-Month SOFR Future	Dec23 Pack	Open	+	6	H	96.4125	96.4250	L	11	□			96.3275				
x	SR3	3-Month SOFR Future	Mar24 Pack	Open	+	4	H	96.7775	96.7800	L	5	□	↓ 96.7775	+0.1025	96.6750	96.8100	96.5575	14,577	
x	SR3	3-Month SOFR Future	Jun24 Pack	Open	+	8	H	97.0125	97.0275	L	3	□			96.9125				
x	SR3	3-Month SOFR Future	Sep24 Pack	Open	+	8	H	97.1500	97.1650	L	3	□			97.0475				
x	SR3	3-Month SOFR Future	Dec24 Pack	Open	+	3	H	97.2200	97.2375	L	8	□	97.1225	+0.0125	97.1100	97.1225	97.1225	10	
x	SR3	3-Month SOFR Future	Mar25 Pack	Open	+	12	H	97.2650	97.2675	L	12	□	↓ 97.2650	+0.1275	97.1375	97.2825	97.0850	8,564	
x	SR3	3-Month SOFR Future	Jun25 Pack	Open	+	8	H	97.2700	97.2875	L	3	□			97.1500				
x	SR3	3-Month SOFR Future	Sep25 Pack	Open	+	8	H	97.2725	97.2900	L	5	□			97.1475				
x	SR3	3-Month SOFR Future	Dec25 Pack	Open	+	3	H	97.2500	97.2900	L	3	□	97.1500	+0.0150	97.1350	97.1500	97.1500	30	
x	SR3	3-Month SOFR Future	Mar26 Pack	Open	+	8	H	97.2525	97.2550	L	3	□	↑ 97.2525	+0.1400	97.1125	97.2700	97.0825	4,714	
x	SR3	3-Month SOFR Future	Jun26 Pack	Open	+	3	H	97.2075	97.2525	L	3	□			97.0875				

Bid

Offer

# SR3 Packs on CME Direct

Front (White) Pack versus Red, Green, Blue, and Gold Packs.

+ 3-Month SOFR Future														
x	SR3	3-Month SOFR Future	Mar23/Mar24 Pack Spread	Open	+	1	Ⓜ	-1.3750	-1.3700	Ⓜ	1	□		P -1.3425
x	SR3	3-Month SOFR Future	Mar23/Mar25 Pack Spread	Open	+	2	Ⓜ	-1.8475	-1.8400	Ⓜ	10	□		P -1.8500
x	SR3	3-Month SOFR Future	Mar23/Mar26 Pack Spread	Open	+	2	Ⓜ	-1.8225	-1.8150	Ⓜ	3	□		P -1.8425
x	SR3	3-Month SOFR Future	Mar23/Mar27 Pack Spread	Open	+	2	Ⓜ	-1.7050	-1.6975	Ⓜ	1	□		P -1.7300

Bid / Offer as Pack spreads.

# SR3 Pack Spreads



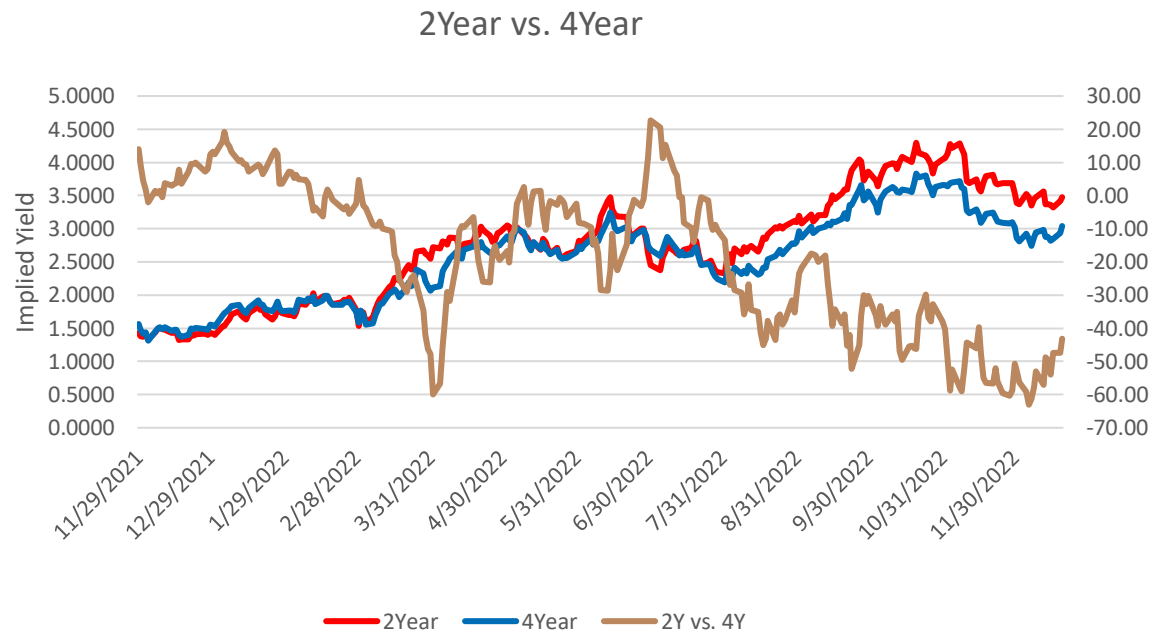
Data source: Bloomberg, 20 December 2022 settlements

# SR3 Pack Spreads



Data source: Bloomberg, 20 December 2022 settlements

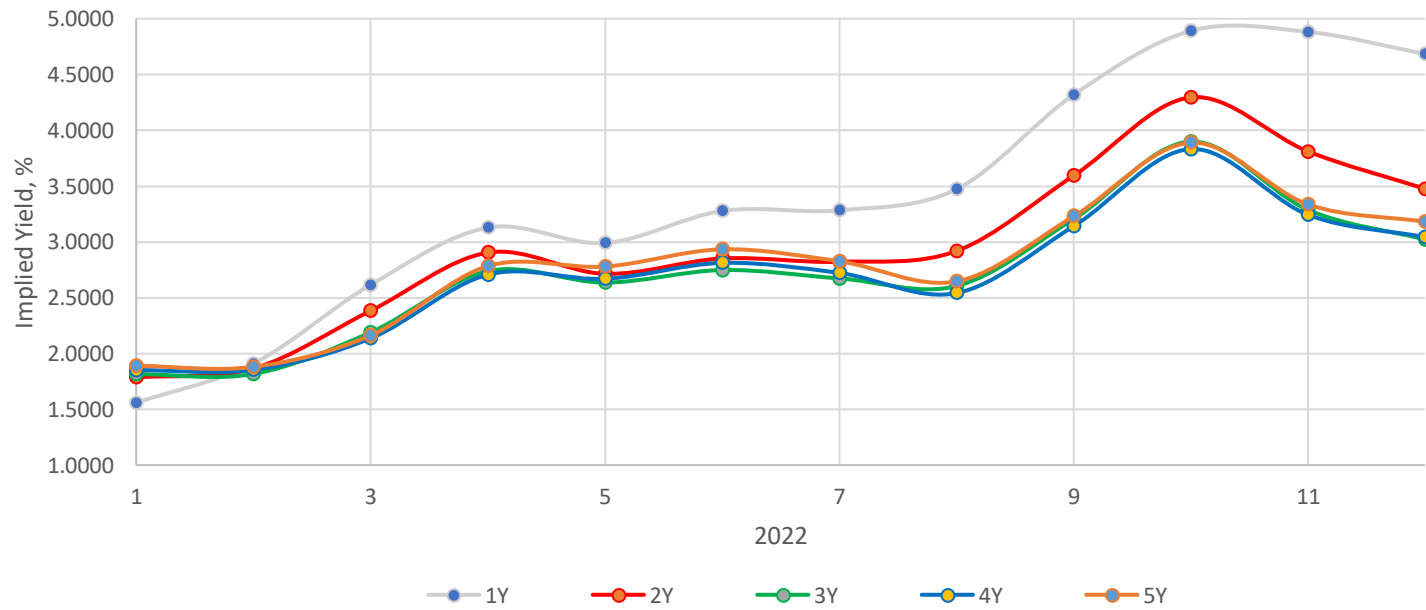
# SR3 Pack Spreads



Data source: Bloomberg, 20 December 2022 settlements

# SR3 Pack Curves

## 3-Month SOFR Packs



Source: Bloomberg

# Questions?

# CME Institute

CME Institute is your place to learn more about futures and options markets.

We have a variety of free online classes, resources, trading simulators, and other tools to help you sharpen your skills and deepen your knowledge of our markets.

Visit [cmegroup.com/education](https://cmegroup.com/education)



# David Gibbs

Director

Education

+1 312 207 2591

David.Gibbs@cmegroup.com



[linkedin.com/in/davidbgibbs/](https://www.linkedin.com/in/davidbgibbs/)

 CME Group