

European Overnight Index futures final settlement calculation

CME Group is launching short-term Interest Rate futures based on the Euro Short-Term Rate (€STR) and on RepoFunds Rates.* Initial listing will consist of eight full quarterly contracts, two serial contracts and three contract that will be in accrual, meaning that they have less than three months to final expiry.

In addition to outright Overnight Index contracts, CME Group will list single contract spread futures linking the underlying overnight index rates to the applicable primary reference rate in the country or region of origin; in this case, EURIBOR.

Later, both outright and spread futures based on the RFR rates of Germany and Italy will be listed for trading during Q4 2022. This note will expound on the settlement calculation of outright futures, applicable to both €STR and RFR futures, though using €STR for examples. A further paper will detail the settlement and assignment process that underpins Single Contract Spread futures.

3M European Overnight Index Futures Final Settlement

The final settlement price for an expiring 3M €STR futures contract is 100 minus the €STR benchmark rate, compounded over the contract's Reference Quarter. The Reference Quarter for 3M €STR futures is the interval from the third Wednesday (inclusive) of the month three months prior to the delivery month, to the third Wednesday (exclusive) of the delivery month.

The definitions below make this more precise: Exhibit 1 provides a breakdown of the calculation methodology for the 3-month €STR futures calculation period.

EXHIBIT 1 – SAMPLE CALCULATION

FINAL SETTLEMENT PRICE = 100 - R	
R	$[\prod_i \{1+(d_i/360)*(r_i/100)\} - 1] \times (360/D) \times 100$
N	Number of TARGET securities market business days in the Reference Period
i	Running variable indexing TARGET market business days during Reference Period
\prod_i	Capital pi (\prod) indicates the terms of the series should be compounded. It is the product of values indexed by the running variable, $i=1,2,\dots,n$.
r_i	€STR value for ith TARGET market business day
d_i	Number of calendar days to which r_i applies
D	$\sum_i d_i$ (i.e., number of calendar days in Reference Quarter)

*Pending regulatory review

The following examples highlight three hypothetical instances in which a non-business day results in a period of accrued simple interest, but no compounding:

EXHIBIT 2 –EXAMPLES

WEEKEND	THURSDAY	FRIDAY	SATURDAY	SUNDAY	MONDAY
May 2022	19	20	21	22	23
€STR benchmark rate (r_i^*)	-0.585	-0.585	nr	nr	-0.586
Days in period (d_i)	1	3	Weekend	Weekend	1
$[1+(d_i/360)*(r_i/100)]$	0.99998	0.99995			0.99998

MID-WEEK HOLIDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
December 2019	30	31	1	2	3
€STR benchmark rate (r_i^*)	-0.531	-0.541	nr	-0.537	-0.539
Days in period (d_i)	1	2	New Year's Day	1	1
$[1+(d_i/360)*(r_i/100)]$	0.99999	0.99998		0.99999	0.99999

LONG WEEKEND	THURSDAY	FRIDAY	SATURDAY	SUNDAY	MONDAY	TUESDAY
April 2022	14	15	16	17	18	19
€STR benchmark rate (r_i^*)	-0.586	nr	nr	nr	nr	-0.58
Days in period (d_i)	5	Good Friday	Weekend	Weekend	Easter Monday	1
$[1+(d_i/360)*(r_i/100)]$	0.99992					0.99998

*Example rate for educational purposes only

nr = no rate published

The Exchange will compute an expiring contract's final settlement price on the morning after the contract's last trading day, when the benchmark €STR or RFR rate for the last day of the contract's Reference Quarter becomes available. The final settlement price is computed so that the value of R is rounded to the nearest 1/1,000th of a percentage point (i.e., the nearest 1/100th of one basis point, or 0.0001 percent per annum). In the case of a tie (a rate that ends with 0.00005 in percent per annum terms) the value of R will be rounded up.

As the outright quarterly European Overnight Index futures final settlement will reference the realized compounded daily values of the underlying benchmark over a forward-looking three-month period between two IMM dates, **the month symbol in the code will reference the beginning of the calculation period, not the month for final settlement. The final settlement month will be three months after the month referenced in the contract code.**

Exhibit 3 presents a sample calculation of the final settlement for the hypothetical March 2022 €STR futures contract.

EXHIBIT 3—FINAL SETTLEMENT €STR FUTURES MARCH 2022

DATE	RFR	DAY COUNT	DIAF ¹
3/16/2022	-0.577	1	0.9999839722
3/17/2022	-0.578	1	0.9999839444
3/18/2022	-0.578	3	0.9999518333
3/21/2022	-0.578	1	0.9999839444
3/22/2022	-0.578	1	0.9999839444
3/23/2022	-0.578	1	0.9999839444
3/24/2022	-0.579	1	0.9999839167
3/25/2022	-0.581	3	0.9999515833
3/28/2022	-0.58	1	0.9999838889
3/29/2022	-0.579	1	0.9999839167
3/30/2022	-0.579	1	0.9999839167
3/31/2022	-0.593	1	0.9999835278
4/1/2022	-0.582	3	0.9999515000
4/4/2022	-0.585	1	0.9999837500
4/5/2022	-0.586	1	0.9999837222
4/6/2022	-0.584	1	0.9999837778
4/7/2022	-0.582	1	0.9999838333
4/8/2022	-0.583	3	0.9999514167
4/11/2022	-0.584	1	0.9999837778
4/12/2022	-0.583	1	0.9999838056
4/13/2022	-0.585	1	0.9999837500
4/14/2022	-0.586	5	0.9999186111
4/19/2022	-0.58	1	0.9999838889
4/20/2022	-0.583	1	0.9999838056
4/21/2022	-0.585	1	0.9999837500
4/22/2022	-0.583	3	0.9999514167
4/25/2022	-0.585	1	0.9999837500
4/26/2022	-0.582	1	0.9999838333
4/27/2022	-0.583	1	0.9999838056
4/28/2022	-0.583	1	0.9999838056
4/29/2022	-0.586	3	0.9999511667
5/2/2022	-0.583	1	0.9999838056
5/3/2022	-0.579	1	0.9999839167
5/4/2022	-0.585	1	0.9999837500
5/5/2022	-0.585	1	0.9999837500

DATE	RFR	DAY COUNT	DIAF ¹
5/6/2022	-0.585	3	0.9999512500
5/9/2022	-0.586	1	0.9999837222
5/10/2022	-0.584	1	0.9999837778
5/11/2022	-0.584	1	0.9999837778
5/12/2022	-0.577	1	0.9999839722
5/13/2022	-0.586	3	0.9999511667
5/16/2022	-0.585	1	0.9999837500
5/17/2022	-0.585	1	0.9999837500
5/18/2022	-0.585	1	0.9999837500
5/19/2022	-0.585	1	0.9999837500
5/20/2022	-0.585	3	0.9999512500
5/23/2022	-0.586	1	0.9999837222
5/24/2022	-0.587	1	0.9999836944
5/25/2022	-0.587	1	0.9999836944
5/26/2022	-0.59	1	0.9999836111
5/27/2022	-0.585	3	0.9999512500
5/30/2022	-0.586	1	0.9999837222
5/31/2022	-0.589	1	0.9999836389
6/1/2022	-0.582	1	0.9999838333
6/2/2022	-0.585	1	0.9999837500
6/3/2022	-0.587	3	0.9999510833
6/6/2022	-0.59	1	0.9999836111
6/7/2022	-0.583	1	0.9999838056
6/8/2022	-0.582	1	0.9999838333
6/9/2022	-0.582	1	0.9999838333
6/10/2022	-0.581	3	0.9999515833
6/13/2022	-0.58	1	0.9999838889
6/14/2022	-0.578	1	0.9999839444

CAPITAL PI TERM	0.99853
ANNUALIZED (SUBTRACT 1 MULTIPLY BY 360/91)	-0.00583
COMPOUNDED RFR RATE:	-0.58304%
ROUNDED TO NEAREST 1/100 BP:	-0.58300%
CONTRACT SETTLEMENT:	100.5830

¹ Daily Interest Accumulation Factor = $\{1+(\text{Day Count}/360) * \text{€STR in \%}\}$ or $\{1+(di/360)*(ri/100)\}$ from the calculation formula

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