

Implied Intercommodity Ratio Spreads

[Implied](#) intercommodity ratio spreads are available for specific agricultural, energy, and interest rate products. For these products, outright orders in the leg markets will create implied intercommodity spread orders and, conversely, intercommodity spread orders create implied orders in each component leg market. Implied bids and offers become eligible quotes but are not disseminated in market data. Trades only match at the fixed ratio of contracts defined per product. Implied bids are rounded down to the nearest tick and implied offers are rounded up the nearest tick.

- Outright orders in the leg markets will create implied intercommodity spread orders.
 - Trades only matching at the fixed ratio of contracts. Implied bids are rounded down to the nearest tick and implied offers are rounded up the nearest tick.
 - Explicit intercommodity spread orders entered into CME Globex create implied orders in each component leg market. Implied bids and offers become eligible quotes but are not disseminated in market data.
 - Implied eligibility is indicated in the [MDP 3.0 - Security Definition](#) with tag 871-IntAttribType=24 (eligible) and tag 872-InstAttribValue=19 (implied eligible)
- [Agricultural Products - Soybean Crush Spread](#)
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For additional information, see:

- [Implied Functionality](#)
- [Security Definition for Implied Intercommodity Ratio Spreads](#)

Agricultural Products - Soybean Crush Spread

The soybean crush spread represents the price differential between the raw soybean product and the yield of its two processed products, i.e., the processing margin. The fixed ratio per leg represents the amount of soybean oil and soybean meal that can be obtained from the given amount of raw soybeans. The soybean crush has two configurations:

- Soybeans +10 / Bean Oil -9 / Bean Meal -11
- Soybeans +10 / Bean Oil -9 / Bean Meal -11/ Soybean Crush Combo +1 (option against the underlying legs)

The crush margin is calculated as follows.

Ratio	10	11	9			
Margin	3500	2000	1500	Total	90% Credit	Margin
RatioxMargin	35000	22000	13500	63450	7050	7050

Energy Products - Crack Spread

The term 'crack spread' derives from the refining process which "cracks" crude oil into its constituent products. The crack spread, or theoretical refining margin, is quoted in dollars per barrel. To obtain it, the combined value of gasoline and heating oil must first be calculated. This value is then compared to the price of crude. Since crude oil is quoted in dollars per barrel and the products are quoted in cents per gallon, heating oil and gasoline prices must be converted to dollars per barrel by multiplying the cents-per-gallon price by 42 (there are 42 gallons in a barrel). If the combined value of the products is higher than the price of the crude, the gross cracking margin is positive. Conversely, if the combined value of the products is less than that of crude, then the gross cracking margin is negative. This sum is then divided by the number of barrels of crude to reduce the spread value to a per-barrel figure.

Crack 1:1 Pricing

Pricing for the 1:1 Crack spread is calculated: Crack Spread Price = [(42 * Leg 1)/100] – Leg 2.

- An arriving Crack spread order may fill at the entered price or at a fractionally better price than that at which it was entered.
- A resting Crack order can trade at a fractionally better price than that at which it was entered.
- Even if traded at fractionally better prices, market data messages for resting Crack spread orders are generated at the resting price.
- For display purposes in the Last Best Price and Trade messages, the following rules apply on all arriving Crack Spread orders:
 - Market data for arriving offers is sent at a price rounded down to the next whole price from the traded price.
 - Market data for arriving bids is sent at a price rounded up to the next whole price from the traded price.
- Execution Report – Fill messages are generated at the actual fractional price.

Last traded price most recent in Leg 1

1. The spread is CL:C1 HO-CL U1, traded at a price of 105.
2. The last traded price in Leg 1 for HOU1 is the most recent, with a price of 14890.
3. CME Globex applies the rounding rule and assigns a price of 14900 to Leg 1.
4. CME Globex determines Leg 2 with the following calculation:

- Leg 2 = $[(\text{Leg 1} * 42)/100 - \text{Crack Price}]$
 - $\text{CLU1} = (42 * 14900)/100 - 105$
 - $\text{CLU1} = 6258 - 105$
 - $\text{CLU1} = 6153$

Last traded price most recent in Leg 2

1. The spread is CL:C1 HO-CL U1, traded at a price of 105.
2. The last traded price in Leg 2 for CLU1 is the most recent, at a price of 6147.
3. Since the last traded price is most recent in Leg 2, CME Globex determines Leg 1 with the following calculation:

- Leg 1 = $[(\text{Crack Price} + \text{Leg 2}) * 100]/42$
 - $\text{HOU1} = [(105 + 6147) * 100]/42$
 - $\text{HOU1} = 625200/42$
 - $\text{HOU1} = 14885.714$

4. CME Globex uses the rounding rule for Leg 1 and assigns a price of 14900.

5. CME Globex determines Leg 2 with the following calculation:

- Leg 2 = $[(\text{Leg 1} * 42)/100 - \text{Crack Price}]$
 - $\text{CLU1} = (42 * 14900)/100 - 105$
 - $\text{CLU1} = 6258 - 105$
 - $\text{CLU1} = 6153$

Rules for Determining Implied 1:1 Crack Spread Prices

Due to the tick value differentials, implied pricing on 1:1 Crack spreads have specific rules for displayed prices and traded prices.

- Implied IN orders are disseminated for 1:1 Crack spreads.
- Implied OUT orders are not disseminated for 1:1 Crack spreads.

Implied INs

Implied "IN" quotes are created by calculating the price of a spread based on resting Bids and Offers in the outright futures contracts involved in the spread. Crack 1:1 implied IN spreads trade in fractional (non-standard) prices, but display at whole prices.

The calculations for implied prices are the same as spread pricing rules ($\text{Crack Spread Price} = [(42 * \text{Leg 1})/100] - \text{Leg 2}$).

- Implied Bid prices always round down for display.
- Implied Offer prices always round up for display.

Implied IN Bid Rounding

1. There is a Bid in HOU1 = 14890
2. There is an Ask in HOU1 = 6147
3. This creates an Implied Bid in the Crack 1:1 spread for HO-CL at 106

- $\text{CL:C1 HO-CL U1} = [(14890 * 42)/100] - 6147$
- $\text{CL:C1 HO-CL U1} = 106.8$
- Round the Implied Bid down for display = 106

Implied IN Offer Rounding

1. There is an Ask in HOU1 = 14890
2. There is a Bid in CLU1 = 6147
3. This creates an Implied Offer in the Crack 1:1 spread for HO-CL at 107

- $\text{CL:C1 HO-CL U1} = [(14890 * 42)/100] - 6147$
- $\text{CL:C1 HO-CL U1} = 106.8$
- Round the Implied Offer up for display = 107

Trades with Implied "IN" Crack Spreads generate executions to users at actual traded prices.

Execution Messages for Trade against Implied IN

Arriving order to Sell at a price of 106 in the Crack 1:1 HO-CL spread:

- Execution Report (tag 35-MessageType = 8):
 - Sold CL:C1 HO-CL U1 @ 106.8

- Sold HOU1 @ 14890
- Bought CLU1 @ 6147
- Execution Report (tag 35-MsgType = 8):
 - Bought HOU1 @ 14890
- Execution Report (tag 35-MsgType = 8):
 - Sold CLU1 @ 6147

Last Traded Price and the Trade market data messages are generated for the Crack spread.

Last Traded Price and Trade market data messages are also sent for the individual legs of the Crack spread.

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Implied OUTs

Implied "OUT" quotes are created by calculating the price of a leg due to resting Bids or Offers in the other outright futures contract and the actual resting bid or offer in the Crack spread.

Implied OUTs in the Crack 1:1 spreads do not display but do trade. Implied OUT orders are only generated (never displayed) at whole tick prices as follows:

- Bids always round lower to the next whole price.
- Offers always round higher to the next whole price.

Implied OUT orders never trade at fractional prices. The rounded price is assigned to the arriving leg and the actual price to the resting leg; CME Globex adjusts the Crack spread accordingly.

Implied OUT Bid Rounding

1. There is a Bid in HOU1 = 14890
2. There is an Ask in the Crack 1:1 spread for HO-CL at a price of 105
3. CL:C1 HO-CL U1 = 105
4. This creates a non-disseminated Implied Bid in CLU1 at 6148
 - $CLU1 = [(14890 * 42) / 100] - 105$
 - $CLU1 = 6148.8$
 - Round the Implied Bid down to a price of 6148
5. The order will work at a price of 6148, but is not disseminated since it is an Implied OUT order.

Implied OUT Offer Rounding

1. There is an Offer in HOU1 = 14890
2. There is a Bid in the Crack 1:1 spread for HO-CL at a price of 105
3. CL:C1 HO-CL U1 = 105
4. This creates a non-disseminated Implied Offer in CLU1 at 6149
 - $CLU1 = [(14890 * 42) / 100] - 105$
 - $CLU1 = 6148.8$
 - Round the Implied Offer up to a price of 6149
5. This order will work at a price of as 6149, but is not disseminated since it is an Implied OUT order.

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Crack 1:1 Implied Examples

1 - Generation of implied OUT bid in distillate (Gasoline - RT).

B / S	Qty	Instrument Code	Price
Buy	5	CL:C1 RT-CL U1	1078
Buy	4	CLU1	6200
Creates the following implied Bid			
(I) Bid	4	RTU1	17328
Price calculates to 17328.5714..., but is created at 17328 (not displayed)			

2 - Generation of implied "OUT" offer in distillate (Gasoline - RT).

B / S	Qty	Instrument Code	Price
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Sell	5	CL:C1 RT-CL U1	1078
Sell	4	CLU1	6200
Creates the following implied Offer			
(I) Offer	4	RTU1	17329
Price calculates to 17328.5714... but is created at 17329 (not displayed)			

3 - Generation of implied "OUT" bid in Crude Oil – CL.

B / S	Qty	Instrument Code	Price
Sell	5	CL:C1 RT-CL U1	1078
Buy	4	RTU1	17330
Creates the following implied Bid			
(I) Bid	4	CLU1	6200
Price calculates to 6200.6 but is created at 6200 (not displayed)			

4 - Generation of implied "OUT" offer in Crude Oil – CL.

B / S	Qty	Instrument Code	Price
Buy	5	CL:C1 RT-CL U1	1078
Sell	4	RTU1	17330
Creates the following implied Offer			
(I) Offer	4	CLU1	6201
Price calculates to 6200.6 but is created at 6201 (not displayed)			

5 - Generation of implied "IN" bid in Crack Spread.

B / S	Qty	Instrument Code	Price
Buy	5	RTU1	17330
Sell	4	CLU1	6200
Creates the following implied Bid			
(I) Bid	4	CL:C1 RT-CL U1	1078
Price created at 1078.6 but is displayed at 1078			

6 - Generation of implied "IN" offer in Crack Spread.

B / S	Qty	Instrument Code	Price
Sell	5	RTU1	17330
Buy	4	CLU1	6200
Creates the following implied Offer			
(I) Offer	4	CL:C1 RT-CL U1	1079
Price created at 1078.6 but is displayed at 1079			

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Examples of Crack Spread Trades with Adjusted Display Prices

Example A

Arriving Bid	Resting Offers - Display Price	Customer Order Prices
2 – 628	626 – 1	625.5 (i)
	627 – 1	626.5 (i)

The following matches take place against the Arriving Bid:

1 trade @ 625.5

1 trade @ 626.5

In the above scenario, the Arriving Order is filled at a fractionally better price than that displayed, using the rounded traded price and not the arriving price.

Example B

Arriving Bid	Resting Offers - Display Price	Customer Order Prices
2 – 627	626 – 1	626
	627 – 2	1 implied at 626.5 and 1 customer order at 627

The following matches will take place against the Arriving Bid:

1 trade @ 626 with customer order

1 trade @ 626.5 with implied order

In the above scenario, the Arriving Order will get filled at a fractionally better price than what has been displayed, since the implied order is for a price of 626.5, it has been rounded up for market data but will trade with the customer price.

Example C

Arriving Bid	Resting Offers - Display Price	Customer Order Prices
3 – 627	626 – 1	626
	627 – 1	626.5 (i)
	627 – 1	627
	627 – 1	627 (i)

The following matches will take place against the Arriving Bid:

1 trade @ 626 with customer order

1 trade @ 626.5 with implied order

1 trade @ 627 with customer order

In this scenario, the Arriving Order will get filled at a fractionally better price than what has been displayed, since the implied order is for a price of 626.5, it has been rounded up for market data but will trade with the customer price. Also, since there are two orders at 627, the trade will occur with the customer order and not the implied; it is only when the implied orders are at a better price level that they can match before a customer order.

Example D

Arriving Bid	Resting Offers - Display Price	Customer Order Prices
2 – 627	627 – 1	626.5 (i)
(Resting) 1 – 626	627 – 1	627
	627 – 1	627 (i)

The following matches will take place against the Arriving Bid:

1 trade @ 626.5 with implied order

1 trade @ 627 with customer order

In this scenario, the Arriving Order will get filled at a fractionally better price than what has been displayed, since the implied order is for a price of 626.5, it has been rounded up for market data but will trade with the customer price. The resting order of 626 will not be able to match with the implied order, since this is really at a better price of 626.5. Both the bid at 626 and the offer at 627 will remain on the book after this trade.

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Interest Rate Products

For treasury products, the intercommodity ratio spread represents the volatility differential between short term and long term interest rate products. The Note over Bond (NOB) for example, spreads ten-year U.S. Treasury Notes against thirty-year U.S. Treasury Bonds at a ratio determined on a quarterly basis.

Implied Pricing

Treasury Spread prices are expressed in terms of each leg's net change from the previous trade date settlement price.

Daily settlement prices for each leg are determined at 2:00 pm CT for every trade date. Treasury ICS prices are then reset during the 4:00-4:45 pm CT CME Globex maintenance window using the 2 pm settlement prices as "0" for each leg in the new session.

When trading begins again at 5:00 pm CT for the following business day, Treasury ICS prices are displayed in terms of net change from the 2:00 pm settlement price.

The following example illustrates how implied prices are derived for Treasury ICS.

Example: Outright Trade – Treasury Market ICS

Current Market

TUT 16600 H8 (2 Year U.S. Treasury Future (ZT) v 10 Year U.S. Treasury Future (ZN))

Bid Qty	Bid Price	Offer Price	Offer Qty
1	-0'020	-0'010	6

Assumptions

- TUT: 2 Year U.S. Treasury Future (ZT) v 10 Year U.S. Treasury Future (ZN)
- TUT Spread Ratio = 1.6600
- Defined ratio = 10:6
- Settlement for ZT = 106'060
- Settlement for ZN = 115'295
- Arriving order on TUT 1660 H8, 1 qty bid @ -0'010

Leg Pricing

Treasury Market ICS Trade Price = -0'010

Leg 2 Price = Leg 2 Settle @115'295

Solve for Leg 1 Price

Treasury Market ICS Price = (Leg 1 Price – Leg 1 Settlement) – ((Leg 2 Price – Leg 2 Settlement) / Ratio))

-0'010 = (Leg 1 Price – 106'060) – ((115'295 – 115'295) / 1.6600)

-0'010 = Leg 1 Price – 106'060

Leg 1 Price = 106'060 – 0'010 = 106'050

Leg Quantity

Treasury Market ICS Qty = 1

Leg 1 Qty = 10

Leg 2 Qty = 6

Implied In Trade -- Treasury Market ICS Source

Current Market

ZTH8 (2 Year U.S. Treasury Future)

Bid Qty	Bid Price	Offer Price	Offer Qty
100	106'090		

ZNH8 (10 Year U.S. Treasury Future)

Bid Qty	Bid Price	Offer Price	Offer Qty

		116'125	100
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TUT 16600 H8 (2 Year U.S. Treasure Future (ZT) v 10 Year U.S. Treasure Future (ZN))

Bid Qty	Bid Price	Offer Price	Offer Qty
10	-0'010		

Assumptions

- TUT Spread Ratio = 1.6600
- Defined Ratio = 10:6
- Settlement for ZT = 106'060
- Settlement for ZN = 116'060
- Implied Bid in the TUT 16600 H8
 - Treasury Market ICS = (Leg 1 Price – Leg 1 Settlement) – ((Leg 2 Price – Leg 2 Settlement) / Ratio))
- Treasury Market ICS = (106'090 – 106'060) – ((116'125 – 116'060) / 1.6600)
- Treasury Market ICS = 0'030 – (0'065 / 1.6600)
- Converted to decimals = 0.0937500 – (0.2031250 / 1.6600)
- Treasury Market ICS = – 0.0286144 (--0.9156608 in 32nd terms) round bid down -0'010
- Arriving order on TUT 16600 H8, 10 qty offer @ – 0'010

Pricing

Treasury Market ICS Trade Price = -0'010

- Actual off tick fill in decimal = -0.9156608 32^{nds}
- 0105 Message price sent on tick = -0'010

Leg 1 = 106'090 (resting price)

Leg 2 = 116'125 (resting price)

Leg Quantity

Treasury Market ICS Qty = 10

Leg 1 Qty = 100

Leg 2 Qty = 60

40 remain resting on the book

Implied Out Trade -- Treasury Market ICS Source

Current Market

ZTH8 (2 Year U.S. Treasury Future)

Bid Qty	Bid Price	Offer Price	Offer Qty
		106'090	100

ZNH8 (10 Year U.S. Treasury Future)

Bid Qty	Bid Price	Offer Price	Offer Qty
10	-0'010		

TUT 16600 H8 (2 Year U.S. Treasure Future (ZT) v 10 Year U.S. Treasure Future (ZN))

Bid Qty	Bid Price	Offer Price	Offer Qty
10	-0'010		

Assumptions

- TUT Spread Ratio = 1.6600
- Defined Ratio = 10:6
- Settlement for ZT = 106'060
- Settlement for ZN = 116'060
- Implied Offer in the ZNH8
- Treasury Market ICS = (Leg 1 Price – Leg 1 Settlement) – ((Implied Leg 2 Price – Leg 2 Settlement) / Ratio))
- -0'010 = (106'090 – 106'060) – ((Implied Leg 2 Price – 116'060) / 1.6600)

- (Implied Leg 2 Price – 116'060) = (0'010 + 0'030) * 1.6600
- (Implied Leg 2 Price = 116'060 + (0'04 * 1.6600)
- Converted to decimals = 116.1875000 + (0.1250000 * 1.6600)
- Implied Leg 2 Price = 116.1875000 + 0.2075000 = 116.3950000 0.3950 in 32nds terms is 12.64 32nds — round up offer to 116'130

Note: Leg 2 ticks is the 10 year, which ticks in 32nds. As a result, the 12.64 is rounded up to the nearest whole 32nd tick

- Implied Leg 2 Price = 116'130
- Implied Leg 2 Qty = 10 * 6 = 60
- Arriving order on ZNH8, 40 qty bid @ 116'130

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