

IMPLIED PRICING FOR
EURODOLLAR
FUTURES ON GLOBEX®

Chicago Mercantile Exchange's (CME) Eurodollar futures are the world's most versatile exchange-traded interest rate derivatives. Now, thanks to our implied spread pricing, even more trading and risk management opportunities can be discovered when trading Eurodollar futures contracts on CME's GLOBEX[®] electronic trading platform.

WHAT IS IMPLIED PRICING FUNCTIONALITY?

Implied pricing in electronically traded Eurodollar futures enables market professionals to see new bids and offers—in individual quarterly contracts and calendar spreads—derived from outright bids and offers in quarterly contracts and pre-defined calendar spreads. The trading engine identifies new bids and offers in outright and spread markets derived from posted prices, creating even greater market transparency, liquidity and trading opportunity for Eurodollar futures traders. For years, traders have taken advantage of the virtually 24-hour access on GLOBEX to trade Eurodollars electronically using many of the same strategy plays available in the Eurodollar pits via open outcry trading during regular trading hours (e.g., Calendars, Butterflies, Condors, Packs and Bundles). Implied pricing functionality on GLOBEX inaugurates a new dimension in price discovery in the electronically traded Eurodollar futures market.

Individual Eurodollar Future Legs

GE1	GE2	GE3	GE4
GE5	GE6	GE7	GE8
GE9	GE10	GE11	GE12

GE is the symbol for Eurodollar futures traded on GLOBEX and the number stands for one of the first eight quarterly contracts in order of expiration.*

Eurodollar Calendar Spreads

GE1-GE2	GE2-GE3	GE3-GE4	GE4-GE5	GE5-GE6	GE6-GE7	GE7-GE8	GE8-GE9	GE9-GE10	GE10-GE11	GE11-GE12
GE1-GE3	GE2-GE4	GE3-GE5	GE4-GE6	GE5-GE7	GE6-GE8	GE7-GE9	GE8-GE10	GE9-GE11	GE10-GE12	
GE1-GE4	GE2-GE5	GE3-GE6	GE4-GE7	GE5-GE8	GE6-GE9	GE7-GE10	GE8-GE11	GE9-GE12		
GE1-GE5	GE2-GE6	GE3-GE7	GE4-GE8	GE5-GE9	GE6-GE10	GE7-GE11	GE8-GE12			

* Exceptions to this will occur four times each year, when a March, June, September or December quarterly Eurodollar future is the nearest expiring contract. During these periods, the implied pricing functionality will apply to the 2nd through 13th quarterly Eurodollar contracts only. This procedure is necessary to ensure that the implied pricing methodology will generate valid transaction prices for all contract months.

Implied pricing and spreading permits outright and futures spreads to trade in minimum price increments of 1/2 of a basis point (0.50 b.p. = \$12.50). Since the front expiring Eurodollar contract—either Serial or Quarterly—

Implied spread pricing is currently available in the first twelve quarterly Eurodollar futures expirations and in 38 calendar spread configurations that are derived from those first three years of quarterly expirations.

CME plans to expand this functionality to include the first 20 quarterly expirations and implied Butterfly spreads in the near future. Once this is implemented, GLOBEX will use individual legs and calendar spreads to derive implied IN Butterfly spreads, and will use Butterfly spreads and a combination of Calendar spreads and individual legs to imply OUT contingent orders in individual legs.

is eligible to trade in 1/4 (0.25) basis point minimum increments, the “front” contract during these four months for implied pricing functionality will be the second quarterly Eurodollar future. This ensures that all implied outright and spread prices trade in minimum increments of 1/2 (0.50) basis point.

However, the expiring quarterly contract and the pre-defined calendar spreads associated with the expiring quarterly contract will be available for trading at a minimum price increment of 0.25 basis points (one-quarter tick), both in electronic trading on the GLOBEX platform and open outcry trading.

HOW DOES IMPLIED SPREAD PRICING WORK?

An implied order is an order created from individual outright orders that are available in the marketplace. With implied pricing, the trading engine will work synthetic orders in spreads and individual leg markets at the same time, without the risk to the trader/broker of being double filled or filled on one leg and not on the other leg. By creating implied orders in addition to outright orders in the system, implied spread trading increases the probability that orders will be executed, improving market depth and liquidity in the electronic Eurodollar futures market. For example, a bid in one Eurodollar contract month and an offer in another contract month can create an implied market in the corresponding calendar spread with those two quarterly expirations.

Before going further, let's be specific about the terms we are using—bids, offers and calendar spreads—in regard to trading Eurodollar futures.

A **bid** in an individual Eurodollar futures contract expiration represents the price at which the futures contracts can be sold.

An **offer** in an individual Eurodollar futures contract expiration represents the price at which the futures contracts can be bought.

When we discuss calendar spreads in Eurodollar futures, **buying the spread** refers to buying the nearby expiration and selling the deferred expiration (e.g., buy the September Eurodollar futures and sell the December Eurodollar futures). Conversely, a customer selling the nearby expiration and buying the deferred expiration would be **selling the spread**.

Similarly, buying the spread, when referring to a Butterfly spread, involves buying the nearby expiration, selling the middle expiration, and buying the deferred expiration, always in a 1:2:1 ratio. The converse is true when selling the spread.

IMPLIED IN ORDERS

Implied **IN** orders are derived from existing outright orders in individual contracts (legs). This means that an outright order in an individual leg for one Eurodollar expiration can be matched with another outright order in an individual leg of a different Eurodollar expiration to create a calendar spread. Butterfly spreads can be implied in using either orders in 3 individual legs or by using 2 calendar spreads. Here are four examples:

Example # 1: Generation of an implied **IN** calendar spread on the **BID** side

GE1	Qty	Bid	Ask	Qty
outright 1	15	9505		
GE2	Qty	Bid	Ask	Qty
			9502	10
outright 2				
GE1-GE2	Qty	Bid	Ask	Qty
IN 1-2	10	03		

With a firm **bid** of 9505 for fifteen contracts in the first Eurodollar expiration and **offer** on ten contracts at 9502 in the second expiration, implied functionality produces a **bid** in the GE1-GE2 calendar spread of 03 for ten contracts. The quantity for the implied IN order is the minimum quantity shared between the two outright orders. The price for the implied IN order is the net difference between the two outright orders (i.e., GE1 outright – GE2 outright = {GE1 – GE2 Implied IN spread}).

Example # 2: Generation of an implied **IN** calendar spread on the **OFFER** side

GE1	Qty	Bid	Ask	Qty
			9420	5
outright 1				
GE2	Qty	Bid	Ask	Qty
outright 2	20	9408		
GE1-GE2	Qty	Bid	Ask	Qty
			12	5
IN 1-2				

Above we see the mirror image of the first example, but in this case an **offer** is generated in the calendar spread. With a firm **offer** on five contracts at 9420 in the first Eurodollar expiration and a **bid** of 9408 on twenty contracts in the second expiration, implied pricing functionality produces an IN offer in the GE1-GE2 calendar spread of 12 for five contracts.

Example # 3: Generation of an implied **IN** Butterfly Spread (Orders in individual legs)

GE1	Qty	Bid	Ask	Qty
outright 1	1	9510		
GE2	Qty	Bid	Ask	Qty
			9505	2
outright 2				
GE3	Qty	Bid	Ask	Qty
outright 3	9509	1		
GE1-GE2-GE3	Qty	Bid	Ask	Qty
IN 1-2-3	1	09		

As you can see, the three outright orders in the above example can be combined to create an implied bid of 09 for 1 lot. The price of a Butterfly spread is derived using the following formula: $GE1 + GE3 - (2 * GE2) = \text{Butterfly}$

Therefore, in the above example, $9510 + 9509 - (2 * 9505) = 09$, the value of the implied bid.

An incoming offer in the GE1-GE2-GE3 Butterfly spread at 09 or better would subsequently match with the 3 original leg orders and clear the above book.

Example # 4: Generation of an implied **IN** Butterfly Spread (2 Calendar Spreads)

GE1-GE2	Qty	Bid	Ask	Qty	
outright 1	1	05			
GE2-GE3	Qty	Bid	Ask	Qty	
			02	1	outright 2
GE1-GE2-GE3	Qty	Bid	Ask	Qty	
IN 1-2	1	03			

In this example, a bid in the GE1-GE2 calendar spread and offer in the GE2-GE3 calendar spread are used to derive a bid in the GE1-GE2-GE3 Butterfly spread. Inherent in the two calendar spreads are the following orders:

Bid GE1-GE2	Offer GE2-GE3
Buy One GE1	Sell One GE2
Sell One GE2	Buy One GE3

As you can see, by combining the two calendar spreads we have a bid for one lot in the nearby, two lots offered in the middle expiration, and a bid for one lot in the deferred expiration which will again allow us to derive in an implied bid in the Butterfly spread.

IMPLIED OUT ORDERS

Implied **OUT** orders are derived from a combination of an existing spread order and an existing outright order in one of the individual underlying legs. These two orders are utilized to create a contingent outright order on the other underlying leg of the spread. Similarly, implied out orders can be derived using a Butterfly spread and a combination of 2 individual leg orders or an individual leg order and a calendar spread. Here are three examples of implied OUT orders:

Example #5: Generation of an implied **OUT** GE2 **BID** from a calendar spread offer and GE1 bid

GE1	Qty	Bid	Ask	Qty	
outright 1	2	9515			
GE2	Qty	Bid	Ask	Qty	
OUT 1-2	2	9511			
GE1-GE2	Qty	Bid	Ask	Qty	
			04	10	outright 2

With an outright **bid** of 9515 for two contracts in the GE1 expiration and ten GE1-GE2 calendar spreads **offered** at 04, the implied functionality produces an OUT **bid** of 9511 on two contracts in the GE2 expiration. The OUT represents the implied order that is constructed as a result of the underlying outright in GE1 and spread order of GE1-GE2. Just as with the implied IN order, the quantity for the implied OUT order is the minimum quantity shared between the outright orders. The price for the implied OUT order is the net difference between the outright orders (i.e., GE1 outright – {GE1 – GE2 spread} = GE2 OUT).

In this case, the implied pricing engine derives an implied bid of 9511, where two contracts can be sold. If a participant sells the implied 9511 bid for two contracts, the trading engine will immediately sell two contracts at 9515 in the first contract month to fill two contracts out of the order for ten spreads at 04.

Example # 6: Generation of an implied **OUT** GE1 **OFFER** from a calendar spread offer and GE2 offer

GE1	Qty	Bid	Ask	Qty	
			9516	3	OUT 1-2
GE2	Qty	Bid	Ask	Qty	
			9512	3	outright 1
GE1-GE2	Qty	Bid	Ask	Qty	
			04	10	outright 2

With an outright **offer** of three contracts at 9512 in the GE2 expiration and an **offer** of ten GE1-GE2 calendar spreads at 04, the implied pricing functionality produces an **OUT offer** of 9516 on three contracts in the GE 1 expiration. The OUT represents the implied order that is constructed as a result of the underlying outright in GE 2 and spread order in GE1-GE2. The price for the implied OUT order is the net difference between the outright orders (i.e., GE2 outright + {GE1 – GE2 spread} = GE1 OUT).

In this case, the implied pricing engine derives an implied offer of three GE1 contracts at 9516. If a participant buys the implied offer at 9516, the trading engine will immediately buy three contracts at 9512 in the second contract month to fill three contracts out of the order for ten spreads at 04.

Example # 7: Generation of an implied **OUT** GE1 Bid (Butterfly + 2 Legs)

GE1	Qty	Bid	Ask	Qty	
Out 1-2-3	1	9512			
GE2	Qty	Bid	Ask	Qty	
outright 1	2	9505			
GE3	Qty	Bid	Ask	Qty	
			9508	1	outright 2
GE1-GE2-GE3	Qty	Bid	Ask	Qty	
outright 3	1	10			

With outright orders in two legs and an outright bid in the Butterfly spread, the engine derives an implied Bid in the third leg. Below is an illustration of how these contracts can be matched:

Buy	Sell
Outright 1 - 2 GE2	Outright 3 - 2 GE2
Outright 3 - 1 GE3	Outright 2 - 1 GE3
Outright 3 - 1 GE1	

As is shown above, by combining the outright leg orders and the spread order, what remains is a bid for 1-lot in GE1 which is the implied bid generated by the engine. Therefore, if a market participant submits an offer in GE1 at 9512 or better, the engine will immediately sell 2 GE2 and buy 1 GE3, clearing the order book.

The same basic Butterfly pricing calculation can be applied to the above example to derive the implied price:

$$GE1 + GE3 - (2 * GE2) = \text{Butterfly}$$

$$GE1 + 9508 - (2 * 9505) = 10$$

$$GE1 = 9512$$

CME'S FLAGSHIP CONTRACT

Since the Eurodollar futures were launched in December 1981, CME has sought to improve this—its flagship contract—to better meet the requirements of the interest rate trading and risk management communities. Implied pricing functionality is an innovation that complements the wide array of pre-defined spreads available for Eurodollar futures on GLOBEX.

Eurodollar futures are available on the GLOBEX platform from 5:00 p.m. to 4:00 p.m. Central time the following day. On Sunday, trading begins at 5:30 p.m. Central time.

Eurodollar Futures Highlights

Contract Size	\$1,000,000
Quotations	Index points
Minimum Price Fluctuation (Tick)	.0025 = \$6.25/contract for front month contract (no implied spreading functionality applies if the “front month” is a quarterly contract); .005 = \$12.50/contract for all other contracts
Contract Months	All Eurodollar contracts are available on GLOBEX, but implied pricing functionality applies only to the designated twelve quarterly contracts
Last Trading Day	11:00 a.m. London time on the second London bank business day immediately preceding the third Wednesday of the contract month
Final Settlement	Based on the British Bankers' Association Interest Settlement Rate

For more information on connecting to the GLOBEX Platform, see the CME's Web site at www.cme.com/eagle or call us at 1-800-331-3332.

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