CME Group

INTEREST RATES

Understanding Packs and Bundles

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John W. Labuszewski
Managing Director
Research & Product Development
312-466-7469
jlab@cmegroup.com

Traders frequently trade "strips" of long or short Eurodollar futures in successive months far into the future as a form of "synthetic" term investment or as a means of hedging over-the-counter (OTC) interest rate swap (IRS) instruments. Thus, CME lists quarterly Eurodollar futures with contract months extending out 10 full years into the future.

Because Eurodollar futures strips have proven to be popular trading instruments, and in light of the complexities associated with the purchase or sale of a battery of futures contracts, CME has developed the concept of "packs" and "bundles" to facilitate such trading activity.

A pack or bundle may be thought of as the purchase or sale of a series of Eurodollar futures representing a particular segment along the yield curve. They may be used to create or liquidate positions along the yield curve. They offer the advantage of being transact-able at a single price or value, eliminating the necessity of entering multiple orders in each contract and the further possibility that some orders may go unfilled.

The popularity of packs and bundles is reflected in Eurodollar volume and open interest patterns. Unlike most futures contracts, where virtually all volume and open interest is concentrated in the nearby or lead month, Eurodollar futures have significant volume and open interest in the deferred months going out 10 years along the yield curve. During the first half of 2013, some 14% of all Eurodollar futures contracts were transacted in the form of packs or bundles.

What are Bundles?

A Eurodollar bundle consists of the simultaneous sale or purchase of one each of a series of consecutive Eurodollar futures contracts. The first contract in any bundle is typically the first quarterly contract in the Eurodollar strip, but bundles may be constructed starting with any quarterly contract. CME lists bundles in 1-, 2-, 3-,4-, 5-, 6-, 7-, 8-, 9- and 10-year terms to maturity. [1]

E.g., one may buy a 1-year or white bundle by purchasing the first 4 quarterly expiration Eurodollar futures contracts.

Constructing Eurodollar Bundles

Term	Color Code	Comprised of	BPV
1-Year	White	1st 4 Quarterlies	$100
2-Year	Red	1st 8 Quarterlies	$200
3-Year	Green	1st 12 Quarterlies	$300
4-Year	Blue	1st 16 Quarterlies	$400
5-Year	Gold	1st 20 Quarterlies	$500
6-Year	Purple	1st 24 Quarterlies	$600
7-Year	Orange	1st 28 Quarterlies	$700
8-Year	Pink	1st 32 Quarterlies	$800
9-Year	Silver	1st 36 Quarterlies	$900
10-Year	Copper	1st 40 Quarterlies	$1,000

E.g., one may sell a 3-year or green bundle by selling the first 12 quarterly expiration Eurodollar futures contracts.

E.g., one may sell a 5-year or gold bundle by selling the first 20 quarterly expiration Eurodollar futures contracts.

What are Packs?

Packs are similar to bundles in that they represent an aggregation of a number of Eurodollar futures contracts traded simultaneously. But they are constructed to represent a series of four consecutive quarterly Eurodollar futures.

Constructing Eurodollar Packs

Term	Color Code	Comprised of	BPV
1-Year	White	1st 4 Quarterlies	$100
2-Year	Red	5th-8th Quarterlies	$100
3-Year	Green	9th-12th Quarterlies	$100
4-Year	Blue	13th-16th Quarterlies	$100
5-Year	Gold	17th-20th Quarterlies	$100
6-Year	Purple	21st-24th Quarterlies	$100
7-Year	Orange	25th-28th Quarterlies	$100
8-Year	Pink	29th-32nd Quarterlies	$100
9-Year	Silver	33rd-36th Quarterlies	$100
10-Year	Copper	37th-40th Quarterlies	$100

[1] Eurodollar futures are sometimes color coded to facilitate reference to individual contract months or to packs and bundles. Futures expiring within one year, including the first 4 quarterly contracts are referred to as "white" months. The 2nd year is "red," 3rd year is "green," 4th year is "blue," 5th year is "gold," 6th year is "purple," 7th year is "orange," 8th year is "pink," 9th year is "silver," and the 10th year is "copper." Thus, a bundle comprised of the first 20 quarterly contracts may be referred to as a gold bundle. A pack comprised of the 5th through 8th available quarterly contracts may be referred to as a red pack.

E.g., one may buy a white pack by buying the first 4 quarterly expiration Eurodollar futures contracts.

E.g., one may sell a red pack in the 2nd year by selling the 5th through 8th quarterly cycle month contracts.

E.g., one may buy a gold pack in the 5th year by buying the 17th through 20th quarterly cycle month contracts.

Both packs and bundles transacted on the CME Globex® electronic trading platform are matched using the first-in, first-out or "FIFO" algorithm.

Quoting Packs and Bundles

The price of a pack or bundle is quoted by reference to the average change in the value of all Eurodollar futures contracts included in the pack or bundle since the prior day's settlement price. They are quoted in increments of one quarter (1/4th) of one (1) basis point (0.01%).

E.g., if the first 4 quarterly Eurodollar contracts have advanced 2 basis points for the day while the next 4 quarterly Eurodollar contracts have advanced 3 basis points for the day, then a 2-year or red bundle may be quoted as "+" or up 2.5 basis points.

$$Bundle\ Quote = \frac{[(+2\ bps\ x\ 4\ cnts) + (+3\ bps\ x\ 4\ cnts)]}{8\ cnts} = +2.5\ basis\ points$$

Measuring Risk Exposure

Fixed income traders frequently measure risk exposures by reference to the "basis point value" or BPV of an instrument. BPV represents the monetary change in the value of a fixed income instrument given a 1 basis point or 0.01% change in yield. [2]

If the value of a single Eurodollar futures contract were to fluctuate by one (1) basis point (0.01%), this represents a monetary fluctuation of $25.00. [3]

Thus, the basis point value (BPV) of a pack or bundle simple represents the number of contracts in the instrument multiplied by $25.

$$BPV\ of\ Pack\ or\ Bundle = No.\ of\ Contracts\ x\ \$25$$

E.g., the basis point value (BPV) of a pack consisting of four Eurodollar futures contracts equals $100 (=4 contracts x $25).

E.g., the BPV of a 3-year or green bundle consisting of twelve Eurodollar futures contracts equals $300 (=12 contracts x $25).

Because the minimum price increment or tick size associated with a pack or bundle is one quarter (1/4th) of one (1) basis point (0.01%), the monetary value of a tick equals 1/4th of the pack or bundle BPV.

E.g., the value of a tick for a pack consisting of four Eurodollar futures contracts equals $25 (=1/4th x $100).

E.g., the value of a tick for a 3-year or green bundle equals $75 (=1/4th x $300).

Leg Price Assignment

After a trade is concluded at a singular price, values are assigned to each of the various legs or Eurodollar futures associated with the pack or bundle. These prices must be within the daily range for at least one of the component contracts of the bundle. This assignment is administered through an automated system operated by the exchange.

The assignment algorithm is driven by the principle that any necessary adjustments from currently prevailing Eurodollar futures should be applied to the most deferred contracts in the pack or bundle first, working forward to nearby contracts.

E.g., assume that a 3-year bundle trades at -2.5 basis points from the previous day's settlement price. But the nearby eight contracts were actually marked -2 basis points; and, the next 4 contracts

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[2] BPV is also frequently referred to as the "dollar value of an 01" or DV01. We prefer the term BPV over DV01 to the extent that we might not always be referring to an instrument denominated in dollars.

[3] BPV of a money market instrument such as a Eurodollar investment is calculated as Face Value x (days/360) x 0.01%. Thus, the BPV of a $1 million, 90-day instrument as represented in a single Eurodollar futures contract equals $25 [= $1 million x (90/360) x 0.01%].

were marked -3 basis points, from the previous day's closing values. The implied average net change is as follows.

$$\begin{aligned} Average\ Net\ Change \\ &= \frac{[(-2\ bps\ x\ 8\ cnts) + (-3\ bps\ x\ 4\ cnts)]}{12\ cnts} \\ &= -2.333\ basis\ points \end{aligned}$$

Thus, the bundle has traded one-sixth (1/6th) of a basis point or 0.16667% below the actual marks associated with the components of the bundle. The assignment algorithm revolves this dilemma per a 2-step process. The algorithm addresses the portions of the quote before and after the decimal point, or the "characteristic" and "mantissa" in mathematical parlance, separately.

The algorithm begins by assigning a net price change of -2 ticks from the previous day's close to each of the twelve legs of the bundle. It proceeds by adjusting these price changes downward to the nearest basis point, one leg at a time beginning with the most deferred contract. The algorithm works forward until the average net price change for the bundle is fully allocated to the negotiated value, in this example -2.5 basis points.

Following this procedure would result in a net price change of -2 basis points for the nearest six legs and -3 basis points for the six most deferred legs.

$$\begin{aligned} Allocated\ Net\ Change \\ &= \frac{[(-2\ bps\ x\ 6\ cnts) + (-3\ bps\ x\ 6\ cnts)]}{12\ cnts} \\ &= -2.5\ basis\ points \end{aligned}$$

Implied Packs and Pack Spreads

"Implied pricing functionality" is available in outright Eurodollar futures vs. calendar spreads and butterflies. This functionality is also applied to packs, spreads between packs and pack butterfly spreads.

Implied pricing is designed to bolster liquidity in the market, recognizing that outright positions are frequently aggregated into another tradable instrument. *E.g.,* a long and a short Eurodollar futures contract calendar spread may be aggregated to create a calendar spread. Or, sometimes instruments are disaggregated into their component parts. *E.g.,* a pack may be disaggregated into a series of four long or short Eurodollar futures contracts.

An implied order in a compound instrument like a spread or pack may be created from individual outright orders entered into the system. This is referred to as an "implied in" order. Or, an implied order may be created by disaggregating an order in a compound instrument to create orders in the individual components of the spread or compound instrument. This is referred to as an "implied out" order. Note that the feature is designed to assure that traders are not double-filled or partially filled.

The CME Globex electronic trading platform supports extensive implied pricing functionalities in the Eurodollar complex. This feature has proven very useful in enhancing liquidity in the market. However, the functionality works behind the scenes and is generally transparent to the end user.