

## Introducing Daily Expiry™ 3-month US Dollar LIBOR [100-RATE] Futures

The best inventions are those which streamline and indeed revolutionize existing ways of doing things. Such is clearly the case with the Philadelphia Board of Trade's (PBOT) Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures. The British Bankers Association has granted Derivative Designs LLC (DD), the PBOT's partner in the design of this product, an exclusive license for the use of its distributed London Interbank Offer Rate (BBA LIBOR™) for the purpose of these futures contracts.

The success of all short-term interest rate (STIR) futures around the world is such that we should ask why, a quarter-century after the introduction of Eurodollar futures on the Chicago Mercantile Exchange (CME) in September 1981, improvements are necessary. Those futures were introduced during a period of very high short-term interest rates and interest rate volatility and, much like the existing Treasury bill and bond futures, were used primarily to make directional bets on interest rates.

It was not until the growth of the interest rate swap market later in the 1980s that Eurodollar futures settled into their now-familiar primary role of pricing and hedging interest rate swaps. While most traders assume ten years of quarterly expirations always have been available, maturities beyond two years were not introduced until June 1987. The implications of this history are astonishing and we will return to them later: For all of the success of various STIR contracts, the world's traders have been using instruments not designed to meet their now-primary application. Legions of academic and practitioner researchers have created ingenious workarounds for various deficiencies, all of which are rendered obsolete by the superior product design of the Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures.

### **Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures: Overview Of Benefits**

These futures solve, simply and elegantly, the following problems associated with quarterly settlement Eurodollar futures (for sake of completeness, the CME offers contracts on the first four non-quarterly months, but these are not traded anywhere near as actively as are the quarterly contracts):

- The convexity bias between the futures market and the cash forward rate agreement market
- Mismatched maturities between a cash market risk and the available futures contracts
- Arbitrary price assignments for individual contracts within Eurodollar bundles and packs
- Identical fixed rates for all four quarterly periods in a Eurodollar pack and however many quarters are involved in the Eurodollar bundle

In addition, Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures can duplicate the functionality of the over-the-counter interest rate swap market while eliminating many of the hidden costs and encumbrances traders have endured over the past quarter-century, including:

- Counterparty credit risk. Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures are cleared and settled daily at the Options Clearing Corporation (OCC), an AAA-rated counterparty.
- Counterparty credit management. Futures markets eliminate the need for assessing the balance sheet of counterparties, assigning appropriate exposure limits and maintaining and updating counterparty documentation
- Barriers to smaller and less-creditworthy counterparties enjoying the interest rate risk management strategies afforded by the swap market

These benefits are addressed in detail in sections below.

### **Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures: Contract Specifications**

All of these benefits are achieved by putting the interests of the customer first and asking how a futures product based on BBA LIBOR™ should be designed, not how customers would have to conform themselves to the product's specifications. The key is offering ten consecutive years of contracts based on three-month BBA LIBOR™ with daily expirations as opposed to ten years of quarterly expirations priced on the second London bank business day immediately preceding the third Wednesday of the contract month.

The contracts are priced in the familiar STIR convention as [100 – 3-Month BBA LIBOR™] on a notional value of \$1,000,000. With a tick value corresponding to one-quarter of a basis point, each tick is worth \$6.25. Other key contract specifications are listed below.

**Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures****CONTRACT SPECIFICATIONS**

<b>Contract Name</b>	Daily Expiry™ 3-month US Dollar BBA LIBOR™ 100-RATE Futures
<b>Listing Date</b>	TBD
<b>Description &amp; Contract Size</b>	Futures on the daily 3-Month US Dollar BBA LIBOR™ lending rate as determined by the British Bankers Association having a notional value of \$1,000,000.
<b>Contract Listings</b>	Ten consecutive years of daily maturities (days in which the exchange and OCC are open for business).
<b>Trading Hours</b>	8:20 AM to 4:15 PM ET
<b>Trading Platform</b>	PBOT XL
<b>Ticker Symbols</b>	Base = E01, E02, out to E31 (2 digit number [01] refers to actual calendar days of 01 to 31) 1/26/2006 Contract = E26F6
<b>Minimum Price Intervals / Dollar Value Per Tick</b>	Regular: .0025 = \$6.25
<b>Daily Settlement Price</b>	Daily settlement price will be the average of the closing PBOT best bid / best offer ("PBBO").
<b>Last Trading Day</b>	Futures trading shall terminate at the close of trading one business day before final settlement date.
<b>Settlement</b>	Cash settlement in USD. Settlement of The Daily Expiry™ 3-month US Dollar LIBOR [100-RATE] Futures Contract will result in the calculation of the final cash settlement amount on the Final Settlement Date. The final cash settlement amount on the Final Settlement Date shall be the final mark to market amount against the final settlement price multiplied by \$2,500. For example, if the last day of trading is on a Thursday, OCC calculates variation payments on Friday and money moves on Monday.
<b>Final Settlement Date</b>	The final settlement date shall be the business denoted by the contract symbol, i.e. final settlement date for the 1/24/2006 Contract / E24F6 is 1/24/2006.
<b>Final Settlement Price</b>	The final settlement price shall be based on 3-Month BBA LIBOR™ (London InterBank Offering Rate) as reported by British Bankers Association (BBA) in its daily fixing at 6 am GMT on the final settlement day, rounded to the nearest .0001. The final settlement price on days on which the BBA does not report its daily fixing shall be the final settlement price most recently announced by BBA.
<b>Reportable Position Level</b>	TBD
<b>Margin</b>	TBD
<b>Issuer and Guarantor</b>	The Options Clearing Corporation
<b>Trading Nuance</b>	An increase in contract value is a positive dollar value per tick. A decrease in contract value is a negative dollar value per tick.

### Forward Rates And The Convexity Bias

Forward rate agreements (FRA) are a critical part of the overall interest rate market. A forward rate is the rate at which a borrower can lock in funds for a fixed period starting at a point in the future. A common example would be locking in borrowing for one year starting one year in the future. If the one-year rate is 5% and the two-year rate is 4.75%, the forward rate would be 4.5%:

$$FR_{1,2} = \frac{(1 + .0475)^2}{(1 + .05)} - 1 = .045$$

A borrower so inclined could obtain a FRA from a bank or dealer or could create a synthetic FRA by selling a strip of futures between one and two years. A long position at a given price is equivalent to lending money at the fixed rate of  $[100 - \text{price}]/100$  percent for the three months commencing with that contract's maturity. If interest rates fall, that loan becomes more valuable, the price of the futures contract rises and the long position receives a daily mark-to-market variation margin gain that can now earn interest at the new, lower rate. The opposite is true if rates increase; now the long position must pay variation margin and forego the opportunity to earn interest on that money at the higher rates.

The various cash flows are not symmetric, however. The value of a basis point on any cash interest rate instrument increases as interest rates fall and decreases as interest rates rise. Restated, the gains on a long position in a falling interest rate environment exceed the losses on any such instrument for an equivalent basis point increase in rates. This property is known as *convexity*.

While futures markets mandate daily mark-to-market accounting and the exchange of variation margins, forward markets do not involve any exchange of funds between initiation and maturity. This creates pricing differences between STIR futures and their corresponding cash market forward interest rates. These become increasingly significant with both time to maturity and interest rate volatility. A convexity adjustment using the formula is required:

$$\text{Forward rate} = \text{Futures rate} - \frac{1}{2}\sigma^2 t_1 t_2$$

where  $t_1$  is the time to maturity of the futures contract,  $t_2$  is the time to maturity of the rate underlying that contract (typically another three months) and  $\sigma^2$  is the annualized variance of short-term interest rate volatility. The asymmetry created by convexity and by when the long STIR futures position must post additional variation margin – when interest rates rise and the foregone income penalty is highest – mandate the STIR futures price be discounted in compensation. Futures rates thus are higher than corresponding forward rates.

The daily expiration feature of Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures eliminates the convexity bias adjustment and brings futures rates and forward rates together. This will allow swap prices to be set directly from observed futures prices rather than from illiquid or sparse FRA prices.

### Other Pricing Benefits

The daily expiration feature of Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures creates three other additional benefits. The first is the ability to match the maturity of the hedge against the maturity of the cash position perfectly. This eliminates the stub period that often exists before the first contract in the strip and after the last contract in the strip.

The second benefit is the definition of a daily yield curve without having to interpolate between two fixed rates defined by the quarterly settlement. While interest rate interpolations through a variety of techniques such as bootstrapping or cubic splines have reached a high level of sophistication, they are perforce subject to estimation errors. A strip of daily prices allows traders to hedge rates exactly.

A third benefit from daily expirations is elimination of price assignments for packs and bundles. At present, packs and bundles are quoted in quarter-tick increments, but whole basis point prices are assigned to individual legs of the trade. Prices then are assigned to reflect fractional combination prices beginning with the longest maturity contracts. If, for example, a one-year pack trades at +1.25, the first three contracts are priced at a net change of +1 and the last contract will be assigned a gain of +2. This arbitrary arrangement becomes unnecessary with Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures.

### Operational And Administrative Advantages

Futures markets offer much greater transparency and anonymity than do cash markets. Minimal documentation is required to open and operate futures accounts, and as the OCC is the counterparty to every trade, the need to establish and manage bilateral credit arrangements is eliminated. Smaller traders who are shut out of the swap market can meet the margin requirements for a strip of Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures.

Larger traders will appreciate the block order entry facility on the PBOT XL platform beginning at 50 contracts, or \$50 million of notional exposure. All trades executed within the block trade receive a single fixed price, thereby eliminating the need for post-trade allocations of different prices or arbitrary price assignments.

### **Who Benefits?**

Nearly all traders who have interest rate risk exposure can benefit from Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures. Included are:

- Corporate issuers looking to price debt;
- Repo desks making yield curve trades who wish to preserve their balance sheets;
- Mortgage lenders looking to lock in their cost of funds;
- Foreign exchange traders who presently use FRA to complete their trades;
- All swap and strip traders; and
- Hedge funds and commodity trading advisors

Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures pass the key hurdle for all new derivatives: They allow users to do what they have been doing already faster, cheaper and better. By eliminating all the little idiosyncrasies and quirks associated with standard STIR futures contracts, Daily Expiry™ 3-month US Dollar BBA LIBOR™ [100-RATE] Futures will lower the cost and complexity of their use while improving their pricing efficiency.