CME Group

CBOT Treasury Futures: Calendar Spreads

November 2011

CBOT Treasury futures calendar spreads combine two transactions in one, have reduced minimum bid-ask (B/A) spreads (¼ of 1/32nd or $7.8125 per contract spread), and are extremely liquid, which helps to minimize costs and allow participants to roll sizeable positions with relative ease.

CBOT Treasury Futures Calendar Spreads and the Quarterly Roll

A futures calendar spread is one transaction that buys a futures contract of one delivery month and sells a different delivery month of the same futures product. Holders of open interest in CBOT Treasury futures will typically roll their position from one delivery month to the next as their position nears expiration.

This is often referred to as the "quarterly roll", which occurs during a short period (roughly two weeks) during each quarter. During this period, the vast majority of open interest will migrate from the nearby delivery month into the next-deferred delivery month. To maintain a long position in Treasury futures, one could sell the calendar spread, which simultaneously sells the nearby delivery month (to offset the existing long position to zero) and buys the deferred delivery month (re-establishing the long exposure), all in one transaction. To maintain a short position, one could buy the calendar spread, which will accomplish the opposite. Utilizing CBOT Calendar Spread markets to maintain open interest offers many advantages.

Price Construction: Determine Spread Prices, Price Assignment, and Gain/Loss

Please see Appendix B for a detailed discussion on calendar spread prices and leg price assignments

Why Use Them?

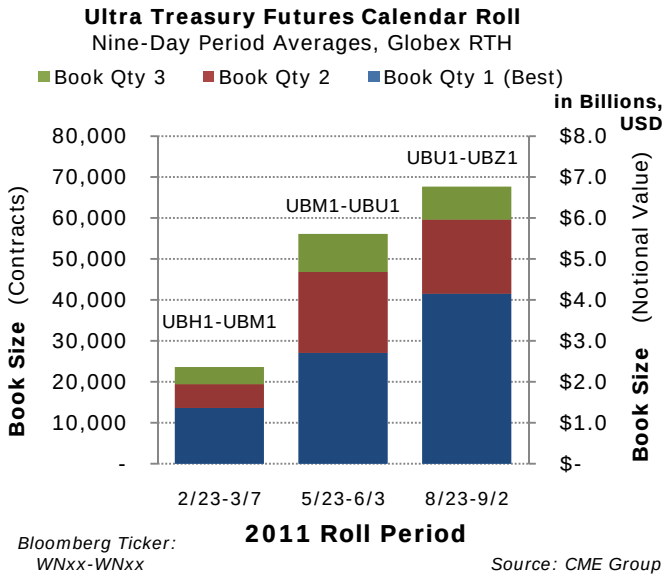
CBOT Treasury futures on CME Globex typically exhibit very robust liquidity on a daily basis in their outright markets (individual delivery months), but exhibit substantially massive amounts of liquidity in the calendar spreads during the quarterly rolls.

Reduce Risk, Lower Costs, Transact in Size

- Combine 2 transactions into 1
- Eliminate legging risk
- Employ Reduced-Tick-Spreads (¼ 32nds)
- Ease of position maintenance
- Liquidity to transact in large size

For holders of substantial amounts of open interest (say, tens of thousands of contracts or more), seeking robust liquidity to roll positions each quarter is vitally important. Minimizing trading costs during the quarterly roll is paramount. CBOT Treasury futures calendar spreads help keep trading costs to a minimum.

Exhibit 1: Ultra Calendar Spread Liquidity



Bloomberg Ticker: WNxx-WNxx

Source: CME Group

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Benefits

One Transaction vs. Two

- Those who transact the roll with Calendar Spreads make just one trade, and therefore cross only one B/A spread. Those who opt to leg across the roll are forced to make two trades -- the outright purchase of one futures contract and the sale of another – and therefore cross two B/A spreads.

Narrow B/A vs. Wide B/A

- The minimum B/A spread in all Treasury Calendar Spreads is ¼ of 1/32nd. By contrast, the minimum B/A spread permitted in outright Treasury futures transactions ranges up to a full 1/32nd. Without calendar spreads, the smallest cumulative B/A spread you would be able to cross to roll a position is **2x** the minimum trading increment of the outright market.
- Consider rolling a position in Ultra Treasury Bond futures. The B/A spread crossed will be ¼ of 1/32nd, or $7.8125 per Ultra Calendar Spread. If outright markets are used instead, two B/A spreads of 1/32nd, or $31.25 per contract are crossed. The cost of crossing these two B/A spreads is $62.50 per contract roll (equal to 2 x $31.25 per contract). By using Calendar Spreads in lieu of outright markets, trading costs incurred from simply crossing the B/A spread are reduced by 88%.

Massive Liquidity vs. Robust Liquidity

- CBOT Treasury Calendar Spreads boast deep liquidity, as the charts attest, easily eclipsing the robust liquidity of the individual delivery month markets. The typical tremendous liquidity in CBOT Treasury Calendar Spreads help to reduce or eliminate the market impact costs of rolling large positions. **See Appendix A for liquidity illustrations** of the CBOT Treasury futures Calendar Spreads of all other products (2-Year, 5-Year, 10-Year, and Bond futures).

Finer Exit and Entry Pricing

- CBOT Treasury Calendar Spreads feature a smaller minimum price increment than their outright markets, resulting in correspondingly finer position exit and entry prices. This can make a noticeable contribution to the portfolio manager's profit/loss, especially in low-volatility markets.

Trading Costs and Liquidity—A General Framework

When rolling positions, investors apply expertise to manage *Explicit Trading Costs* & *Implicit Trading Costs*.

Explicit Trading Costs:
Known before execution:

- **Commissions**
- **Fees**
- **Taxes**
- **Bid-Ask Spread**

Implicit Trading Costs:
Fluctuate with market conditions:

- **Market Impact Cost** – Potential adverse movement in price due to the liquidity demands of the order
- **Timing Risk Cost** – Potential adverse movement in price due to the time it takes to execute the order. Volatility and liquidity influence Timing Risk Cost.
- **Opportunity Cost** – Potential adverse impact arising from the inability to completely execute the entire order, typically due to insufficient liquidity or adverse price movement.

Market Impact Costs and Timing Risk Cost tend to be inversely related. The more one attempts to minimize Market Impact by spreading out an order over time, the higher Timing Risk may be, or vice-versa.

Implicit Trading Costs have the potential to create very large impacts, easily overwhelming the entire set of Explicit Trading Costs.

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CBOT Treasury Futures: Calendar Spreads

November 2011

Highly liquid markets reduce the impact of Implicit Trading Costs, helping alleviate many risks. As a result, open interest holders place a substantial value on highly liquid markets.

Measuring Treasury Quarterly Roll Liquidity

Conceptually, liquidity may be assessed in four different ways. We may readily observe these factors on the CME Globex electronic trading platform.

- ***Width*** **–** How tight or wide is the bid-ask spread?
- ***Depth*** **–** What is the quantity of orders resting on the bid or offer, or beyond the best bid and best offer?
- ***Immediacy*** **–** Can a large order be executed immediately? Does it require some time to be filled?
- ***Resiliency*** **–** How long does it take for the market to bounce back after a large order is filled?

Trade Example 1: Ultra Treasury Bond Futures Quarterly Roll

On August 26, 2011, a portfolio manager (PM) holds a long position of 30,000 Sep11 CBOT Ultra Treasury Bond futures – $3 Billion in notional face value – that must be rolled from the September 2011 delivery month to the December 2011 delivery month in order to maintain this core exposure.

By selling 30,000 contracts in the Sep11-Dec11 calendar spread, the PM will zero out the long position in Sep11 and simultaneously reestablish the long position in the Dec11 contract, all in one transaction. Selling 30,000 UBU1-UBZ1 calendar spread is a transaction that simultaneously sells UBU1 (Sep11 delivery month leg) and buys UBZ1 (Dec11 delivery month leg). As Exhibit 2 illustrates, the Globex order book has more than enough depth at the best bid to accommodate this order in one transaction – 38,000 contracts on the bid, with a minimum ¼ of 1/32nd B/A spread.

Exhibit 2 – CBOT Ultra Treasury Futures Calendar Spread Market, UBU1-UBZ1, 8/26/11

Portfolio Manager Position	Calendar Spread Bid/Ask Prices	Size on the Best Bid (contracts)	Size on the Best Ask (contracts)
30,000	1-15.00 / 1-15.25	38,000	42,000

Moreover, as Exhibit 3 attests, the remarkable liquidity of UBU1-UBZ1 Treasury Calendar Spread enables the PM to execute the trade while holding all Implicit Trading Costs to zero, making the cost of the roll not only small, but reasonably predictable.

Based on the Ultra Calendar Spread liquidity, the PM executes all 30,000 contracts at once!

Exhibit 3 – CBOT Ultra Treasury futures Calendar Spread Market, 8/24/11

Trading Cost Component	Estimate	$ Impact	% of Notional
Commission and Fees:	$3.12 per spread[1]	$93,600	0.00312%
Bid-Ask Spread	$7.8125 per contract	$234,375	0.00781%
Explicit Trading Costs (Subtotal)		**$327,975**	**0.0109%**
Market Impact Cost	$0 per contract	$0	0
Timing Risk Cost	$0 per contract	$0	0
Opportunity Cost	$0 per contract	$0	0
Implicit Trading Costs (Subtotal)		**$0**	**0**
TOTAL TRADING COSTS		**$327,975**	**0.0109%**

[1] For example only, includes exchange trading and clearing fees and hypothetical brokerage commissions. Actual fees and commissions may vary. Per contract fees and commissions are charged on each leg of a calendar spread.

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CBOT Treasury Futures: Calendar Spreads

November 2011

One Trade. . . One Price. . . Your Size. . .

The massive liquidity of the CBOT calendar spread provides the PM an easy trade-execution decision. The PM was able to execute the entire order at once and at one price, immediately rolling the $3 Billion notional position at a Total Trading Cost of $327,975, which represents approximately 1 basis point (0.0109%) of the notional value of the position. Implicit Trading Costs are zero – the market B/A spread is the minimum ¼ of 1/32nd wide, the order is executed at the best bid price, and the size of the order is less than the market size on the bid, limiting the market impact to zero.

For sizeable orders, not only can Implicit Trading Costs potentially range in the tens of millions of dollars, but the *uncertainty* of how these execution costs play out throughout the day can increase overall risk tremendously. Many open interest holders go to great lengths to execute large orders at once and at one price – giving them certainty of P/L and certainty of trading costs.

Please view the Appendices for further illustrations of CBOT Treasury futures Calendar Spreads

- **Appendix A** displays average liquidity of CBOT Calendar Spreads during 2011
- **Appendix B** discusses the mechanics of calendar spread pricing and leg-price assignments.

Useful Links

***Liquidity Analytics Tool*:** Interactive tool that illustrates liquidity of Treasury futures outright markets, and provides quantitative and timely data for improving order execution strategies. www.cmegroup.com/liquidity

Treasury Pace of the Roll: Tool providing daily updates on the progressive of the Treasury futures quarterly roll: www.cmegroup.com/ratesroll

Interest Rate Futures Liquidity Report: Provides a snapshot of the recent volume, open interest, and depth of CME Group Interest Rate contacts. www.cmegroup.com/trading/interest-rates/interest-rate-futures-liquidity.html

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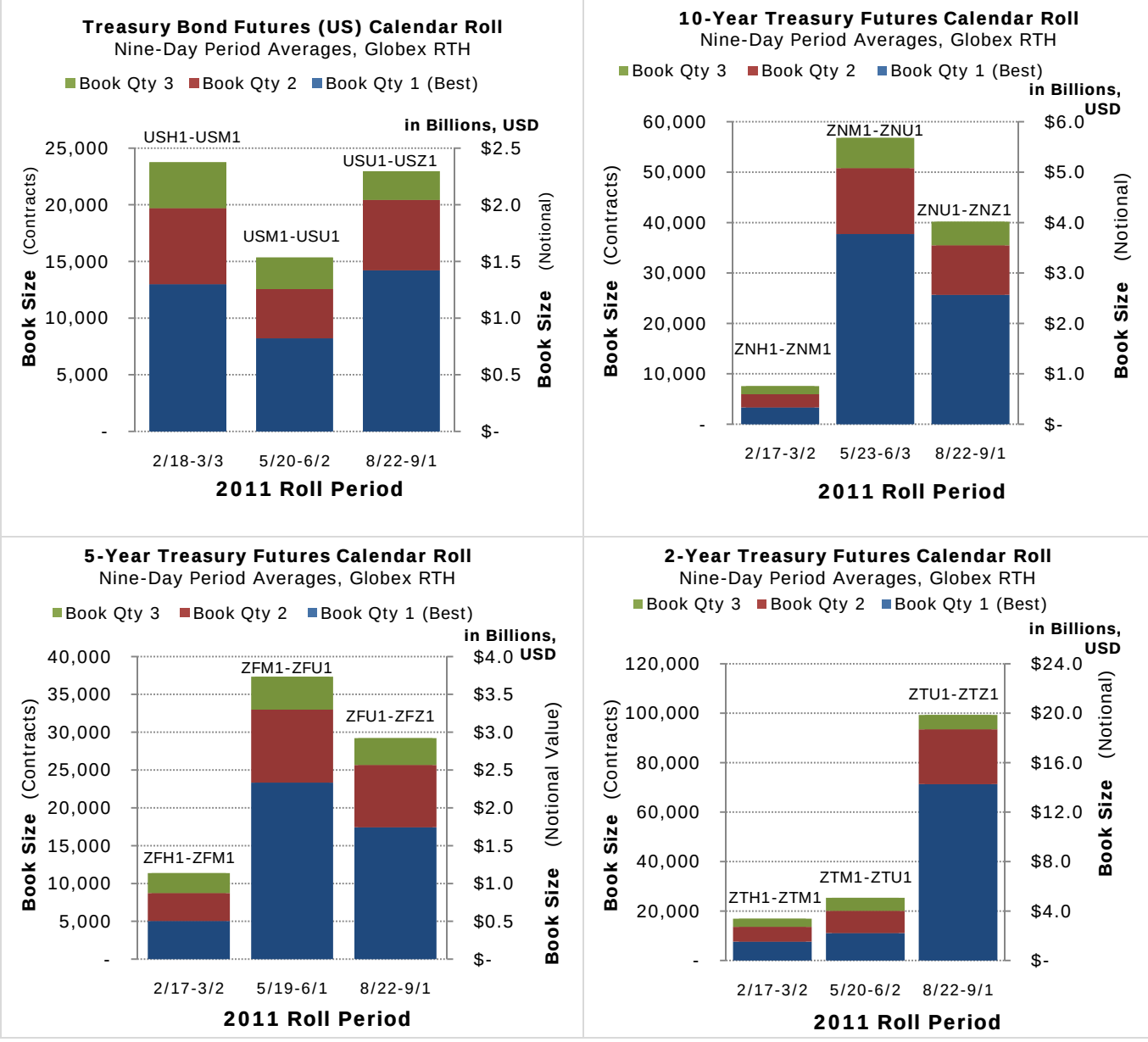
November 2011

Appendix A: The following graphs give a visual depiction of the time-weighted average displayed liquidity on CME Globex. The averages reflect 7am – 4pm (Central Time) for nine-day periods during the each contract's 2011 quarterly rolls.

Exhibit 4 –Average Liquidity of CBOT Treasury Futures Calendar Spread Markets, 2011



Source: CME Group

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CBOT Treasury Futures: Calendar Spreads

November 2011

Appendix B: Calendar spread pricing mechanics and two available methods for leg price assignments.

How Do You Interpret CBOT Treasury Futures Calendar Spread Prices?

Making Sense of Calendar Spread Prices:
Buying the calendar spread entails buying the nearby month (e.g. Sep11) and selling the deferred month (e.g. Dec11).

Conversely, selling the calendar spread entails selling the nearby month and buying the deferred month.

BID Price: The bid price of the calendar spread is the difference between the bid price of the nearby month and the ask price of the deferred month.

ASK Price: The ask price of the calendar spread is the difference between the ask price of the nearby month and the bid price of the deferred month.

Treasury Calendar Spreads offer two methods for assignment of leg prices: Standard and SLEDS, as illustrated in Examples 1 and 2, respectively.

Outright Markets vs. Calendar Spreads

Constructing Calendar Spread Prices from Outright Prices

	Bid	Ask
Sep (U1)	146- 03	146- 04
Dec (Z1)	144- 20	144- 21

BID = (Sep11 Bid - Dec11 Ask); ASK = (Sep11 Ask - Dec11 Bid)

	Bid	Ask
	146- 03	146- 04
subtract	144- 21	144- 20
	Bid	Ask
UBU1-UBZ1	1- 14	1- 16

= 2 full 32nds B/A Spread ($62.50 per contract)

Actual Calendar Spread Market Prices

	Bid	Ask
UBU1-UBZ1	1- 15.00	1- 15.25

= ¼ of 1/32nd B/A Spread ($7.8125 per contract)

Example 1:

An investor (PM) holds a 30,000 contract long position in CBOT Sep11 Ultra Treasury futures (originally purchased at price of 128-21). On 26 August 2011, the PM rolls the entire position into Dec11 Ultra Treasury futures (UBZ1), using the Sep11-Dec11 Calendar Spread (UBU1-UBZ1), as follows:

August 26 Markets
Last price for Sep11 on 8/26 is 146-03
Last price for Dec11 on 8/26 is 144-20
UBU1-UBZ1 market is 1-15.00 Bid and 1-15.25 Ask. Book sizes are 38,000 and 42,000, respectively.

Transaction Execution
The PM rolls the entire position by selling 30,000 Sep11-Dec11 calendar spreads (UBU1-UBZ1 on CME Globex or WNU1-WNZ1 on Bloomberg) at one price, 1-15.00

Sep11 Delivery Month Final P/L (Leg 1)
(Exit Price 146-03) – (Entry Price 128-21) * $1,000 per point * 30,000 contracts = $523,125,000

Dec11 Delivery Month Entry Price (Leg 2)
(Sep11 Last Price 146-03) – (calendar spread transaction price 1-15) = 144-20

Daily Mark-to-Market
Dec11 position will be marked-to-market with the August 26 daily settlement price

Appendix B continued: Calendar spread pricing mechanics two leg price assignment methods.

Example 2: SLEDS[2] Method

www.cmegroup.com/tools-information/lookups/advisories/clearing/files/Chadv08-155.pdf

The PM holds a 30,000 contract long position in CBOT Sep11 Ultra Treasury futures (originally purchased at price of 128-21). On 26 August 2011, the PM rolls the entire position into Dec11 Ultra Treasury futures (UBZ1), using the Sep11-Dec11 Calendar Spread (UBU1-UBZ1). The PM's clearing member uses SLEDS method for leg price assignments for calendar spreads transactions in CBOT Treasury futures.

August 26 Markets

Last price for Sep11 on 8/26 is 146-03
Last price for Dec11 on 8/26 is 144-20
UBU1-UBZ1 market is 1-15.00 Bid and 1-15.25 Ask
Prior day's settlement price for Sep11 was 144-26 (8/25/11 settlement price)

Transaction Execution

The PM rolls the entire position by selling 30,000 Sep11-Dec11 calendar spreads (UBU1-UBZ1 on CME Globex or WNU1-WNZ1 on Bloomberg) at one price, 1-15.00

Sep11 Delivery Month Final P/L (Leg 1)

(Prior Settle Price 144-26) – (Entry Price 128-21) * $1,000 per point * 30,000 contracts = $484,687,500

Dec11 Delivery Month Entry Price (Leg 2)

(Sep11 Prior Settle Price 144-26) – (calendar spread transaction price 1-15) = 143-11

Daily Mark-to-Market

The new Dec11 position will later be marked-to-market with its August 26 daily settlement price. Any difference between Sep11 final P/L utilizing the SLEDS method in this example compared to example 1 will be equally offset with the Dec11 daily mark-to-market. For example, if the settlement price turns out to be the last price of 144-20 (utilizing the price from example 1), then the resulting 1st day's mark-to-market gain on the Dec-11 position will be $38,437,500. The combined gain on both legs ($484,687,500 + $38,437,500) is $553,125,000, equaling the Sep11 final P/L from example 1.

Myth Busted: *I'm rolling positions from a delivery month priced at 146 to a delivery month priced at 144. It feels like I'm trading down and losing 2 points!"*

Reality: As the examples above illustrate, the price differential between the two legs of the calendar spread is not itself a mark-to-market, and therefore makes no impact on the trader's P/L. For example, under the standard price attribution approach shown in Example 1:

The trader exits the position in nearby Sep11 futures at a price of 146-03. This price determines final mark-to-market on that contract position, and no other.

The trader also establishes a new position in the deferred Dec11 futures at a price of 144-20. This entry price establishes the basis for the initial mark-to-market on that contract position, and no other.

[2] Single Line Entry of Differential Spreads

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