CME Group

INTEREST RATE PRODUCTS

Hedging Borrowing Costs with Eurodollar Futures and Options

By James J. Boudreault, CFA, Financial Research and Product Development

Eurodollar futures and options provide agricultural producers with liquid, efficient tools for locking in interest rates and controlling borrowing costs.

Introduction

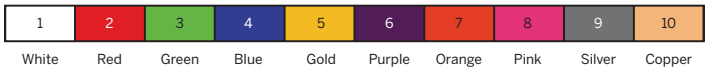
Grain and livestock producers typically borrow money to finance seed, fertilizer, livestock, equipment, or harvest operations. These loans tend to be short-term in nature and predictable in timing, but variable in size. Eurodollar futures and options are ideally suited for constructing hedges to protect against interest rate risk exposures in such loans and to accommodate varying loan amounts. The Eurodollar (ED) contract toolkit features extremely liquid markets, standardized contract size of $1 million, standardized duration of one-quarter of one year, and expiration months that reach as far as 10 years into the future.

Among the leading global interest rate benchmarks are the London Interbank Offered Rates (LIBOR). LIBOR interest rates include terms to maturity between overnight and one year. 3-month (3M) LIBOR — the rate that ED futures reference — is a widely followed benchmark for setting interest rates on personal, commercial, and mortgage loans and interest rate swaps.

ED Futures: Price = 100 - Forward Rate

For any ED futures contract, the price reflects the market consensus expectation of 3M LIBOR on the day the contract expires. The ED futures contract price is quoted as 100 minus this forward 3M LIBOR rate. For instance, if forward 3M LIBOR were 0.42 percent per annum, then the ED futures price would be quoted as 99.580 price points. If instead forward 3M LIBOR were 5 percent, the ED price would be 95.000 points. This means ED futures prices move inversely with their forward yields: If yield goes up, price goes down, and vice-versa.

At any time, ED futures are listed for expiration every March, June, September, and December for the coming 10 years. For ease of identification and transaction, ED futures are grouped into color-coded segments, with each spanning four quarterly expiration months.



For example, in November 2010 the "White" year comprises ED futures expiring in December 2010 and March, June, and September 2011, and the "Red" year refers to ED futures that expire in December 2011 and March, June, and September 2012.

Regardless of when it expires, each ED futures contract is defined so that every 1 basis point change in the forward rate — that is, every contract price change of 0.01 price points — is worth $25. Moreover, because each ED futures contract references a 3-month forward interest rate, the (forward) duration exposure of every ED contract is standardized at 0.25 years. A further convenience is that every ED futures contract expires by cash settlement, by final mark-to-market to the final settlement price.

Example: Lock in borrowing costs now for a loan you plan to take out later

Assume it is November. You're a grain producer who plans to borrow approximately $1 million next March 14 to finance seed, fertilizer, and operations for spring planting. You intend to repay the loan six months (more precisely, 182 days) later on September 12. Your bank agrees to a loan rate of 3M LIBOR plus 100 basis points (3M LIBOR + 1 percent). That is, your bank sets the interest rate to 3M LIBOR on the day you take out the loan (Monday, March 14), and resets the rate to 3M LIBOR again three months later (Monday, June 13), in each case adding 1 percent to the LIBOR baseline.

To judge how to hedge the bank loan exposure with ED futures, compare the dates, the rate, the amounts, and the interest rate sensitivity of the two. To measure interest rate sensitivity, compare the Basis Point Value (BPV) — the dollar value of a change of 1 basis point (or 0.01 percent) per annum in the loan interest rate.

Bank Loan

Dates	Borrow on March 14, 2011. Repay on September 14, 2011.
Rate	3M LIBOR + 1 percent, with 3M LIBOR set on **March 14** for interest payment on June 13, and reset on **June 13** for interest payment on September 12.
Amount	$1 Million
Basis Point Value	$1,000,000 x 182 days / 360 days x 1 basis point = $50.56

Eurodollar Futures

Dates	EDH1 (Mar2011 ED delivery month): 3M LIBOR (Fix date) coverage from 3/14/11 + 90 days EDM1 (Jun2011 ED delivery month): 3M LIBOR (Fix date) coverage from 6/13/11 + 90 days
Rate	EDH1 expires with reference to spot 3M LIBOR on Monday, **March 14**, 2011. EDM1 expires with reference to spot 3M LIBOR on Monday, **June 13**, 2011.
Amount	$1 Million per contract per quarter
Basis Point Value	$25 per CME Rulebook

Hedge Construction

The simplest way to think about hedging the loan is to match the loan amount with the ED futures contract notional size. You are borrowing $1 million for six months. Intuitively, you will need to string together a sequence of two consecutive ED futures expiries to cover the 6-month interval, with one contract for each half of the interval.

A more precise approach is to construct the hedge from a BPV standpoint. The basis point value of your loan is $50.56, and each ED contract BPV is standardized at $25. The number of ED contracts that would match the loan's interest rate exposure is 2.02 (equal to $50.56 / $25). For practical purposes this rounds to 2 contracts.

Suppose that when you arrange the loan and then hedge its forward interest rate exposure in mid-November, the EDH1 market price is 99.580, which represents a 3M forward LIBOR rate of **0.420** percent starting on March 14, 2011, and the EDM1 market price is 99.455, representing a forward rate of **0.545** percent starting on June 13, 2011.

Selling one each of these two ED contracts (a short position) will establish a hedge that will profit if either of the corresponding forward 3M LIBOR rates rise, but will create a loss if either of the forward 3M LIBOR rates fall. Either way, the effect of the hedge is to lock in your borrowing costs. For every uniform rate increase of 1 basis point across the six month forward interval spanned by the loan, you will realize a profit of $50 from your short ED position while incurring an increase in interest cost of $50.56 attributable to the rate on your bank loan. Alternatively, should forward interest rates decrease (and ED futures prices rise), for each basis point you will realize a loss of $50 from your short ED position while benefitting from a reduction in interest cost of $50.56 on your bank loan.

To make this concrete, suppose hypothetically that EDH1 were to expire on March 14 at a price 99.080. This would signify an increase of 50 bps in 3M LIBOR versus the price at which you sold the EDH1 futures contract in mid-November. Suppose as well that EDM1 expires on June 13 at a price of 98.955, signifying a 50 bps increase in 3M LIBOR versus the interest rate that was reflected in the EDM1 futures contract when you sold it in mid-November. The profit/loss on your short position in ED futures would be:

50 bps x $25 per bp per contract x 2 contracts = **+$2,500**

Meanwhile, the 50 bps increase in the interest cost of the $1 million loan would equate to:

$1,000,000 x 182 days / 360 days x 0.50 percent = **-$2,527.78**
Total Effect = $2,500 - $2,527.78 = -$27.78

The profit on your ED futures hedge position would recoup all but $27.78 of the extra loan interest cost that would result from the 50 bps increase in market interest rates. (The residual loss is attributable simply to the need to round your futures hedge from an ideal size of 2.02 ED contracts to an operational size of 2 ED contracts.)

Hedge Position Management

In this example, the critical dates for the loan exposure that you are hedging: funding date, repayment date, and interest rate reset dates – happen to line up closely with the critical dates for the ED futures that you use to hedge. This means that your hedge will work tolerably well if you simply let each of the ED futures contracts go to expiration. In practice, forward interest cost exposures may not align with ED futures critical dates. Fortunately, the same basic approach would apply: You would aim to set the interest rate sensitivity, or BPV, of the ED futures hedge as close as possible to the BPV of the forward loan exposure. The key difference is that you would need to manage the hedge position by timing the removal of each sequence of ED futures so as to match the timing of the bank loan's rate setting and/or reset dates.

Hedge Summary

By using ED futures to hedge the loan in this example — or potentially any other loan exposure for which the rate is set on the basis of LIBOR — you effectively lock in your borrowing costs at the prevailing forward 3M LIBOR rates as reflected in ED futures contract prices. **Had you not established a hedge in November, your total interest expense would have virtually doubled, from around $2,500 in November based on the forward LIBOR rates to approximately $5,000 at the time the loan was funded.** Locking in interest rates and costs ahead of time allows you to focus on producing a fruitful harvest.

How do you buy or sell Eurodollar futures and options?

Market participants must trade through a Futures Commission Merchant (FCM). To ensure performance on the contracts, CME Clearing collects monies for performance bonds when contracts are traded, called initial margin. In the example above (and at the time this was published) each March 2011 and June 2011 ED futures contract requires $650 of initial margin per contract. (For current information on CME Group margin requirements, please visit:**www.cmegroup.com/margins.**)

Futures Margin Requirement

2 contracts x $650 per contract = **$1,300 intial margin** to establish the futures hedge

Alternative Hedge Construction — Eurodollar Options

Another possible hedging method is to use options on ED futures. Simply buy (go long) put options on the March and June futures with strike prices closest to where the futures are trading (at-the-money).

For Example

Buy: 99.625 March 2011 PUT on EDH1: Quoted Premium = 11 basis points x $25 x 1 contract = $ 275

Buy: 99.455 June 2011 PUT on EDM1: Quoted Premium = 17 basis points x $25 x 1 contract = $ 425

As with futures, each 1 basis point of option premium equals $25. So, to implement this hedge using options, you would buy 1 each of the 99.625 March 2011 PUT and the 99.455 June 2011 PUT options.

Option Premium Required

($275 x 1) + ($425 x 1) = **$700 in premium** to establish the options hedge

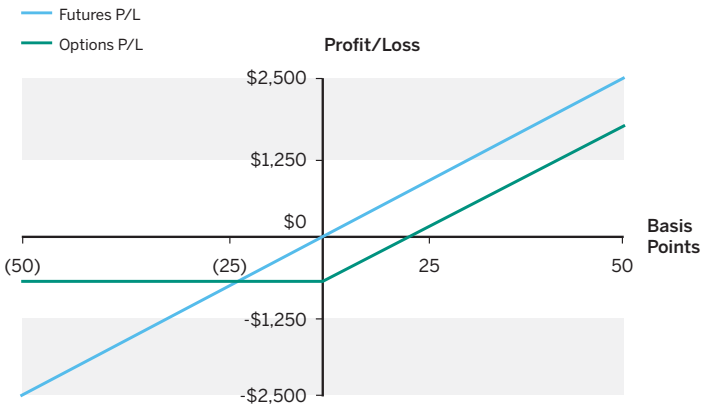
Initial Futures Margin vs. Option Premium

An important difference between the two hedge strategies is the distinction between initial futures margin and option premium. The total amount of futures margin you would have to post with your FCM – including both initial margin and subsequent daily pays or collects on variation margin – will vary as the futures contract price moves up or down. By contrast, option premium is money paid once, by the buyer of the option to the seller, at the time the option is transacted. Theoretically, if prices were static from the time of establishing the position until the position were exited, your futures margin would be returned and there would be no profit or loss (aside from transaction costs). However, the option hedge behaves more like an insurance policy, with option premium playing the role of insurance premium. The option premium (resale value) would decline over time due to the time value (time decay) component of the option value.

As the Exhibit depicts, the option hedge has an asymmetrical profit/loss profile: It limits your downside if the market moves against you, while still maintaining your exposure to most of the upside if the market moves in your favor. The futures hedge has a symmetrical profit/loss profile, under which you have exposure to both downside and upside movements in futures prices.

Exhibit

Profit/Loss Profile – Short Eurodollar futures vs. Long Eurodollar Put Options



Cash Flows

As an option buyer, upon paying the option premium you would incur no more cash flows until the position is exited or exercised. Holding a position in futures, however, entails meeting daily "mark-to-market" cash flows associated with changes in the market price of the position. With this in mind, your preferences regarding cash flows may contribute to your decision on which hedging method to choose.

The option position permits the purchaser to "fire and forget," as it involves no interim cash flows until it is exercised or exited, or it expires, while the futures position requires managing the cash flows associated with the daily mark-to-market.

Hedge Borrowing Costs Years into the Future

ED futures typically have robust liquidity through at least their first twenty quarterly expirations. This may enable the producer to lock in forward 3M LIBOR rates up to five years into the future.

To lock in your interest expenses for the 2015 crop year, you could utilize March 2015 (EDH5) and June 2015 (EDM5) Eurodollar futures. On November 23, 2010, for instance, forward 3M LIBOR rates implied by closing prices for March 2015 and June 2015 ED futures were **3.41** percent and **3.60** percent, respectively.

Summary

The Interest Rate products listed at CME Group exchanges cover the entire USD yield curve comprising Eurodollars, Fed Funds, Treasuries (physical delivery), On-The-Run Treasuries (cash-settled), and Swap futures and options, enabling participants to create hedges tailored to their needs.

For additional information visit **www.cmegroup.com/interestrates.**

IR301/225/1210