The Eurodollar alternative

FAS 133 makes it difficult for firms to partial-term hedge with swaps. Ira Kawaller and David Goone show how Eurodollar futures can be used as an alternative

Prior to the implementation of FAS 133, many corporate entities used interest rate swaps to convert from fixed- to floating-rate exposure for some portion of the term of their debt obligations. For example, a firm with 10-year fixed-rate debt may have entered into a five-year swap, intending to float only the first half of the contractual cashflows. This practice has become known as partial-term hedging.

However, under FAS 133 – the new accounting rules pertaining to hedging and derivatives – hedgers who have used swaps in this way will not qualify for hedge accounting.

FAS 133 requires that when one is hedging recognised assets or liabilities with known cashflows, such as fixed-rate debt, the appropriate accounting treatment must follow "fair-value" hedge accounting rules. These rules require that both gains and losses from the derivative and gains and losses on the hedged item due to the risk being hedged must be recognised in current income. Ideally, fair-value hedges of fixed-rate debt should reflect only the accruals on the debt and the swap in any given accounting period. All other effects should be offsetting.

Hedge accounting, however, is not automatic. To qualify, the gains or losses of the derivative must be expected to generate a close offset to the gains or losses on the debt attributable to the risk being hedged. And in the typical case where swaps are the hedging instrument, this condition will not be satisfied. That is, price effects on the shorter-term swap will almost certainly be smaller than the price effects on the longer-term debt in the majority of cases.

Despite this apparent prohibition, FAS 133 does allow hedgers to designate "one or more selected contractual cashflows" of an asset or liability as the hedged item.[1] Hence, it isn't the strategy of partial-term hedging that fails to qualify for hedge accounting. Rather, it's the swap contract that fails. If another instrument can be found that can reliably deliver the intended offset, hedge accounting can be preserved. That instrument exists: the Eurodollar futures contract. This article describes how Eurodollar futures work and how they can be used specifically in connection with partial-term hedging strategies.

Understanding Eurodollar futures

The first thing to understand about Eurodollar futures is that they are futures contracts. Futures contracts serve the same economic purpose as forward contracts – that is, they serve to lock in the price of some underlying good, for settlement at a set point in the future.

Futures, however, have some rather unique institutional features. First, they are traded on an exchange so that parties to a trade are essentially indifferent to the original counterparty to the transaction – that is, the exchange serves to guarantee the performance of the transactions. Second, they are available only for a select set of specific underlying instruments. Third, they are standardised in terms of having a fixed size and specific value dates or delivery dates, dictated by the contract. Finally, and perhaps most significantly, they are marked to market, with price changes settled in cash on a daily basis. Essentially, the exchange bears the responsibility of collecting from the losers and paying the winners every day. The capacity to do so is protected, in part, by the posting of collateral or a performance bond – also called initial margin, or original margin – by both parties, before the futures trade can be initiated.

The Eurodollar futures contract simply applies this futures mechanism to an interest rate. It serves as a price-fixing mechanism that sets offered rates on three-month Eurodollar time deposits, with the value date of the underlying deposit scheduled for the third Wednesday of the expiry month – for example, March, June, September or December.[2] The precise rate secured by the futures contract is found simply by subtracting the futures price from 100. For example, a futures price of 95.00 reflects the capacity to lock up a 5% offered rate on the underlying three-month deposit. Given this convention, it should be clear that as interest rates rise, futures prices fall, and vice versa.

With the face amount of the Eurodollar futures contract being $1 million and with the underlying deposit having a maturity of three months, every basis point move in the futures price (yield) translates to a value of $25 ($1 million × 0.0001 × 90/360). In general, Eurodollar futures prices will closely track movements in the spot three-month Eurodollar time deposit yields, although changes cannot be expected to be identical over any given period.

The futures market participant can maintain long positions, which profit from price increases (yield decreases), or short positions, which profit from price declines (and yield increases). In either case, the participant will be obliged to mark the contract to market on a daily basis and make daily cash settlements for any change in value, valued at $25 per basis point moved. The mark-to-market obligation can be terminated at any time by simply trading out of the position – that is, making the opposite transaction to the initial trade.

The contract expires two London business days before the third Wednesday of the contract month – ie, on the trade date for a spot Eurodollar deposit with a settlement date of the third Wednesday. Following expiry, any participant who had an open position as of the expiry would be required to make one, final mark-to-market adjustment, and then no further obligations or responsibilities would remain. The final settlement price is set equal to 100 minus spot three-month Libor on the expiry day, as reported by the British Bankers' Association. Thus, the contract is said to be "cash-settled" with no allowance or capacity for a physical delivery process.

Hedging zero-coupon debt

When using Eurodollar futures to hedge fixed-rate debt, the hedger needs to view each prospective cashflow of the debt as an independent, stand-alone zero-coupon instrument. Hedging the full security then distils to hedging a series of zero-coupon securities. Essentially, the same technology is repeated for each cashflow the entity wants

A. Setting conditions

Spot trade date	July 31 2000
Spot value date	August 2 2000
Forward value date	April 15 2001
Hedge value date	September 30 2000
Spot Libor (SVD to HVD) maturity	6.253%/59 days
Spot Libor (SVD to FVD) maturity	6.941%/256 days
Forward Libor (HVD to FVD) maturity	7.075%/197 days
Maturity value of cashflow	$50 million
HVD value	$48.136 million

to hedge. Critically, the appropriate number of futures contracts required to meet this objective will depend on the hedging objectives of the hedger. That is, a different number of Eurodollar futures would be needed to hedge overnight interest rate risk, versus the interest rate risk over a different term.

In a typical corporate hedging application, the hedger isn't interested in offsetting an instantaneous interest rate change. Rather, he or she should be striving to offset price effects due to interest rate changes that occur over an accounting period. A functioning hedge should generate a gain or loss that compensates the hedger for the difference between:

a) an initial, end-of-the-accounting-period forward value of the cashflow; and

b) the actual market value of the cashflow, as of the end of the accounting period.

Thus, for those with this orientation, it is essential to specify a hedge value date equal to the end of the accounting period.

In contrast to the typical corporate hedger, the hedger who is concerned about an immediate impact of an interest rate change – for instance, a hedger who operates in a mark-to-market trading environment – would be a special case. For a hedger with this orientation, the relevant hedge value date would be today, rather than the end of the accounting period. As a consequence, the current market value of the prospective cashflow would substitute for the end-of-quarter forward value.

The procedure is described below:

☐ Identify the forward value date of the prospective cashflow (FVD)
☐ Determine the hedge value date (HVD).
☐ Calculate the time between HVD and FVD (Time).
☐ Determine the appropriate Libor-based (forward) interest rate for the period between HVD and FVD (R).
☐ Using R, discount the cashflow amount to a value relevant for a value date equal to the HVD (V).
☐ Construct a strip of Eurodollar futures[3], where the length of the strip should be equal to the remaining time between HVD and FVD.

The number of futures contracts to buy or sell is calculated by the following formula[4]:

$$\#F = V \times \text{Time}$$

where #F is the number of futures contracts; V is the original projected value of the cashflow for HVD in millions of dollars; and Time is the time measured in quarters, between the HVD and the value date of the cashflow.

An example

We can illustrate the procedure with an example. Assume the conditions as set out in table A. The ideal futures hedge would apply 48.136 contracts a quarter, for a horizon of 197 days or 2.19 quarters (197/90 = 2.19). Thus, the number of contracts required, #F, is 48.136 × 2.19, which rounds to about 105 contracts in total.[5] In this example, and in general, the time between the HVD and the FVD does not divide evenly into whole numbers of quarters. When this is the case, a certain amount of discretion is needed as to the insertion of a number of futures contracts for the fractional quarter. We propose the creation of a weighted average of futures contracts as a means of approximating the desired maturity. As we demonstrate below, this solution has the attractive feature that it largely offsets an interest rate perturbation, regardless of the manner in which the yield curve may have changed. We accomplish this with the following:

$$a \times 2\text{qtrs} + (1 - a) \times 3\text{qtrs} = 2.19\text{qtrs}$$

where a is the weighting given to the two-quarter strip, and (1 – a) is the weighting given to the three-quarter strip.

In this example, a = 0.81, which suggests that 0.81 × 105 or 85 contracts should be allocated to the two-quarter – December and March – strip and 0.19 × 105 or 20 contracts should be allocated to the three-quarter – December, March and June – strip. Given the desire to protect against the risk of rising interest rates, the contracts should be sold, allowing the hedger to liquidate or buy back these contracts at lower prices after the expected rate increase is realised. The data is consolidated in table B.

B. Consolidated data

	2-quarter	3-quarter	Blended
Totals	85	20	105
December (92.995)	42.5	6.7	≈ 49
March (93.025)	42.5	6.7	≈ 49
June (93.000)		6.6	≈ 7

Recall that yields are found by subtracting futures prices from 100.00, and given the prices shown in parenthesis in the first column of table B, the effective two-quarter and three-quarter money market yields – R2q and R3q, respectively – are:

$$R2q = \left(\left(1 + 0.07005\left(\tfrac{90}{360}\right)\right)\left(1 + 0.06975\left(\tfrac{90}{360}\right)\right) - 1\right)$$

$$\left(\frac{360}{180}\right) = 7.051\%$$

$$R3q = \left(\left(1 + 0.07005\left(\tfrac{90}{360}\right)\right)\left(1 + 0.06975\left(\tfrac{90}{360}\right)\right) - 1\right)$$

$$\left(\frac{360}{270}\right) = 7.116\%$$

The blended (ie, 2.19-quarter) rate is thus 0.81 × 7.051% + 0.19 × 7.116% = 7.063%. In theory, this blended rate should be identical to the forward rate for the period starting at the end of the accounting period going through to the value date of the cashflow. The minor difference in this case (7.063% versus 7.075% – see the rate associated with HVD to FVD in table A) is a reflection of the minor degree of inefficiency between the interbank prices and futures prices.

To demonstrate the effectiveness of this hedge, we assume that the spot 197-day Libor rate as of September 30 – when the hedge value date arrives – is 25bp below the initial forward rate covering this same period, as of July 31, the original trade date. We then calculate the difference between the present value of the cashflow as of September 30, relative to its initial forward value for that date.

Irrespective of whether the interest rate changes arise because of a parallel or non-parallel shift of the yield curve, we show that the futures hedge will generate a close offset to this price change.

Making the above assumptions, the present value of the prospective cashflow on September 30 becomes:

$$\frac{\$50\,\text{million}}{\left(1 + 0.06825\left(\tfrac{197}{360}\right)\right)} = \$48.200\,\text{million}$$

which represents an increase of about $64,000 from the originally calculated forward value (V) of $48.136 million. If the security was held as an asset, this increased value would be beneficial; if held as a liability, the higher value would be adverse.

With regard to the futures results, three potential scenarios are shown:

- a) All the futures rates rise – ie, futures prices fall – by the same amount.
- b) The interest rate change is concentrated in the nearby – December – futures contract.
- c) The interest rate change is concentrated in the most-deferred – June – futures contract.

The first scenario reflects a parallel yield curve shift, while the second and third reflect extreme examples of twisting yield curves.

A) a uniform change in futures prices: For the blended rate to rise by 25bp, a uniform price change of 24.5bp is required.[6] Given the positions dictated by the above example, the total futures results are found as follows:

- 49 December contracts × 24.5bp × $25 per bp = $30,012.50
- 49 March contracts × 24.5bp × $25 per bp = $30,012.50
- 7 June contracts × 24.5 basis points × $25 per bp = $4,287.50

The total comes to $64,312.50.

B) a rate change in the December futures prices: For the blended rate to rise by 25bp with the rate-change effect concentrated exclusively in the December contract, that contract would have to fall in price by 52.5bp. This result is identical to the previous outcome, as reflected by the following, single equation: 49 December contracts × 52.5bp × $25 per bp = $64,312.50.

C) a rate change in the June futures prices: For the blended rate to rise by 25bp with the rate-change effect concentrated exclusively in the June contract, that contract would have to fall in price by 381bp. In this case, a slightly higher result follows: 7 Jun contracts × 381.5bp × $25 per bp = $66,762.50

Again, the objective of the hedge was to realise a futures offset of about $64,000. Thus, in the worst case of the three scenarios posed, the ratio of hedge performance relative to the hedge objective is about 105% – well within the 80%-120% ratio standard commonly cited as a highly effective hedge.

Accounting considerations

Under FAS 133, assuming the qualifying criteria are satisfied, fair-value hedge accounting would be the appropriate treatment when a specific contractual cashflow is designated as the hedged item. The documentation should stipulate that the risk being hedged is the risk of changes in the fair-value of the contractual cashflow attributable to interest rate changes.

Gain or loss of the futures hedge will be recorded in earnings, as will the change in the fair-value of the security due to the risk being hedged. In addition, the carrying value of the debt will be adjusted to reflect this change in fair-value due to the risk being hedged. Subsequent to these changes in the carrying amount of the debt, if no adjustment were made to the amortisation schedule, an incremental gain or loss, the equal and opposite of the aggregated changes to the carrying amount adjustments, would have to be recognised coincidentally with the payment or receipt of the cashflow designated as the hedged item.

In fact, however, in order to realise the intended accounting result, whereby the realised interest expense/revenue would be converted from a fixed to a floating rate, an adjustment to the amortisation schedule should be made, but only at the time the hedge is liquidated. With this methodology, the interest rate effects during the hedge period would be realised during the accrual period associated with the payment – or receipt – of the contractual cashflow being hedged.

To illustrate this, let us suppose the cashflow being hedged reflects an 8%, semi-annual fixed rate on the liability side, say, equal to an $80,000 expense. The next coupon payment is to be paid on December 12, and the hedger wants to convert from fixed-to-floating for the subsequent interest payment to be made on June 12, six months later.

The starting hedge position would be to buy Eurodollar futures, in a quantity dictated by the first equation, and the hedger would maintain hedge coverage until December 10 – the trade date associated with the December 12 value date. At the same time as the termination of the hedge, an adjustment to the amortisation schedule would be needed. This revision would effectively allocate the accumulated adjustments to the carrying value made during the hedging period – ie, up until December 10 – to the period from December 12 through June 12 – the period remaining until payment is made for the contractual cashflow being hedged is made.

Assume that over the hedge horizon – ie, prior to December 10 – the interest rate being hedged falls by 1%. The present value of price effect of this rate change would be somewhat less than $10,000, say $9,500, and a perfect hedge would thus generate a gain of this amount. The hedge result and the change in the carrying amount of the debt have offsetting impacts on current earnings.

On the termination of the hedge, however, an adjustment to the amortisation schedule should be made to reverse the original $9,500 change in the carrying amount of the debt. The resulting interest expense realised during the coupon period associated with the hedged item would be $80,000 – $9,500 = $70,500, reflecting a 7.05% interest rate. Note that this outcome is slightly larger than the 7.00% interest expense that would have been realised under a synthetic instrument accounting approach. The discrepancy, however, is fully accounted for by the difference between the present value of the interest rate effect versus the future value of this effect. Clearly, the extent of this present value/future value mismatch will be more exaggerated, the more distant the contractual cashflow being hedged.

Conclusion

Many risk managers coping with the task of implementing FAS 133 have taken a keen interest in the idea of hedging zero-coupon fixed-income securities, as a "work-around" to the prohibition of partial-term hedging. The FASB clearly articulated that companies may not qualify for fair-value hedge accounting if they use swaps with shorter maturities than the debt they are seeking to hedge.

However, companies may designate "one or more selected contractual cashflows" – ie, zero-coupon securities – as hedged items. And when Eurodollar futures are used for this purpose, hedge accounting treatment may be preserved.

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[1] *See paragraph 21a(2)(b) of FAS 133*

[2] *The CME lists 40 quarterly contracts in the March quarterly cycle, as well as the four nearest serial contract months*

[3] *A strip is a trade that involves buying or selling multiple contract expiries. For example, buying March and June contracts would be a two-quarter strip; buying March, June, and September contracts would be a three-quarter strip*

[4] *This formula ignores any differences between the credit risk associated with the Libor-based swap rate versus that of the debtor. If one wanted to account for this credit risk differential, the number of contracts required would be* #F *from equation 1, multiplied by* MDc/MDs, *where* MDc *and* MDs *are the modified durations of the zero-coupon security and the modified duration of the Eurodollar strip, as of the hedge value date. This adjustment, however, would not be appropriate in the case where partial-term hedging is the intended objective*

[5] *Futures must be traded in whole numbers of contracts*

[6] *Due to the effect of compounding, each contributing forward price would have to change by an amount slightly less than 25bp. The calculations also reflect the constraint that the minimum price change of the futures contract is 0.005*

[7] *If futures contracts used in original hedge constructions expire prior to the intended hedge liquidation date, the hedge would have to be rolled forward. Each new hedge position would be based on a more distant hedge value date, and the time between the hedge value date and the ultimate cashflow settlement date would necessarily decline, quarter-by-quarter*