A practical guide to spreads – Translating Credit Futures prices into credit spreads

Architects of trusted markets EUREX

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Fixed Income instruments have a range of quotation conventions. Bonds are usually quoted in % of par-value, either with the accrued interest included (dirty price) or not (clean price), although sometimes they are quoted in yield. For credit instruments, one core driver of the price and yield is how much more risk is priced into the bond versus a "risk-free" alternative government bond or the swap curve, also known as the Credit Spread. In particular, Credit Default Swaps mostly remove the yield curve component from the cash-flows of the bond and are often quoted in credit spread.

Eurex Credit Index futures, on the other hand, differ from many traditional Credit Derivatives as they trade in units of the underlying index. These indices track the total returns of the bonds, including price returns, accrued interest and coupon returns. They grow indefinitely, and it is not immediately clear what a price means in terms of average yield of the included bonds.

A further complication arises through the structure of bond markets. The underlying indices settle once a day since many of the included bonds are infrequently traded and only quoted. Consequently, to ensure accurate pricing, it is necessary to have a longer timeframe to observe prices.

So, how do we translate futures prices into traditional bond metrics like yield or credit spread? Unfortunately, there is no exact way to calculate this, but we can still approximate it with reasonable precision. There are several steps involved in the process.

1. **Discounting futures prices back into cash prices by applying the fair funding rate.**
2. **Approximate implied yield using duration against yesterday's index print.**
3. **Calculate spreads against the benchmark yield.**

Translating futures prices

Futures prices are related to cash prices with the following formula, which describes the cash-futures basis:

$$F_{t,T} = I_t \times \left(1 + r_{t,T} - b_{t,T}\right)^{T-t}$$

Where I is the index value, r the fair funding rate and b the implied lending rate. If the futures are traded, we have two unknown factors, I and b, as the fair funding rate is known from swap markets. Usually, two unknown factors in an equation pose a problem since there are infinite solutions. However, in this case, we can translate one into the other. A higher implied lending rate means we can get the exposure to the underlying cheaper than funding would imply, and vice versa. In the end, the PnL of the futures equals that of the underlying minus the basis. If b rises, I falls, and vice versa, and the relationship is one-for-one[1]. We can, therefore, assume that $b = 0$ and pull all the price information from implied lending into the underlying. The formula now reads:

$$F_{t,T} = I_t \times \left(1 + r_{t,T}\right)^{T-t},$$

so the index price can be calculated using

$$I_t = F_{t,T} \times \left(1 + r_{t,T}\right)^{t-T}.$$

[1] Or bijective for the math nerds

Locating underlying yield

Now that we have determined the index price that the futures market is implying, we still need to determine what this means in terms of yield of the constituting bonds. Following traditional bond math, bond prices may be approximated through yield using:

$$B(y) \approx \underbrace{B(y_0)}_{\text{prev close}} \times \underbrace{(1+y_0)^{1D}}_{\text{1 Day carry}} - \underbrace{D(y_0) \times B(y_0) \times \Delta y}_{\text{yield change}},$$

with D being the modified option-adjusted duration of the bond and y_0 yesterday's closing yield to worst observed from the bond markets.

In aggregate, over the whole index, we get

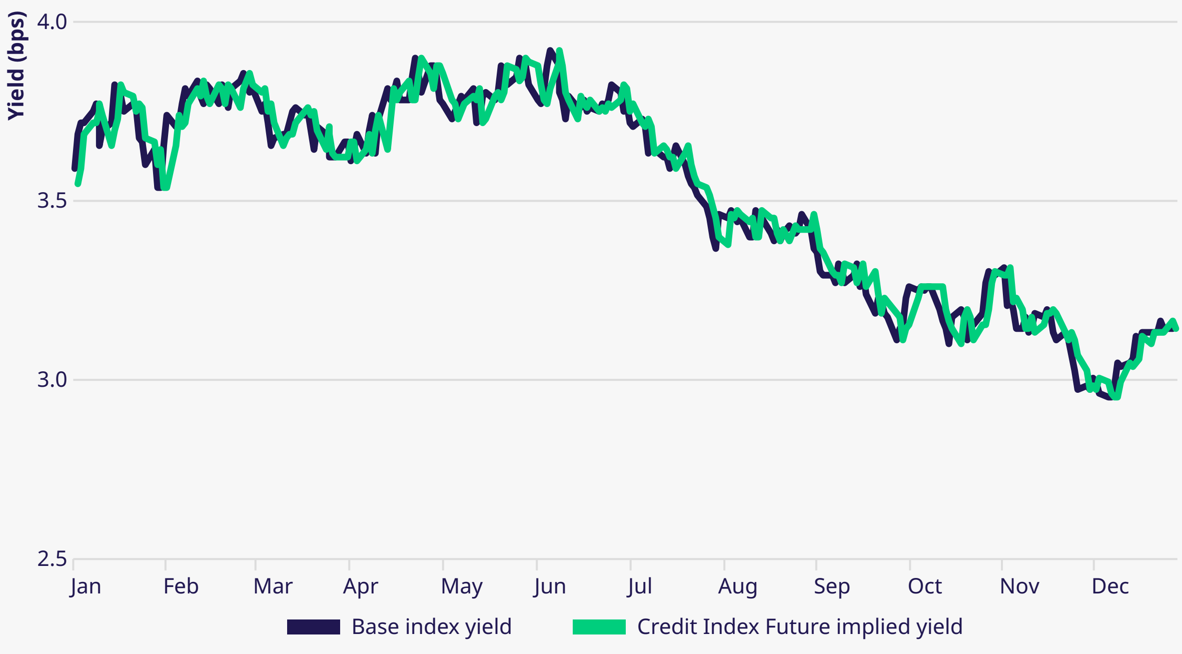
$$\Delta y \approx \frac{\frac{I_{t-1} \times (1+y_0)^{1D} - I_t}{I_t}}{D_{I_t}}$$

Finally, we find the implied yield that is implied by the futures prices as the sum of yesterday's yield and their implied move.

$$y \approx y_0 + \Delta y$$

It is worth noting that we took quite a few short-cuts here. The first approximation works fine as long as the yield moves are relatively constrained, as we are omitting convexity and higher order terms from the Bond price Taylor series. From a practical standpoint, this should only matter when yields move more than 100bps as the convexity (usually below 1) is scaled by the square of yield move. Additionally, we omit the roll-down of bond along the curve over the period between the observation time and the previous close. This is mostly because it is difficult to establish a term structure for all bonds of the index, particularly as some do not have a liquid credit curve. However, the impact should be fairly limited during most regimes.

Figure 1: Historical Futures' Implied Yield and Yield-To-Worst of the Base Index throughout 2024. Base Index is RECMTREU and Credit Index Future Is LXYA.



Source: Bloomberg, Eurex.

Benchmarking against the curve

Credit spreads are calculated against a benchmark yield that a corresponding risk-free bond would command. But what exactly does risk-free mean? Is it the swap curve? Or rather government bonds? CDX par spreads are calculated against the swap curve, while it is common to benchmark cash bonds against the nearest German government bond or U.S. Treasuries. In the end, there are multiple ways of choosing a benchmark, differing quite substantially in terms of curve structure, liquidity in various tenors, and risk factors. There are two practical methods that use Government Bond Futures:

Benchmarking against the nearest benchmark Government Bond Futures from a duration perspective.

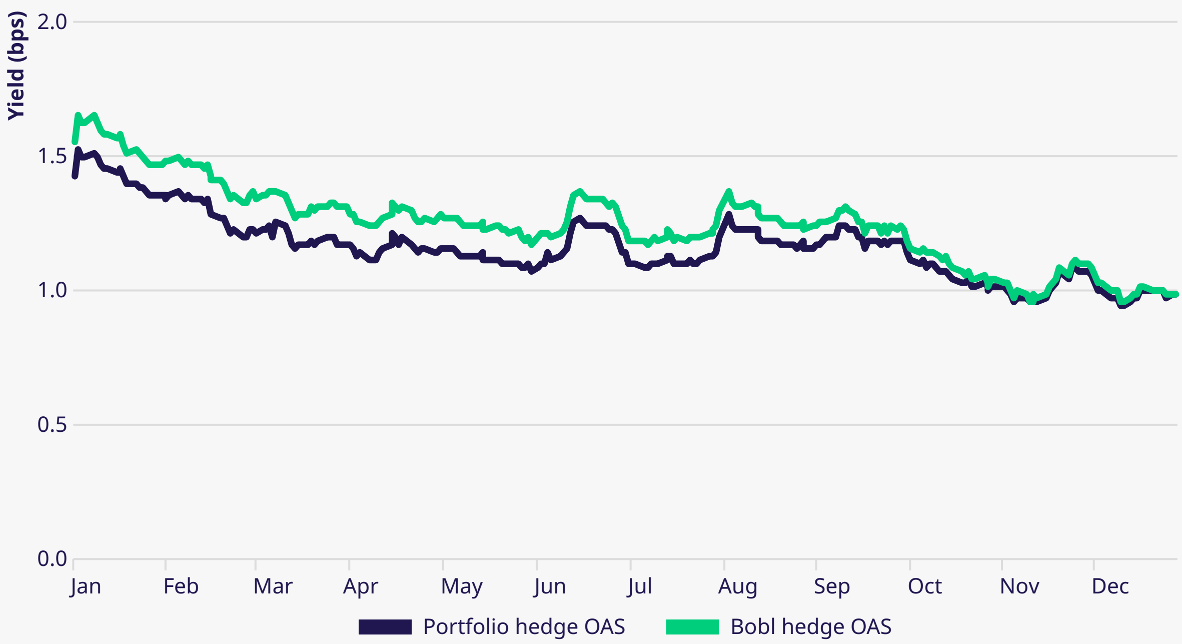
This method is the quickest and fastest to implement. While it can generally track movements on the front end until the maturity of the CTD, it can lack sensitivity on the back end. This makes the strategy particularly vulnerable to changes in the shape of the curve. The credit spread can be calculated as the spread against the yield of the CTD Bond.

Table 1: Theoretical hedge composition of a €100m investment in RECMTREU Index using Bobl Futures.

Duration window	Average index duration	Correspoding hedge	Futures duration	Futures contracts per €100m
0 – 100	4.30	Bobl Future	4.36	848

Source: Bloomberg, Eurex.

Figure 2: Theoretical Yields of an RECMTREU Portfolio hedged with EGB Futures throughout 2024.



Source: Bloomberg, Eurex.

Benchmarking against a portfolio of futures

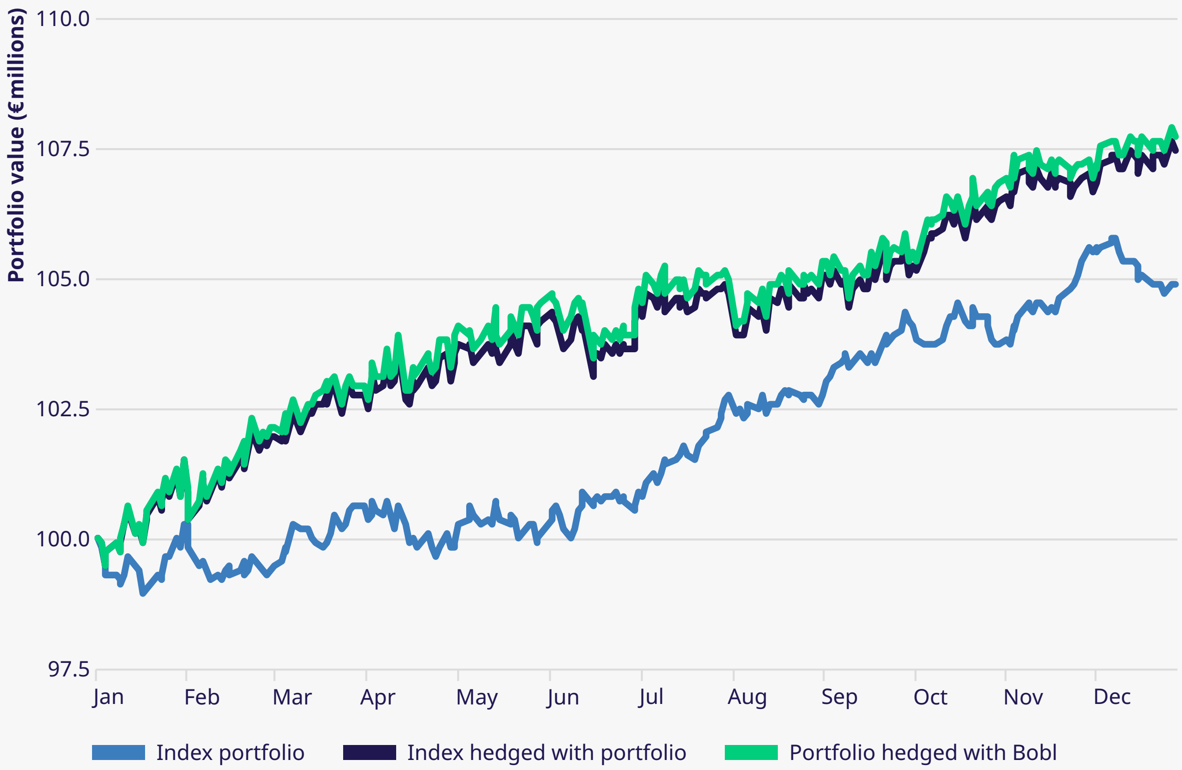
One common method used by, e.g., Bloomberg is to group the bonds in the underlying index into buckets, corresponding to a duration-matched government bond future. The resulting futures portfolio can map most curve movements accurately and reasonably stable, so the weights don't change too much. Here, the benchmark yield is the futures price-weighted average yield of the CTDs of the hedging portfolio.

Table 2: Theoretical hedge composition of a €100m investment in RECMTREU Index using EGB Futures.

Duration basket	Average basket duration	Correspoding future hedge	Futures duration	Futures contracts per €100 m
0 – 2.5	1.69	DUA Comdty	1.82	245
2.5 – 7	4.46	OEA Comdty	4.36	513
7 – 13	8.56	RXA Comdty	7.92	97
13 – 100	15.51	UBA Comdty	19.88	7

Source: Bloomberg, Eurex.

Figure 3: Theoretical Performance of a €100 m Investment in 2024. Base Index RECMTREU and EGB Futures hedges.



Source: Bloomberg, Eurex.

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