Q3 Methodology:

Instruments & Conventions:

Deposits: We use deposit rates starting from SWD (one week) onwards. The day count convention for deposits is Act/360.

IRS: We'll use IRS rates with standard market conventions: fixed leg with 30/360 day count and annual payments, while the floating leg follows EURIBOR conventions (Act/360).

Spot Date:

With a 2-day spot lag from the trade date (November 24, 2024), our spot date is November 26, 2024.

Curve Construction:

We will build three independent yield curves using QuantLib’s built-in helpers:

One with linear interpolation on swap rates,

One with constant forward interpolation,

One with cubic spline interpolation.

We’ll use the default solver/calibration settings provided by QuantLib.

Outputs:

For each curve, we’ll generate:

A table and plot of discount factors versus maturity.

A table and plot of spot (zero) rates versus maturity.

A table and plot of forward rates versus maturity.

The output range covers the entire term structure—from the earliest usable instrument (SWD deposit) up to the longest maturity (60Y IRS).

Generally, you would use the deposit rate for the 1‑year maturity and not the swap rate. Deposit rates are typically viewed as the more direct, liquid measure for short-term funding costs, while swap rates are used to extend the curve to longer maturities. Using the deposit rate helps anchor the short end of your curve consistently, as outlined in standard bootstrapping procedures

Q6 Assumptions:

 **Simplification Assumption:**  
In practice, CVA is often calculated as the discounted expected loss using the *incremental* (or marginal) default probability over each period. That is, instead of using 1−Q(t)1−Q(t) (which is the cumulative default probability up to time tt), you might compute the difference between survival probabilities at successive periods:

ΔDefault Probability=Q(ti−1)−Q(ti)ΔDefault Probability=Q(ti−1​)−Q(ti​)

Multiplying this incremental default probability by the exposure in that period would yield a more precise CVA.  
**Your approach, however, is a reasonable discrete approximation** if you assume default risk is evaluated only at coupon dates and the exposure remains constant within each period.

 **Exposure Assumption:**  
You’ve taken the coupon amount as the exposure. This is appropriate if the main concern is the loss of coupon payments in the event of default. In a more detailed model, you might consider both coupon and principal exposures, especially if default risk applies to the whole bond value.

**To evaluate the bond for Q10, the analysis is based on the market price as of 18 Nov 2024, with the decision to purchase the bond occurring on 24 Nov 2024. The bond's fair value and credit-adjusted price are calculated as of 18 Nov, ensuring that the model-implied price is compared to the market price (98.43) from EuroTLX on that date. The CDS spread is then adjusted to match the market price, simulating the credit risk on 18 Nov and not accounting for market changes between 18 Nov and the 24 Nov purchase decision.**

Why is the **market-implied CDS** we just backed out (34.06 bps) **different from** the **quoted CDS** (49.21 bps) that we used earlier?

Let’s break that down — because this is the key insight Q10 is really testing for.

## 🧠 They're Not Supposed to Be the Same.

You're comparing:

| **CDS Source** | **What It Means** |
| --- | --- |
| **Quoted CDS (49.21 bps)** | Market price for a **standard CDS contract** on the issuer (BNP), likely 5Y |
| **Implied CDS (34.06 bps)** | What the bond price suggests the market thinks about **this bond's credit risk** |

So now the question becomes:

## ❓ Why Aren’t They Equal?

Great. Here are the **four key reasons**:

### 1. 📅 **Maturity Mismatch**

Your bond matures **in July 2027** (~2.7 years from evaluation date).

But the CDS quote (49.21 bps) is **likely a 5-year CDS**, which:

* Prices in risk over a longer horizon,
* May be more sensitive to longer-term credit risk,
* Has more liquidity.

🧠 **Implied CDS is a shorter-term measure.**

### 2. 💸 **Recovery Rate Assumption**

In your CVA model, you're using a **fixed 40% recovery**.  
But the real CDS market could be pricing in a **different implied recovery**, which affects how the spread is quoted.

### 3. 💧 **Bond-Specific Factors**

Your bond may have:

* A cap/floor structure,
* Slightly less liquidity,
* Cash flow timing differences vs. a par bond

So even with the same issuer, **individual bonds can trade differently** than the synthetic CDS market.

### 4. 📉 **CDS vs. Cash Bond Market Dynamics**

* CDS markets often move faster, more reactively.
* Bond pricing can be influenced by:
  + **Liquidity**
  + **Dealer inventory**
  + **Investor demand**
  + **Technical factors**

So they may not always be in sync — and this spread difference is exactly where **relative value trading** happens.

## ✅ So What Are You Really Doing in Q10?

You're reverse-engineering:

“What credit risk does this **specific bond price** imply?”

Then comparing it to:

“What credit risk does the **CDS market** think the issuer has?”

## 📢 Insight You Can Write

The quoted CDS spread of 49.21 bps reflects general 5-year market pricing for the issuer’s credit risk, while the bond’s market-implied CDS of 34.06 bps is specific to the structure, maturity, and pricing of this bond. The difference may reflect liquidity premiums, maturity mismatches, or technical dislocations between the CDS and bond markets. Such discrepancies can be used to identify relative value or arbitrage opportunities between the bond and CDS curves.

## ✅ 5. Let's Code This

### Just to confirm:

* You want to use **quoted market swap rates** from your existing Excel sheet (MarketData.xlsx), correct?
* We'll assume a notional of **€1,000** for the bond (consistent with the rest of your code)?
* We’ll use the same **log-cubic discount curve** from Q3, and **evaluation date = 18 Nov 2024**?

If so, I’ll write the script that:

* Builds and prices the 3Y vanilla swap
* Bumps the curve ±1bp and recomputes NPV
* Computes the PVBP
* Computes the **hedge ratio** against your bond’s level sensitivity (from Q11)

Ready to go? Just confirm those assumptions above and I’ll drop the full implementation.