BAYES BUSINESS SCHOOL
CITY ST GEORGE'S UNIVERSITY OF LONDON

Group Coursework Submission Form (PA)

Specialist Masters Programme

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MSc in: Quantitative Finance	
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Module Title: Fixed Income	
Lecturer: Professor Gianluca Fusai	**Submission Date:** 27th of March 2025

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SMM269 Fixed Income

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Contents

1 Product Description and Market Data

1.1 Product overview

In this report, we discuss a pricing method for a structured bond and implementation of a hedging strategy.

As of the trade date (November 24, 2024), the bond has a little short of three years to the maturity (July 29, 2027), and promises quarterly payment of variable interest rates according to 3-month EURIBOR rate determined two days prior to start of the relevant coupon period, subject to a minimum interest rate of 1.60% p.a and a maximum of 3.70% p.a. These features suggest that the cash flow of the bond is as shown in red line in Figure 1. As a result, this cashflow structure can be replicated by the combination of:

1. a floating rate note (FRN) with zero spread and the same reference rate, reset date, coupon payment dates and maturity as the bond, and;
2. long position of a floor with strike rate at 1.6% and short position of a cap with strike rate at 3.7%, where the length of agreement, frequency, of reset tenor and the notional amount are alined to be the same as the FRN component above.

As indicated by dotted lines in the figure, these two components have offsetting payoff structure at or below 1.6% and at or above 3.7%, which generates the identical cashflow as the bond at each corresponding level of EURIBOR rate.

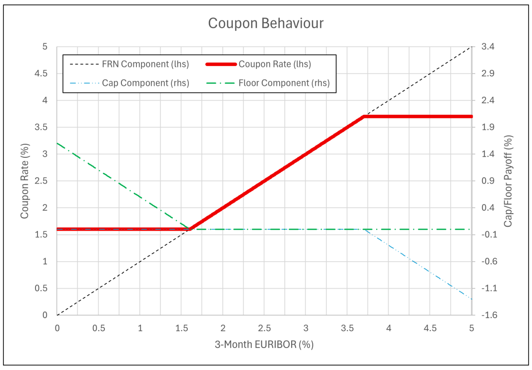

Figure 1: Coupon Behavior

Figure 2 summarizes all the historical coupon payments up until the trade date. Since issuance, EURIBOR rates at each reset date experienced significant fluctuation from as low as 0.238% to almost 4%. As a result, the bond provided the floor rate of a 1.6% instead of 0.238% p.a. at the first payment, while paying the cap rate of 3.7% p.a. during the period of October 2023 and July 2024, demonstrating the both cap and floor structure of the bond as examined above.

Reset Date	Start Date	End Date	# of Days (30/360)	Reference Rate (%)	Coupon Rate (%)	Coupon Amount
7/27/2022	7/29/2022	10/31/2022	91	0.238	1.6	4.04
10/27/2022	10/31/2022	1/29/2023	89	1.605	1.605	3.97
1/26/2023	1/29/2023	4/29/2023	90	2.468	2.468	6.17
4/27/2023	4/29/2023	7/29/2023	90	3.25	3.25	8.13
7/27/2023	7/29/2023	10/29/2023	90	3.714	3.7	9.25
10/26/2023	10/29/2023	1/29/2024	90	3.952	3.7	9.25
1/25/2024	1/29/2024	4/29/2024	90	3.925	3.7	9.25
4/25/2024	4/29/2024	7/29/2024	90	3.864	3.7	9.25
7/25/2024	7/29/2024	10/29/2024	90	3.686	3.686	9.22

1.2 Interest Rate Assumptions

For the use of bond pricing, we derived the interest rates at different points in future time by bootstrapping the market rates. For this purpose, we used the EURIBOR rates up to 12 months and swap rates from 2 year to 30 year, and adopted geometric interpolation for the period where market data is not available.The derived term structure of interest rate is shown in Figure 2.

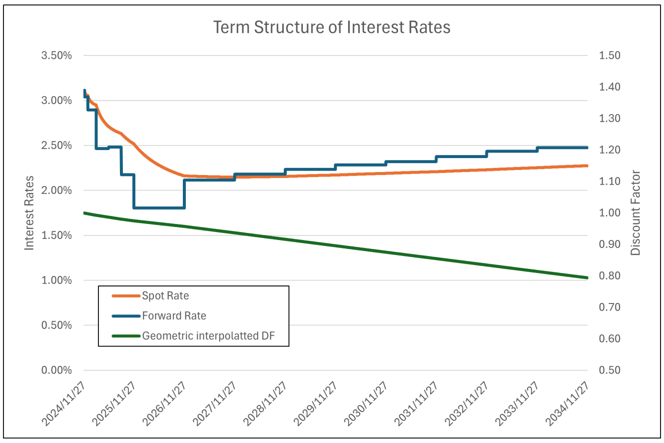

Figure 2: Term Structure of Interest Rates

2 Pricing Procedures and Model Justification

As we saw in the first section, the bond is assumed to have the interest rate exposure in relation to the two different components, namely the FRN component and option component. In addition, it should be noted that the bond also has credit risk exposure corresponding to a bank with credit rating of AA. Based on these main characteristics, the general structure of the fair value of the bond is modeled as follows:

$$FV_{bond} = FRN\,Value + Option\,Value - Credit\,Value\,Adjustment \tag{1}$$

2.1 FRN component

2.1.1 Fair value of FRN component

In a standard FRN case, if we can assume the issuer is default-free, we have zero risk in the undetermined future cashflows. Hence, in this case the present value of FRN is solely dependent on the current coupon, as described by:

$$PV_{total\,cashflow} = P(t, T_1) \cdot (1 + c \cdot \alpha_{T_0,T_1})$$

where c denotes current coupon, T_0 and T_1 are the last reset day and next coupon payment day. This value consists the value of FRN component of the bond.

2.1.2 Implications of non-linear cashflow

In a standard FRN case, the best scenario for the bond holder at maturity is that the total coupon payment is maximized, and the worst scenario is that the total coupon payment is minimized. These two scenarios correspond to the EURIBOR rate moving above 3.7% or below 1.6% throughout the entire period. The total cash received until maturity without compounding is summarized in Table 2.

Best Case	Worst Case	Difference
1100.22	1043.32	56.9

Table 2: Best vs Worst Case Comparison

On the other hand, the evaluation of the present market value of total cashflow becomes not straightforward in the presence of the option component. With regards to the relationship of the cashflow and EURIBOR rates, there are 3 possible scenarios:

1. 3-month EURIBOR rate moves between 1.6% and 3.7% until matuiry. In this case, the present value of total cashflow is descreibed by 2.1.1.
2. 3-month EURIBOR rate moves above 3.7%.In this scenario, while the coupon rate is capped at 3.7%, higer interest rate exceeding 3.7% discounts the scheduled coupon payments. As a result, $EURIBOR(T_i, T_{i+1}) \times \alpha_{T_0,T_1}$ will be smaller than $P(t, T_i) - P(t, T_{i+1})$, hence:
$$PV_{total\,cashflow} < P(t, T_1) \cdot (1 + 0.037 \cdot \alpha_{T_0,T_1}) \cdot FV$$
3. 3-month EURIBOR rates move below 3.7%. Contrary to the scenario 2, while the minimum cashflow is secured at 1.6%, the discount factor can be more larger, which results in:
$$PV_{total\,cashflow} > P(t, T_1) \cdot (1 + 0.016 \cdot \alpha_{T_0,T_1}) \cdot FV$$

As a result, if the best (worst) scenario is expected at present, the bond holder might be better off by selling (keeping) the bond. This characteristic highlights the bond's nature as an instrument to prepare for a market downturn.

2.2 Option Component

We price the option components embedded in the coupon structure using the Black model for interest rate derivatives. Firstly, the overall coupon structure we noted in section 2.1 can be replicated as follows:

$$\text{Coupon}_t = \min(\max(\text{Euribor}_t, \text{Floor}), \text{Cap}) = \text{Euribor}_t - \text{Caplet}_t + \text{Floorlet}_t \tag{2}$$

The above decomposition treats the coupon as a floating-rate note (FRN), adjusted by subtracting a caplet and adding a floorlet for each period. This enables us to isolate and value the embedded option components.

2.2.1 Model Selection and Justification

We use the Bachelier (1900) model for pricing caplets and floorlets. This model assumes that forward rates follow a normal distribution under their respective forward measures. It is particularly appropriate when market conditions involve low or negative interest rates, or when volatilities are quoted in absolute (normal) terms.

The caplet and floorlet values under the Bachelier model are given by:

$$\text{Caplet}_i = \delta_i P(t, T_i) \left[(F_i - K)N(d) + \sigma_i \sqrt{T_i}\, n(d) \right] \tag{3}$$

$$\text{Floorlet}_i = \delta_i P(t, T_i) \left[(K - F_i)N(-d) + \sigma_i \sqrt{T_i}\, n(d) \right] \tag{4}$$

where:

$$\begin{aligned}
d &= \frac{F_i - K}{\sigma_i \sqrt{T_i}} \\
\delta_i &= \text{day-count fraction} \\
P(t, T_i) &= \text{discount factor to maturity} \\
F_i &= \text{forward rate observed at time } t \\
K &= \text{strike rate (cap or floor)} \\
\sigma_i &= \text{normal (absolute) volatility of } F_i \\
N(\cdot) &= \text{standard normal cumulative distribution function} \\
n(\cdot) &= \text{standard normal probability density function}
\end{aligned}$$

Unlike the Black model, the Bachelier framework does not require rates or strikes to be strictly positive, making it more robust in environments with negative rates or near-zero forwards.

2.2.2 Volatility Calibration

Caplet volatilities were calibrated from market quotes of 3-month EURIBOR caps. The implied volatilities were interpolated to match the quarterly coupon schedule of the bond. Since the cap strike (3.70%) lies significantly above all forward rates observed on the valuation date, the caplet values are effectively zero. Conversely, forward rates are below the floor rate (1.60%), making the floorlets in-the-money and non-zero. The resulting values of the floor and cap components for each coupon payment are summarized below:

Floorlet	**Caplet**
0.001210	-
-0.000092	0.000069
0.000100	-0.000072
0.000166	-0.000039
0.000572	-0.000657
0.000881	-0.001706
0.000978	-0.001656
0.001070	-0.001595
0.001146	-0.001511
0.000972	-0.000502
0.001041	-0.000439

Table 3: Floorlet and Caplet

The final row represents the **summed values** of all forward premiums across the coupon dates:

- **Total Floor Premium (long position):** 0.008043708
- **Total Cap Premium (short position):** -0.008108942

As expected, the cap component has negligible value due to the cap being far out-of-the-money under current interest rate conditions. The floor components are positive and contribute to the bond's value, acting as protection for the bondholder in low interest rate environments. These results reflect the asymmetric optionality embedded in the coupon structure of the bond.

2.3 Credit Valuation Adjustment (CVA)

2.3.1 Conceptual Overview

To account for the issuer's potential default before maturity, we adjust the risk-free valuation of the bond by incorporating the **Credit Valuation Adjustment (CVA)**. The CVA represents the expected loss arising from counterparty credit risk and is defined as the difference between the bond's risk-free value and its risky value.

The survival probability of the issuer over the time interval $[t, T]$ is approximated using the CDS spread:

$$Q(t,T) = \frac{e^{-CDS(t,T)\cdot(T-t)} - R}{1-R} \tag{5}$$

where:

- $Q(t,T)$ is the survival probability over $[t,T]$,
- $CDS(t,T)$ is the CDS spread over the period (in decimal),
- R is the recovery rate (assumed 40%).

Then, by defining $D(t,T) = 1 - Q(t,T)$, CVA is obtained as the difference in theoretical fair value of the FRN with credit risk and default-free FRN:

$$\begin{aligned} CVA = & - P(t,T_1)\cdot D(t,T_1)\cdot c\cdot \alpha_{T_0,T_1} - \sum_{i=2}^{11} P(t,T_i)\cdot D(t,T_i)\cdot F(t,T_{i-1},T_i)\cdot \alpha_{T_{i-1},T_i} \\ & - P(t,T_{11})\cdot D(t,T_{11}) + R\cdot \sum_{i=2}^{11} P(t,T_i)\cdot (D(t,T_i) - D(t,T_{i-1})) \\ & + R\cdot P(t,T_1)\cdot (D(t,T_1)) \end{aligned} \tag{6}$$

2.3.2 Risk Adjusted Valuation

Using the cash flow profile of the bond, we decompose the present value into:

- Present Value (PV) of coupons assuming survival: €43
- PV of the notional assuming survival: €915.97
- PV of expected recovery upon default: €11

Thus, the total risky value of the bond is:

$$\text{Risky Value} = 57.2 + 924.3 + 7.9 = \text{€ } 989.3 \tag{7}$$

The risk-free value, i.e., the full PV of coupons and notional assuming no default, is:

$$\text{Risk-Free Value} = \text{€ } 1001.2 \tag{8}$$

2.3.3 CVA Calculation

The Credit Valuation Adjustment is then computed as:

$$\text{CVA} = \text{Risk-Free Value} - \text{Risky Value} = 1001.2 - 989.3 = \text{€ } 11.9 \tag{9}$$

Recovery Ratio	40.00%
PV Coupons on Survival	€ 57.20
PV Notional on Survival	€ 924.3
PV Cash Flow on Default	€ 7.9
Risk-Free Value	€ 1001.20
Risky Value	€ 989.3
Bond Gross Price	€ 989.30
CVA	€ 11.9

Table 4: CVA and Risk-Adjusted Valuation Summary

Discussion

The CVA of €11.9 quantifies the market-implied compensation for bearing the credit risk of BNP Paribas over the bond's remaining life. A recovery rate of 40% was assumed in line with market convention. The calculation reflects the potential loss in value if the issuer defaults, based on CDS spreads sourced from Investing.com.

Assumptions

For the survival probability calculation, the following key assumptions were made:

- **Constant CDS Spread:** A flat CDS term structure was assumed, with a constant spread of 1% across all maturities.
- **Fixed Recovery Rate:** A fixed recovery rate of 40% was applied to BNP Paribas debt, in line with market conventions.
- **Risk-Neutral Framework:** All calculations were performed under a risk-neutral measure, consistent with standard valuation models for credit risk.
- **No Counterparty Risk:** The model assumes the CDS protection seller is default-free. Thus, no adjustment was made for CDS counterparty credit risk.

3 Implementation of Pricing Procedure

Coupon Component Valuation and Bond Pricing

The bond's valuation under the risk-free assumption is decomposed into the present value of its coupons and the notional repayment. The following table summarizes the present value of each component:

Component	Present Value (EUR)
Face Value	1,000.00
Present Value of Coupons	57.70
Present Value of Notional	943.4
Bond Gross Price	**1,001.2 0**

Table 5: Risk-Free Valuation of Coupon and Notional Components

Accrued interest is computed based on the current coupon and time elapsed since the last coupon payment. With 28 days elapsed in a 92-day accrual period, the accrued interest is:

$$\text{Accrued Interest} = 6.51 \times \frac{28}{92} = 1.98 \text{ EUR} \tag{10}$$

Metric	Value (EUR)
Current Coupon	6.51
Days Since Last Coupon	28
Days in Coupon Period	92
Accrued Interest	1.98
Clean Price	**999.20**

Table 6: Accrued Interest and Clean Price

The gross price includes accrued interest, while the clean price represents the market quote net of accrued amounts.

Expected Cash Flow Profile

To further analyze the bond, we generate a chart of the expected future cash flows (excluding notional repayment). These reflect the projected coupon payments under the risk-free scenario, taking into account the capped and floored floating structure of the bond.

Expected Cash Flow Values

Period	Expected Coupon (EUR)
1	6.51
2	7.21
3	6.26
4	6.47
5	5.47
6	3.69
7	3.89
8	4.09
9	4.25
10	5.76
11	5.95

Table 7: Expected Coupon Cash Flows (Quarterly)

Cash Flow Chart

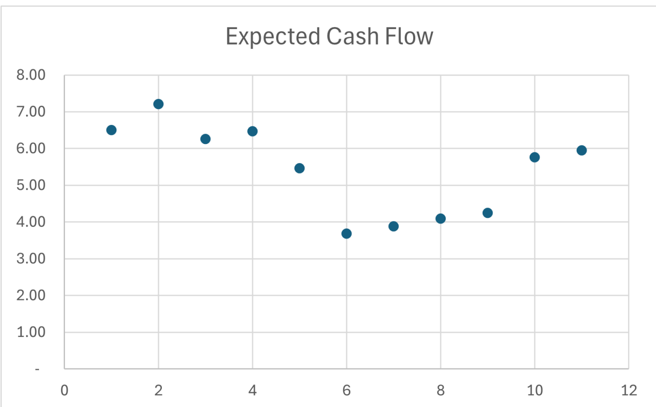

Figure 3: Projected Coupon Cash Flows Over Time

Commentary

As shown in the table and chart above, the expected coupon payments vary over time due to the interaction between the projected 3-month Euribor rates and the bond's embedded floor (1.60%) and cap (3.70%). Periods where forward rates are low result in cash flows closer to the floor level, while higher-rate periods push cash flows toward the cap. This uneven pattern reflects the optionality embedded in the structure, which affects both pricing and hedging strategies.

Market Comparison and Implied CDS Estimation

We compare the model-derived fair value of the bond to its observed market price and estimate the market-implied CDS spread.

Fair Value vs Market Value

- **Model Fair Value (Clean Price)**: €999.20
- **Market Price (EuroTLX, 18 Nov 2024)**: €984.30

The model price is higher than the market price, suggesting that the market is pricing in **higher credit risk** compared to our model assumptions. A higher credit risk corresponds to a higher CDS spread and hence a lower bond valuation.

Implied CDS Spread Estimation

To estimate the **market-implied CDS spread**, we invert the bond valuation process. Using a calibrated mapping between CDS spreads and bond prices, we find the CDS spread that aligns the model value with the observed market price. Table 8

CDS	Shift (in bps)	Fair Value
0.004576	0	989
0.004476	-1	990
0.004076	-5	991
0.003576	-10	992
0.003076	-15	993
0.002576	-20	994
0.004676	1	989
0.005076	5	988
0.005576	10	987
0.006076	15	985
0.006576	20	984

Table 8: Bond Valuation vs CDS Spread

From this mapping, we interpolate to find the **market-implied CDS spread** that justifies the market price of €984.30:

$$\text{Implied CDS Spread} \approx 0.00194 \quad \text{or} \quad 19.4 \text{ bps} \tag{11}$$

$$\text{Market Implied CDS} \approx 0.00651 \quad \text{or} \quad 65.1 \text{ bps} \tag{12}$$

Discussion

This result suggests that the market perceives BNP Paribas to be more risky than implied by the 45.8 bps spread used in the initial model. The interpolated spread of 19.4 bps reflects the credit risk level embedded in the market price. This difference may stem from updated market sentiment, differences in liquidity, or a more pessimistic market view on BNP's creditworthiness.

The exercise also illustrates how market prices can be reverse-engineered to extract implied credit spreads, providing valuable insights into how credit risk is perceived in real-time.

Sensitivity to Shifts (Level, Slope, Curvature)

The sensitivities of the bond's price with respect to changes in the level, slope and curvature are reported below in Table 9 :

The shifts applied are (Level: -0.2%; Slope: 0.1% to the shortest term and -0.1% to the longest term, distributed equally across maturities; Curvature: Convexity applied as 0.5% to the shortest and longest end of the maturities and -0.5% to the median).

	Up Shifts		**Down Shifts**		**DV01**		**Hedge**
	Bond	**Swap**	**Bond**	**Swap**	**Bond**	**Swap**	**Ratio**
Parallel	1,006	11	997	2	-5	-5	-0.9579
Slope	1,000	5	1,002	7	1	1	-0.8801
Convexity	1,010	14	992	-2	-9	-8	-1.1034

Table 9: Bond and Swap Sensitivities with Hedge Ratios

The sensitivity analysis shows how the bond's value responds to various shifts in the term structure of interest rates. We have calculated key sensitivities to implement an effective hedging strategy.
These shifts represent the principal components of yield curve dynamics, capturing approximately 95% of all historical term structure movements. The analysis shows that the bond's price is most sensitive to convexity shifts followed by parallel shifts in the yield curve, with the initial value of 1,001 changing to 1,010 for upward shifts and 992 for downward shifts in convexity, and with the initial value of 1,001 changing to 1,006 for upward shifts and 997 for downward shifts for level, respectively. The DV01 (dollar value of 01) values indicate that a 1 basis point parallel shift results in a price change of approximately 5 currency units, while slope and convexity changes have impacts of 1 and 9 currency units respectively.

Hedging Strategy using plain vanilla Swap

Based on the sensitivity analysis, we'll develop a hedging strategy using plain vanilla swaps to neutralize the bond's exposure to term structure movements.

Swap Selection Criteria

- **Maturity matching:** Select swaps with maturities corresponding to the bond's key exposure points.
- **Liquidity consideration:** Focus on highly liquid benchmark tenors for efficient execution.
- **Hedge effectiveness:** Use combinations of swaps that collectively offset the bond's sensitivities.

Hedge Ratio Determination

The hedge ratios derived from the sensitivity analysis guide our implementation:

Risk Factor	Hedge Ratio	Implementation Approach
Parallel	-0.9579	Primary hedge using receiver swaps with notional = 95.79% of bond face value
Slope	-0.8801	Barbell strategy using shorter and longer tenor receiver swaps with combined notional = 88.01% of bond face value
Convexity	-1.1034	Multi-point hedge using appropriate receiver swaps with notional = 110.34% of bond face value

Table 10: Hedge Ratios and Implementation Approaches

All swaps would be structured as receiver swaps (receive fixed, pay floating) to offset the FRN with floor minus cap structure of the bond. The negative hedge ratios confirm this direction of the hedge. This approach creates a comprehensive hedging strategy that addresses all three principal components of yield curve risk while maintaining operational efficiency.

Hedging Strategy: Implementation and Limitations

The implementation approach is as per Table 10.

Key Limitations

- **Non-linearity mismatch:** The bond's embedded options create convexity that linear instruments like vanilla swaps cannot perfectly replicate, resulting in residual second-order exposures.
- **Basis risk between hedging tenors:** Perfect correlation between swap rates at different tenors cannot be assumed, especially during market dislocations.
- **Dynamic hedge parameters:** The hedge ratios themselves are not static and will require recalibration as market conditions evolve.

Sensitivity to Changes in CDS Levels

To assess the bond's exposure to credit risk, we analyze how its fair value responds to changes in the CDS spread — effectively measuring its sensitivity to credit spread movements, or **CVA delta**.

Methodology

We varied the CDS spread incrementally above and below the base case (65.76 bps) and revalued the bond for each spread. The results are summarized below:

CDS Spread (Decimal)	Shifti (bps)	Fair Value (EUR)
0.006576	0	970
0.004476	-1	976
0.004076	-5	977
0.003576	-10	979
0.003076	-15	980
0.002576	-20	981
0.004676	+1	976
0.005076	+5	975
0.005576	+10	973
0.006076	+15	972
0.006576	+20	971

Table 11: Bond Value Sensitivity to CDS Spread Changes

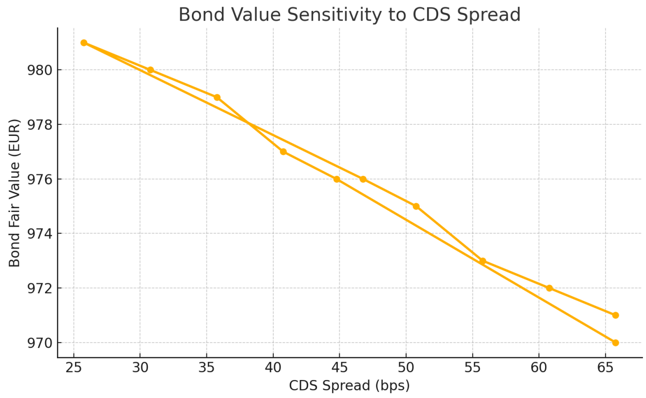

Figure 4: Bond Value Sensitivity to Changes in CDS Spread

Interpretation

The bond demonstrates a clear inverse relationship between credit risk and market value.

- As **credit quality improves** (i.e., CDS spread decreases), the bond's value increases.
- As **credit risk increases** (i.e., CDS spread widens), the bond's value declines.

This relationship is consistent with the economic intuition of fixed income markets, where higher credit spreads imply greater risk of default and thus a lower bond valuation.

Estimated Sensitivity

From the data:

$$\Delta\text{Price} \approx -2 \text{ units per 10 bps change in CDS}$$

$$\Rightarrow \frac{\Delta\text{Price}}{\Delta\text{CDS}} \approx -0.2 \text{ per basis point}$$

This suggests the bond's fair value is moderately sensitive to changes in credit spreads, with a CVA delta of approximately **-0.2 per basis point**. This sensitivity can be used to evaluate credit risk exposure and to inform hedging strategies using CDS instruments.

Hedging Credit Risk with CDS

The BNP Paribas bond pays floating coupons linked to the 3-month Euribor with a floor of 1.60% and a cap of 3.70%. The bond matures on July 29$^{\text{th}}$, 2027. If the bond defaults, bondholders may stop receiving payments and typically recover only a portion of the bond's principal.

Hedging Strategy

Credit Default Swaps (CDS) can be used to hedge against such credit uncertainties. A CDS is a bilateral contract in which the protection buyer pays a periodic fee (CDS spread) to the protection seller. In return, if the reference entity (in this case, BNP Paribas) defaults, the protection seller compensates the buyer for the loss. This effectively acts as credit insurance.

Implementation Steps

1. After determining the exposure amount, the investor enters into a 5-year CDS contract as the protection buyer, matching the bond's maturity.
2. The protection buyer pays a quarterly spread (premium) to the protection seller. This payment is the cost of hedging.
3. If no default occurs, the CDS expires worthless and the buyer incurs only the premium cost.
4. If a default occurs, the protection seller reimburses the buyer for the loss based on the CDS payout formula.

CDS Payout Formula

$$\text{CDS Payout} = (1 - R) \times \text{Notional} \tag{13}$$

where R is the recovery rate (typically assumed to be 40%), and the Notional is the face value of the bond.

3.1 Risk Analysis

Given the bond's sensitivities against each of the level, slope, curvature of the spot rate and against the CDS spread, we examined the Value at Risk (VaR) and Expected Shortfall (ES) at 99% confidence level. Table 12 illustrates the results based on Monte Carlo simulation, and the corresponding price change derived from exact formula (2), given the movement of the risk factors that gives VaR by Monte Carlo simulation. Figure5 shows entire P&L distribution obtained by 10,000 simulations. While the ES calculation is implemented based on individual values, the values of *Shocks* column of *ES* row indicate conditional averages of each factor for reference.

	Shocks				PnL		
	Level	Slope	Curvature	CVA	MC	Exact	Difference
VaR	0.3520	-0.0386	-0.0016	0.0576	184.2165	138.1128	46.1037
ES	0.3773	-0.0167	0.0272	0.0053	215.2883	154.9332	60.3551

Table 12: VaR and ES

The result above shows the there are some gap between the estimates of the MC method and Exact method, highlighting the difficulty of precisely estimating the risk embedded in the complicated structure. Next, to investigate the risk structure further, we decomposed the VaR to Marginal VaR and CVaR. The results are summarized in Table 13.

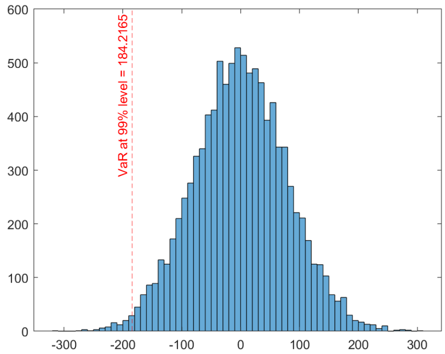

Figure 5: P&L Distribution

	Level	Slope	Curvature	CVA
MVaR	446.0588	-12.1652	36.4957	8.1102
CVaR	159.3067	0.8689	23.4615	0.5793

Table 13: Summary of decomposed VaR

The table indicates that the level component is dominant in contribution to the total risk. This implies that even if the cashflow structure is not straight forward, large part of the risk can be hedged by adequate hedging strategy to cover level component. Finally, the fair value of the bond price is decompoed in the following Table14.

	FRN component	Option component	CVA component	Total
Present Value	4.1690	1000.1387	-16.8612	987.4466

Table 14: Fair value of the components

As it can be expected from formula (1), this highlights FRN component occupies only a small portion in the present value, and the value of the bond is essentially linked to the option value.

4 Results and Discussion

The analysis of the BNP Paribas structured bond reveals several key insights: The bond's fair value (€989.30) differs from its market price (€984.30), indicating the market perceives higher credit risk than our model assumes. Component analysis shows the option element dominates the value structure (€1000.14), while the FRN component contributes minimally (€4.17). The CVA adjustment (€16.86) reflects the required credit risk premium. Sensitivity analysis indicates highest responsiveness to term structure level and curvature changes, with DV01 values of -5 and -9 respectively. Risk decomposition confirms level risk dominance (Marginal VaR: 446.06), suggesting hedging strategies should prioritize this factor. The asymmetric cash flow projection reflects the interaction between projected EURIBOR rates and the bond's floor and cap constraints

5 Recommendations and Conclusions

5.1 Recommendations

Based on our analysis, we recommend a cautious long position in this bond for investors seeking moderate income with downside protection. The current market price of €984.30 represents a slight undervaluation compared to our fair value estimate, offering a potential entry point. However, investors should implement the suggested hedging strategy to mitigate interest rate risks, particularly level risk exposure. The bond is most suitable for portfolios seeking to limit downside risk in low-rate environments while accepting capped returns during rate increases.

5.2 Conclusion

The bond's value is primarily driven by its option components rather than its floating rate characteristics. The floor mechanism (1.60%) provides significant protection during low interest rate environments, while the cap (3.70%) limits returns in high-rate scenarios. Effective hedging requires focusing on level risk neutralization using receiver swaps at 95.79% of face value, with supplementary hedges for slope and curvature risks. Credit risk exposure can be managed with CDS contracts, with moderate sensitivity (-0.2 per basis point). This structured product balances floating rate exposure with embedded optionality, offering a tailored risk-return profile suited to moderate interest rate environments.