MASTER OF FINANCIAL ENGINEERING
UCLA Anderson School
Credit Risk
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Problem Set 3

Problem 5 (Credit Default Swaps) We assume that the intensity follows a CIR process with parameters

$$\kappa = 0.02,\ \theta = 0.01,\ \sigma = 0.1,\ \lambda_0 = 0.01.$$

(a) Implement the values of the fee and the protection leg when the intensity follows a CIR process. You should be able to deal with both discrete and continuous coupon payments.

(b) Compute the fair spreads of a CDS contract when $r = 0.05$ and $R = 0.4$ for maturities $T = 1, ...10$ and quarterly fee payments.

(c) Compare your results from part (b) to a situation where fee payments are made continuously.

Problem 6 (CDS Calibration) On March 24, 2010, we observed the CDS spreads for Google that are given below. Fee payments are made quarterly and the default-free interest rate is assumed to be $r = 0.05$. The recovery is assumed to be $R = 0.4$.

Maturity	CDS spread in bps
1	11.29
2	14.175
3	17.15
4	19.78
5	22.135
6	24.56
7	27.015
8	30.085

(a) Implement the fair spread of a CDS when the intensity λ_t follows an inhomogeneous

Poisson process with stepwise-constant intensity

$$\lambda(t) = \sum_{i=0}^{7} \lambda_i^{step} \cdot \mathbf{1}_{[i,i+1]}(t).$$

(b) To calibrate the model, you have to determine the parameters λ_i^{step} for $i = 0, 1, \ldots, 7$. For $i > 1$ this has to be done numerically. However, for $i = 0$ there is a closed-form solution for λ_0^{step} if fees are paid continuously. Provide this solution and explain.

(c) Calibrate the above model to the first 7 observed CDS spreads and plot the intensity process.

(d) Now calibrate the model when you include the 8-year CDS. What happens? Explain your answer.

(e) Finally, use a CIR model to calculate CDS spreads. To calibrate such a model, one usually minimizes the pricing errors. Implement a function that gives you the average quadratic pricing error for some given observed spreads when using a parameter set $[\kappa, \theta, \sigma, \lambda_0]$. Minimize this pricing error function via an optimization algorithm (MATLAB: fsolve, fminsearch,...) and provide the optimal parameters.