

Assignment 3.

1. Exercise: Asset Swap

Given the discounting curve vs Euribor 3m on the 15th of February 2008 at 10:45 C.E.T. and knowing that a 3y bond price for an issuer YY is 101 (101% of the *face value*) with an annual coupon equal to 3.9% (*annual bond*) with coupons paid on the same swap dates, compute the *Asset Swap Spread Over Euribor3m*.

2. Case Study: CDS Bootstrap

Given values for discounts on the case-study on curve bootstrap on the 15th of February 2008 at 10:45 C.E.T. consider the obligor ISP with a recovery π equal to 40% and CDS spreads (annual bond): 1y 29 bps, 2y 32 bps, 3y 35 bps, 4y 39 bps, 5y 40 bps, 7y 41 bps.

- Build a complete set of CDS via a spline interpolation on the spreads.
- Build $\lambda(t)$ piecewise constant for the issuer, neglecting the "accrual" term.
- Which is the impact of the "accrual" term? Show that this term is really negligible.
- Consider Jarrow-Turnbull approximation (a constant λ and continuously paid CDS spread) and compare the result with the one previously obtained.

3. Exercise: Price First to Default

Given values for discounts on the case-study on curve bootstrap on the 15th of February 2008 at 10:45 C.E.T. Consider two obligors ISP and UCG. Assume that UCG has recovery π equal to 45% and CDS spreads (annual bond): 1y 34 bps, 2y 39 bps, 3y 45 bps, 4y 46 bps, 5y 47 bps, 7y 47 bps.

- Build a complete set of CDS via a spline interpolation on the spreads.
- Price a first to default with maturity 20th of February 2012 on the obligors ISP and UCG with the Li model considering a Gaussian copula and correlation $\rho=0.2$.
- Plot the First to default price w.r.t. different values of the correlation ρ . Does the correlation parameters impact the price significantly?

4. Python Basic Exercises

- Load the time-series AAPL and the time-series SPX (using the provided python script).
- Plot them. Compute log-returns of both time-series and plot them. Hereinafter consider only log-returns.
- Estimate the slope of the regression AAPL (dependent variable) on SPX (independent variable).
- Compute the yearfrac between the first and the last date in the AAPL dataset in act/365 (use the function provided).
- You observe the realization of a function $f(x)=[1,2,3.5,4,2]$ in the points $x=[0,1,2,3,4]$. Linearly interpolate in the point $x=2.7$.
- Simulate a standard Normal random variable. Check that the variance of the simulated random variable converges to one as the number of simulation increases. Check also that the Gaussian CDF evaluated in the quantile 0.9 of the simulated data gives the correct result.
- Compute analytically the minimum of $(x-3)^2+(y-7)^2$. Compute the minimum numerically.

Function signatures

[datesCDS, survProbs, intensities] =

bootstrapCDS(datesDF, discounts, datesCDS, spreadsCDS, flag, recovery).

dates and discounts are the same outputs of bootstrap function; datesCDS do not include the settlement date; function outputs are vectors with the same length; flag = 1 (approx), 2 (exact) or 3 (JT).

All vectors are column vectors.

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