Homework 2: Defaultable Bonds and CDS pricing

Credit Risk (MF772) Fall 2021 Instructor: Roza Galeeva

Due date: Sep 23 , 2021 8am. Please, note that `late assignments will not be accepted.`

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1. A five year credit default swap entered on Mar 20 2018, requires quarterly payments at the rate of 200 basis point per year. [1] The principal is \$ 100 Million. A default occurs after 3 years and two months. The auction process finds the price of the cheapest deliverable bond to be 40% of its face value. Describe the cashflows and their timing for the seller of the credit default swap.

2. We consider a five year *digital CDS*, which pays notional \$1 in case of default. We need to find its fair value spread s, giving the following information:

a) The continuous hazard rate per year is $h = 0.03$.

b) The risk free rate r, continuously compounded is 4%.

c) The premium is paid each 6 months.

d) Default can happens each 6 months, and the payment in case of default is made at the end of the 6 months period.

Note : Do not forget to include the payments for protection when default happens (for the past 6 months). Make a partition of the 5 years period, diving it by a half a year , and calculate accurately survival and default probabilities on this grid. For example, the survival probability at the end of the first six months is $e^{-\frac{0.03}{2}}$, and the default probabilities in each period of 6 months are differences of the corresponding survival probabilities (not constant through the year, as in the example in the class).

3. Go back to the defaultable bond we analyzed in the class (spreadsheet "DefaultableBond-Pricing" in Questrom, except we don't fix the coupon rate). Consider two cases:

a) The hazard rate h is constant, $h = 0.04$ (we did it in the class), so default times follow the exponential distribution.

b) The default times follow the Weibull distribution with parameters $\lambda = 0.04$ and $p = \frac{3}{4}$

For each of these cases, find the semi-annual coupon rate c, so that the bonds are valued at *par*, thus the value of the bond = 1. Which coupon rate is higher and why?

[1] The standard dates for maturity of CDS contracts are Mar 20, June 20, Sep 20, and Dec 20