Derivative Instruments
Paris Dauphine University - Master IEF (272)

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Exercises Chapter 11

Exercise 1 (Done) *Suppose that 1-year bond issued by a corporation yields 150 basis points more than the risk-free rate.*

If the recovery rate is estimated at 40%, the average hazard rate for year 1 is

$$\bar{\lambda}(1) = \frac{s(1)}{1-R} = \frac{0.0150}{0.6} = 2.5\%$$

Suppose further that 2-year and 3-year bonds yield 180 and 195 bp more than the risk-free rate, respectively.

a) What are the average hazard rate $\bar{\lambda}(2)$ for years 1 and 2, and $\bar{\lambda}(3)$ for all three years?

b) What is the average hazard rate for the second year?

c) What is the average hazard rate for the third year?

Exercise 2 (Done) *Suppose that the LIBOR/swap rate curve (risk free rate) is flat equal to 3%.*

A 1-year corporate bond provides a coupon of 4% per year payable semiannually and it has a yield of 5% (continuous compounding).

Assume that defaults can take place at the beginning of the year and that the recovery rate is 30%.

(a) What is the market price of the bond?

(b) What is the equivalent risk-free bond's value?

(c) What is the bond risk premium?

(d) What is the loss in case of default?

(e) Deduce the risk-neutral default probability p.

Exercise 3 *Suppose that the LIBOR/swap rate curve (risk free rate) is flat equal to 2%. A 2-year corporate bond provides a coupon of 3% per year payable semiannually and it has a yield of 2.8% (continuous compounding). Assume that defaults can take place at the end of the year (immediately before a coupon or principal payment) and that the recovery rate is 35%.*

(a) What is the market price of the bond?

(b) What is the equivalent risk-free bond's value?

(c) What is the bond risk premium?

(d) What is the loss in case of default at each possible date of default?

(e) Estimate the risk-neutral default probability $\bar{p}$ on the assumption that it is the same each year.

Exercise 4 *Suppose that the risk-free zero-coupon curve is flat at 7% per annum (continuous compounding) and that defaults can occur halfway through each year in a new 5-year credit default swap (CDS).*

We assume that, in the event of default, protection is paid in the middle of the year, with no flow from the variable leg occurring at the end of the year, and that half of the annual spread is paid during the year of default.

Suppose that the recovery rate is 30% and the average hazard rate is 3.045%.

Let s denote the spread of the CDS in basis points.

(a) What is the present value of the end of 5th year expected payments of the fix leg ?

(b) What is the present value of the 5th mid-year (i.e., $t = 4.5$) expected payments of the fix leg ?

(c) What is the present value of the 5th mid-year (i.e., $t = 4.5$) expected payments of the variable leg ?

(d) Suppose the sum of the present value of all expected payments of the fix (resp. variable) leg before the 5th year is $3.1815s$ (resp. 0.0702). Estimate the credit default swap spread.

Exercise 5 *Consider Exercice 4.*

What is the value of the swap per dollar of notional principal to the protection buyer if the credit default swap spread is 150 basis points ?

Exercise 6 *Consider Exercice 4.*

What is the credit default swap spread if it is a binary CDS ?