Homework 3. Quantitative Methods for fixed Income Securities

CHAPTER 3 Yield-to-Maturity

3.9. In October 15, 2015, the spot-rate curve for **quarterly compounding** is

$$\hat{r}(i/4) = 0.0175 + 0.00125 \times (i-1)/4, \quad i = 1, 2, \cdots, 120.$$

a. Calculate and plot the discount curve.
b. Calculate and plot the forward rate curve.
c. Calculate and plot the swap rate curve.
d. Consider a 10-year **payer's** swap initiated in October 15, 2015. If one year later, the spot-rate curve becomes

$$\hat{r}(i/4) = 0.019 + 0.001 \times (i-1)/4, \quad i = 1, 2, \cdots, 120.$$

What is the MtM value of the swap?

3.10. In October 15, 2015, parties A and B enter into a forward-rate agreement (FRA) in which A pays the fixed rate and B pays the floating LIBOR rate. The features of the FRA are

Maturity	One year
Underlying	3-month forward rate (i.e., 3m LIBOR)
Notional value	$100m
Currency	USD

a. Let the related discount factors at time t=0 be $d(1) = 0.98$ and $d(1.25) = 0.975$, calculate the fair fixed rate for the trade.
b. At maturity, the 3m LIBOR rate is 2.85%, calculate the P&L to A.
c. What is the P&L to B?

3.11. [Continued from 3.10] If 6 months later, in April 15, 2016, we have the discount factors $d(0.5) = 0.985$ and $d(0.75) = 0.97$.

a. What is the mark-to-market value of the FRA?
b. If party A chooses to close out the FRA, what will be his P&L?

3.12. [Continued from 3.9] Consider a trade of FRA with the following features:

Maturity	Two years
Underlying	3-month forward rate (i.e., 3m LIBOR)
Notional value	$100m
Currency	USD

a. What is the fair fixed rate for the trade?
b. Suppose one year later, the spot rate curve becomes

$$\hat{r}(i/4) = 0.019 + 0.001 \times (i-1)/4, \quad i = 1, 2, \cdots, 120.$$

What is the 3-month LBOR rate for the period from 1 to 1.25 years?

c. If party A chooses to close out the FRA, what will be his P&L? Suppose he receives the floating-rate payment.