Assignment - 1

Financial Engineering - 2

Unit-1 & 2

Q1 borrow/lend = LIBOR

6 month rate = 5%
9 month rate = 6%

FRA = 7%

e^{RT}

~~Amt = 100~~
~~to = for 9 months → 6%~~
~~$= 100 \times e^{(0.06 \times 0.75)}$~~

Forward Rate $= \dfrac{0.06 \times 0.75 - 0.05 \times 0.50}{0.25}$

$= 0.08 = 8\%$

Q2 a) ~~the tot~~ In total, the gain or loss under a futures contract is equal to the gain or loss under the corresponding forward contract. But the timing ~~is~~ varies in each case. The contracts need to be defined whether it be futures or forwards. The long forwards helps take a perfect hedge. The long future provides a slightly imperfect hedge. In this case, the company will make loss at its hedge. If it is with forward rate, the loss is realized at the end. If it is with future contract, the loss will be realized daily.

(b) The future contract would lead to a slightly better outcome. Since the company makes profits through hedging If company uses forward contract, the profit will be realised at the end, whereas ~~in~~ in future, the company will realise its profit daily, which is better on the Present Value.

c) The future contract would have better profits rather than the forward contract, cause initially there is fixed positive CFs ~~whereas~~ & the negative CF are later on.

d) The forward contract ~~those~~ would be better because the negative CF first and the positive CFs later.

Q3 The company might want to choose the delivery date from not so great to best. The bank can get the product based on 2 assumption

- If the domestic int rate is higher than the rate, then the delivery date is ~~des~~ decided acc to the long or ~~call~~ short position.
- If the domestic int rate is lower than the rate, the delivery date is ~~des~~ decided acc to the Long or Short position.

Q4 Contract Value $= 10000\,[100 - 0.25(100 - 92)]$

$= 980000$

No. of contract (N) $= \dfrac{\text{portfolio forward Value}}{\text{future contract price}} \times \dfrac{\text{Portfolio Duration}}{\text{futures Duration}}$

$\frac{\text{Portfolio Duration}}{\text{future Duration}} = 2$ {Commercial Paper is 2 times to futures}

$\therefore N = \frac{\text{Forward Values}}{\text{Future Contract price}} \times 2.$

$= \frac{48{,}29{,}000}{9{,}80{,}000} \times 2 = 9.84$

$\therefore$ 10 contract shld be shorted

Q5 No of short future contracts required are:

$\frac{\text{portfolio forward rate}}{\text{future Contract price}} \times \frac{\text{Portfolio Duration}}{\text{future Duration}}$

$\therefore \frac{100{,}000{,}000}{122{,}000} \times \frac{4}{9}$

$\therefore 364.3$

a) No. of Contracts : $\frac{100000000}{122000} \times \frac{4}{7} = 468.5$

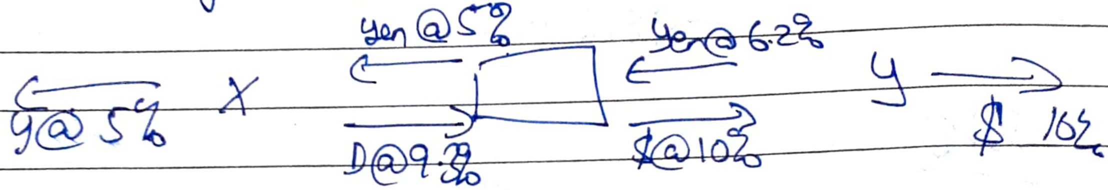
DATE / /

Q6 X has an advantage in yen market & buys of $
Y has an advantage in doubt market & buys yen.

1.5% → Yen
0.4% → dollar.
Through Swap,
Gain = (1.5 − 0.4)% = 1.1% pa.

Bank = 0.5% pa
Leaving 0.3% for X & Y.

X borrows dollars at = 9.6 − 0.3 = 9.3%
Y borrows yen at = 6.5 − 0.3 = 6.2%



Q7 The swap rate is the fixed rate that the receiver gets in exchange for the uncertainity of paying a short term rate.
At the same time, the swap rate for a particular maturity is the swap per yield for maturity, thus, the yield is the coupon rate on the fixed income instrument.

Q8 The bank can offset the risk by entering into int rate swaps ~~to~~ with other financial institutions in which a bank signs a contract abt which states to pay fixed and receive floating rate.

Q9 The appropriate disc rate:

12% pa with quaterly compounding

11.8% pa with continuous compounding.

The next floating payment $= 0.0918 \times 100 \times 0.25$

$= 2.95$.

$\therefore$ floating rate bond $= 10-2.96\, e^{-0.1182 \times 21}$

$= 100.941$

Value : $2.5e^{-0.1182 \times 2/12} + 2.5\, e^{-0.1182 \times 5/12}$.

$+ 2.5e^{-0.1182 \times 8/12} + 2.5\, e^{-0.1182 \times 8/12}$

$+ 102.5\, e^{-0.1182 \times 4/12}$.

$= 98.678$.

Q10

Forward price $= 8\%$

$K_t = 7.6\%$.

$T = 4$ yrs.

$r_F = 8\%$.

Volatility $= 25\%$

Payoff from swap $= \max[0.076 - K, 0]$.

Annuity at the end of 5, 6, 7, 8 & 9 yrs

$= \sum_{i=5}^{9} e^{-0.078i} = 2.972$

$d_1 = \dfrac{\ln[0.08/0.076) + 0.25^2 \times 2}{0.25\sqrt{4}} = 0.352$

$d_2 = -0.1474$.

Swaption $= \$40,000$.

Q11 $S_0 = 1/1.48 = 0.6757$

$K = 1/1.50 = 0.6667$

$r = 0.08$, $\sigma = 0.12$

$q = 0.04$, $T = 1$.

Value of derivative $= 10{,}000\, N(-d_2)\, e^{-0.08\times 1}$.

$$d_2 = \ln\left(\frac{0.6757}{0.6667}\right) + \left(0.5 - 0.04 - \frac{(0.12^2)}{2}\right)$$

$= 0.3852$.

$\therefore N(-d_2) = 0.3501$.

$\Rightarrow 10{,}000 \times 0.3501 \times e^{-0.08} = 3231$

Q12 In Asian option, the pay-off becomes more certain as the time passes and the delta approaches zero as the maturity date is approached. Making delta hedging easy.

Q13 This is a cash on nothing Call.

Value $= 100\, N(d_2)\, e^{-0.08\times 0.5}$

$$d_2 = \frac{\ln\left(\frac{900}{1000}\right) + \left(0.08 - 0.03 + \frac{0.2^2}{2}\right)\times 0.5}{0.2\times\sqrt{0.5}}$$

$= 0.1826$.

$N(d_2) = 0.4276$.