Interest Rate Risk Management (IRRM) [8 Marks]

There are two types of Rate of Interest

(i) Fixed Rate

(ii) Floating Rate

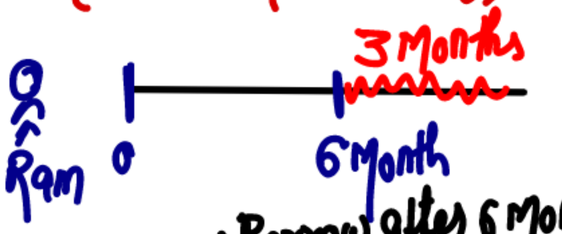
[Benchmark Rate (Reference Rate) + Spread]

LIBOR

MIBOR

Risk from Floating Rate Borrowing

Short Term Borrowing (future borrowing)

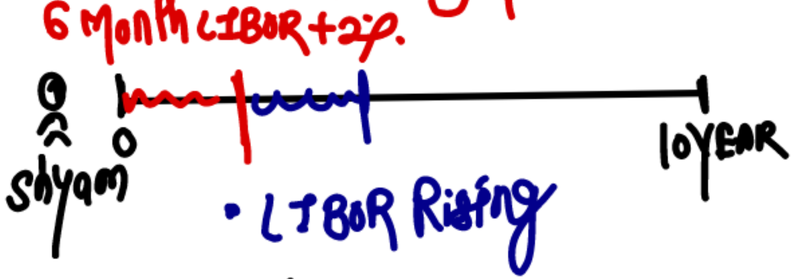


- Borrow after 6 months
- LIBOR Rising

→ **Hedge**

(i) Forward Rate Agreement
(ii) Interest Rate option
(iii) Euro dollar future

Long Term Borrowing (Existing Borrowing)



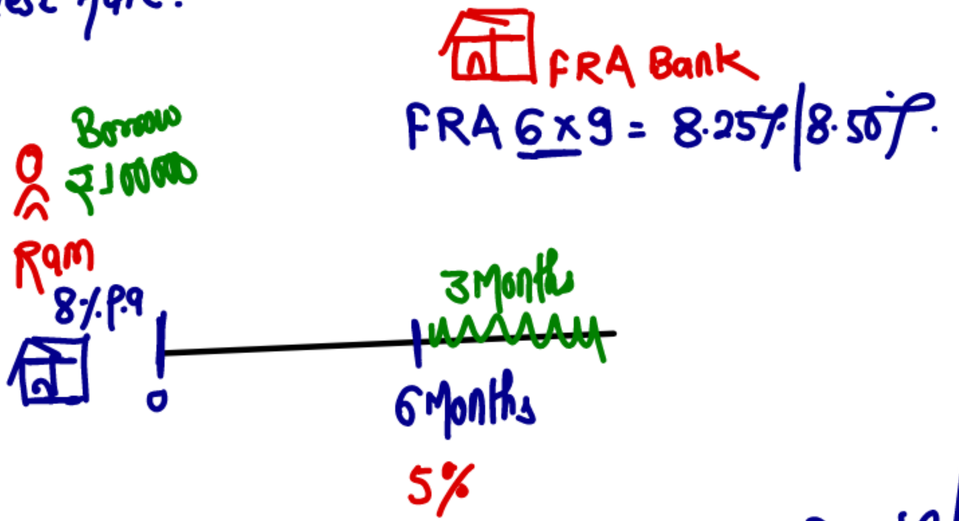
- LIBOR Rising

→ **Hedge**

(iv) financial Swap
(v) Cap, Collar & Floor
(vi) T. Bill future

PART 1 FRA

- Forward Rate Agreement means forward Contract On Interest Rate.



- Suppose Bank Quotes FRA 6x9 = 8.25%/8.50%

① 9t means
- Contract to borrow after 6 months for 3 months @ 8.50% P.A.
- Buy FRA @ 8.50%
- Long position @ 8.50%

① 9t means
- Contract to Invest @ 8.25% after 6 months for 3 Months
- Sell FRA @ 8.25%
- short position @ 8.25%

EXAMPLE – 01

Mr. Ram wants to borrow ₹ 40,00,000 after 3 months for 6 months. Current interest rate is 9% P.a. City bank quote FRA 3 × 9 is 10%/11%

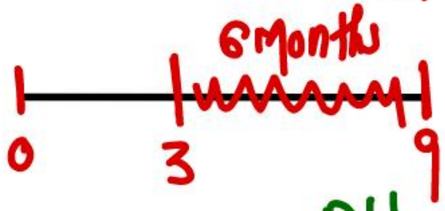
Ram buy FRA 3 × 9 @ 11% P.a. Calculated effect on FRA and Effective rate of interest if after 3 months for 6 months is –

Case 1: 13% p.a.

Case 2: 8% p.a.

11%↑

(Page No. 01)



Effective Rate

Int paid to Bank (4000000 × 13% × 6/12) 260000

Amt Req from FRA Bank 40000

37558.68 (1.065) 220000

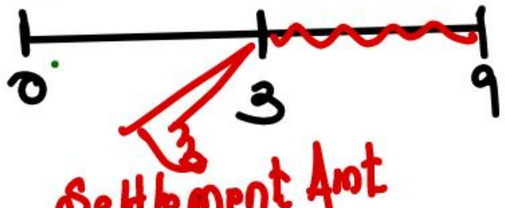
$$\text{Effective Rate} = \frac{220000}{4000000} \times 100 \times 12\%$$

$$= 11\%$$

Case 1 If After 3 months

Rate = 13%

City Bank will pay to Ram



Settlement Amt

$$\text{Settlement Amt} = \frac{(N)(RR-FR)\frac{Dtm}{DY}}{\left[1+\left(RR \times \frac{Dtm}{DY}\right)\right]}$$

$$= \frac{₹4000000\ (0.13-0.11) \times \frac{6}{12}}{\left[1+(0.13 \times \frac{6}{12})\right]}$$

$$= ₹37558.68$$

Case 2 8%

Ram will pay to FRA Bank

$$\text{final Settlement} = \frac{₹4000000 \times (0.08 - 0.11)\frac{6}{12}}{\left[1 + \left(0.08 \times \frac{6}{12}\right)\right]}$$

$$= ₹57692.31$$

Effective Rate

InH paid to Bank $\left(4000000 \times 8\% \times \frac{6}{12}\right) = ₹160000$

(f) paid to FRA Bank $(57692.31 \times 1.04) = ₹60000$

$= ₹220000$

$$EC = \frac{220000}{4000000} \times 100 \times \frac{12}{6}$$

$$= 11\%$$

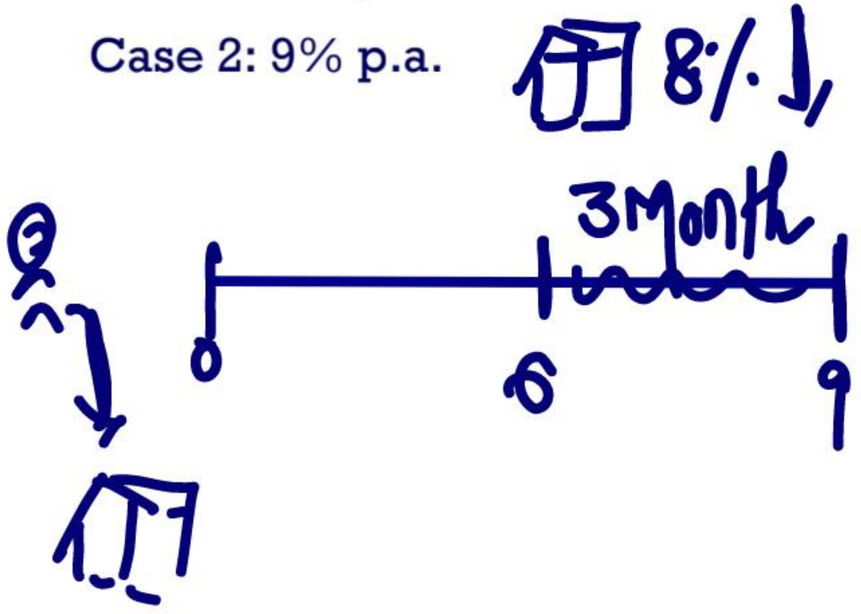
EXAMPLE – 02

Mr. Shyam wants to invest ₹ 50,00,000 after 6 months for 3 months. City bank quote FRA 6×9 is 8%/10%. Ram sell FRA 6 × 9 @ 8% p.a.

Calculate effect on FRA [redacted] of interest if after 6 months for 3 months is –

Case 1: 5% p.a.

Case 2: 9% p.a.



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$$\text{final Settlement} = \frac{(N)(RR-fR)\frac{Dtm}{DY}}{\left[1+(RR\times\frac{Dtm}{DY})\right]}$$

Case 1 Rate 5%

City Bank will Pay to shyam

$$= \frac{5000000\times(0.05-0.08)\frac{3}{12}}{\left[1+(0.05\times 3/12)\right]}$$

$$= ₹37037.04$$

Case 2 Rate 9% P.a.

shyam will Pay to City Bank

$$= ₹12225$$

QUESTION – 01

M/s. Parker & Co. is contemplating to borrow an amount of ₹ 60 crores for a Period of 3 months in the coming 6 month's time from now. The current rate of interest is 9% p.a., but it may go up in 6 month's time. The company wants to hedge itself against the likely increase in interest rate.

The Company's Bankers quoted an FRA (Forward Rate Agreement) at 9.30% p.a.

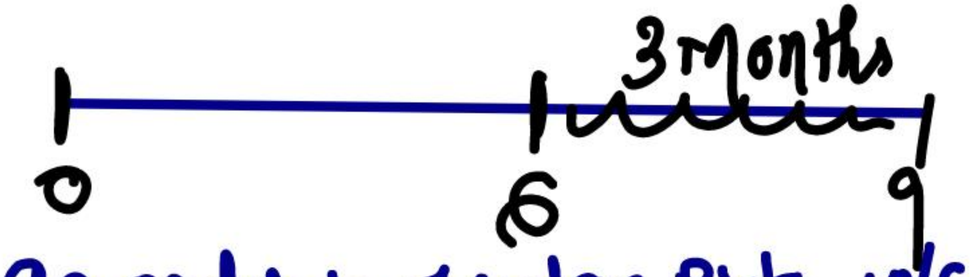
What will be the Final settlement amount, if the actual rate of interest after 6 months happens to be

(i) 9.60% p.a. and

(ii) 8.80% p.a.?

(Exam May – 2013, SM & PM)

(Page No. 03)



In order to Hedge Risk, M/s Parker & Co. should buy FRA at 9.30% p.a

H.W

C.W. Copy

QUESTION – 02

The treasurer of an insurance company expects to have a surplus of £5 million 6 months from now. She has decided to park the fund in a 3 months euro sterling deposit. The current 3 months deposit rate 9%. A 6×9 £5 millions FRA is being quoted at 8.75%. The treasurer sells an FRA to protect herself from falling rates. Compute the effective rate of return on her investment if on day 182.

The 3months deposit rate is 9.5%

The rate is 8%

(SM New Syllabus & PM)

(Page No. 04)

QUESTION – 03

P Ltd. is contemplating to borrow an amount of ₹ 50 crores for a period of 3 months in the coming 6 months time for now. The current rate of interest is 8% per annum but it my go up in 6 months time. The company wants to hedge itself against the likely increase in interest rate.

The Company's Bankers quoted an FRA (Forward Rate Agreement) at 8.30% per annum.

Compute the effect of FRA and actual rate of interest cost to the company, if the actual rate of interest during consideration period happens to be

(i) 8.60% p.a., or

(ii) 7.80% p.a.

(Show your working on the basis of months)

(Exam November - 2019)

(Page No. 05)

P Ltd will Buy FRA @ 8.30% p.a.

$$\text{final Settlement} = \frac{(N)(RR-FR)\frac{Dtm}{DY}}{1+(RR\times\frac{Dtm}{DY})}$$

(i) Rate 8.60% p.a.

Company's Bank will pay to P Ltd

$$= \frac{50\text{ cr.}\,(0.086-0.083)\frac{3}{12}}{[1+(0.086\times 3/12)]}$$

$$= ₹\,367107.20$$

Effective Rate

Intt paid to Bank $(50\text{cr}\times 8.60\%\times 3/12) = 10750000$

(-) Recd Settlement Amt 367107.20 $\left(\dfrac{375000}{1037500}\right)$ or $\dfrac{0}{1}$

$$\frac{10375000}{50000000}\times 100\times\frac{12}{3} = 8.31\%$$

QUESTION – 04

TM Fincorp has bought a 6 × 9 ₹ 100 crore Forward Rate Agreement (FRA) at 5.25%. On fixing date reference rate i.e. MIBOR turns out be as follows:

Period	Rate (%)
3 Months	5.50
6 Months	5.70
9 Months	5.85

You are required to determine:

(a) Profit/Loss to TM Fincorp. in terms of basis points 0.25% or 25 BP

(b) The settlement amount.

(Assume 360 days in a year)

(SM New Syllabus & PM)

(Page No. 07)

H.W
C.W copy

FRA for Arbitrage

Following steps are applied for arbitrage

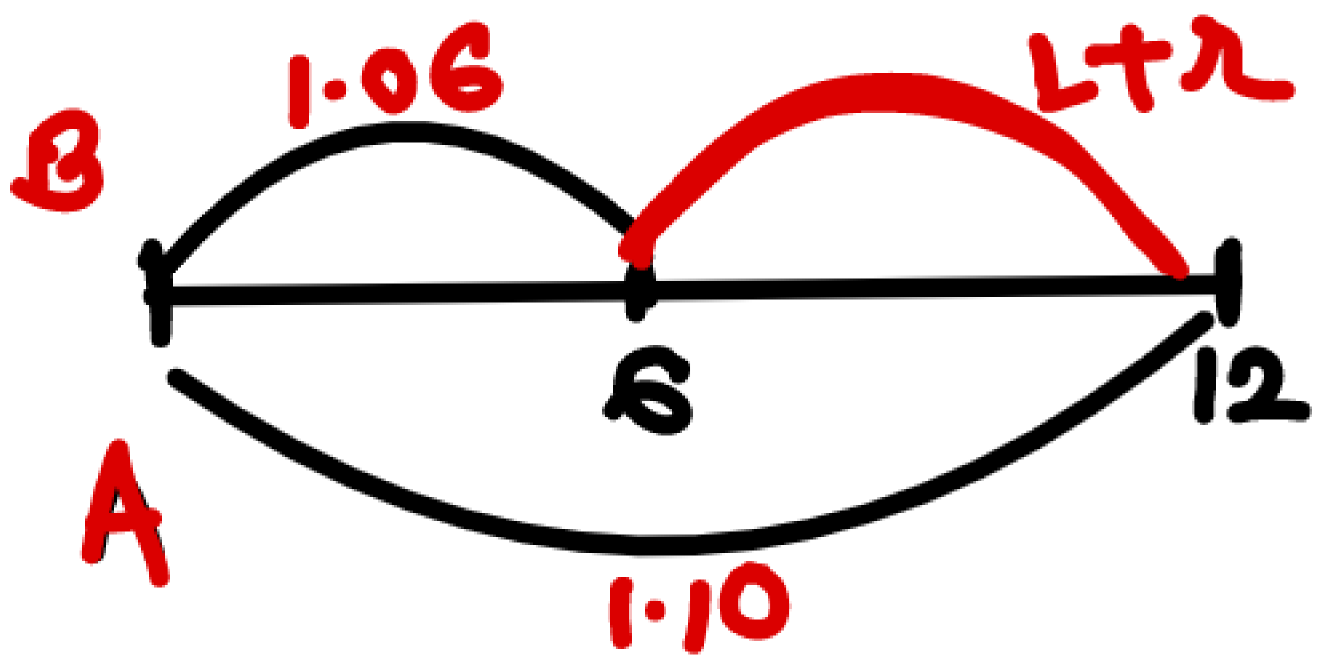
Step 1 Calculate Theoretical FRA

$$\text{Theoretical FRA} = \frac{\text{Bigger factor}}{\text{Smaller factor}}$$

Step 2 Compare with Actual FRA

If Actual FRA < Theoretical FRA, FRA is Underpriced, Buy FRA

Actual FRA > Theoretical FRA, FRA is Overpriced, Sell FRA

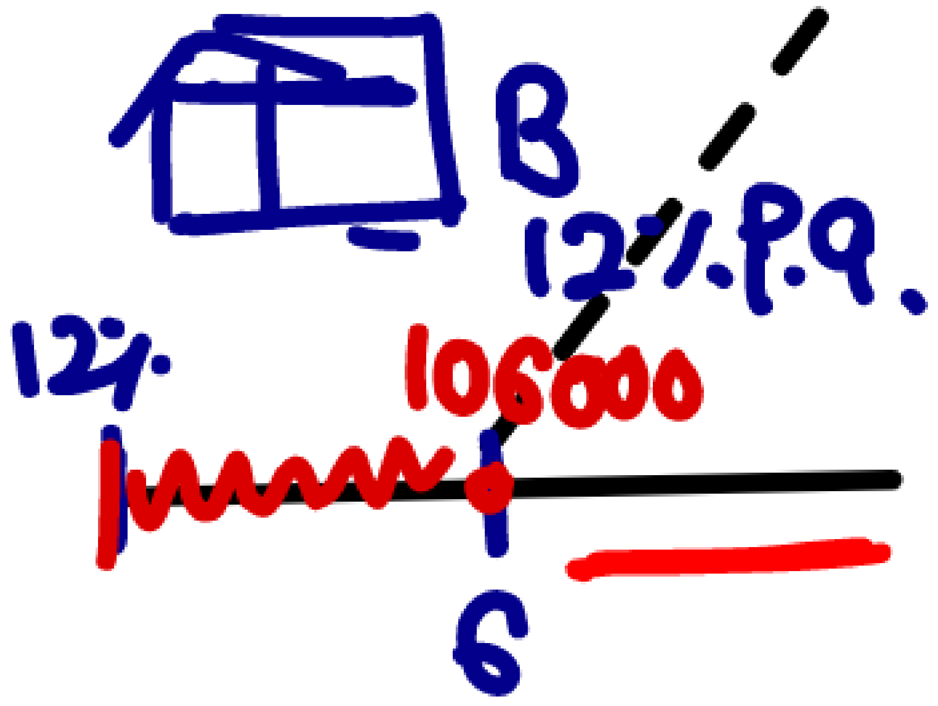


Ram wants to Invest ₹100000 for 1 YEAR


10% p.a.

Bank A

₹110000



₹106000

Int > 4000


FRA Bank

FRA 6×12 = 10%

$$\frac{₹4000}{₹106000} \times 100 \times \frac{12}{6}$$

= 7.55% p.a.

Theoretical FRA

A = B

$1.10 = (1.06)(1+r)$

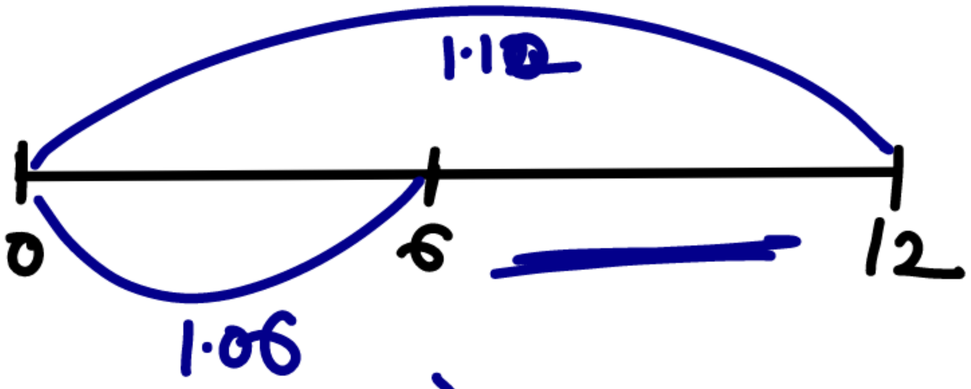
$$r = \left[\frac{1.10}{1.06} - 1\right] \times 100 \times \frac{12}{6} = 7.55\%$$

Eg

6 Month LIBOR = 12% P.a.

12 Month LIBOR = 10% P.a.

FRA 6×12 = ?



$$(1.06)(1+r) = 1.10$$

$$r = 7.55\%$$

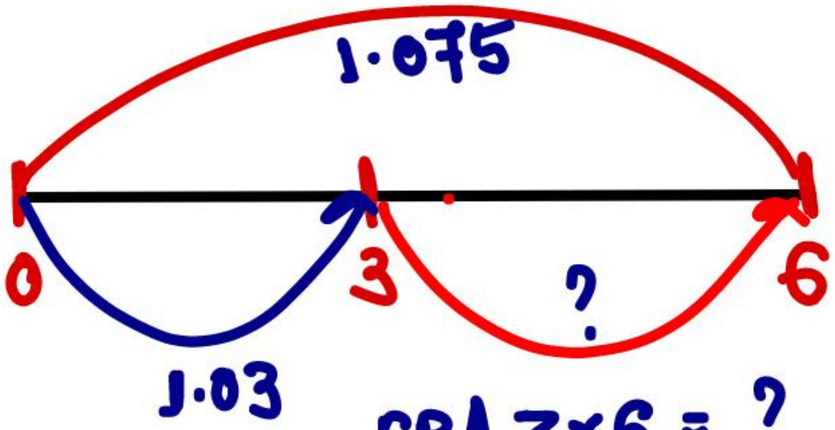
EXAMPLE – 03

3 Months LIBOR = 12% p.a.

6 Months LIBOR = 15% p.a.

Calculate 3 months FRA after 3 months.

(Page No. 01)



FRA 3×6 = ?

$1.075 = (1.03)(1+r)$

$r = \left[\frac{1.075}{1.03} - 1\right] \times 100 \times \frac{12}{3} = 17.47\%$

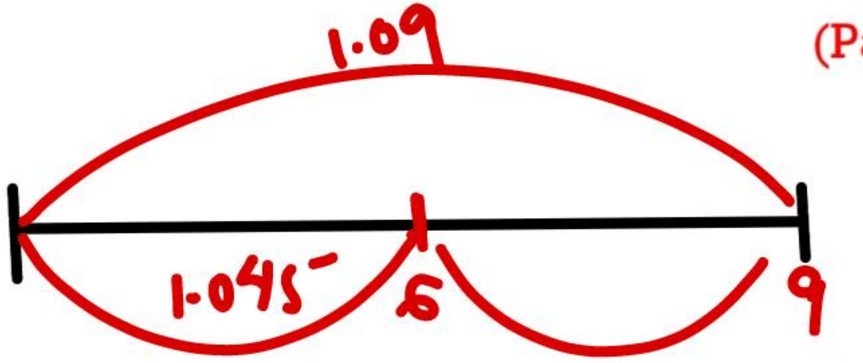
EXAMPLE – 04

6 Months LIBOR = 9% p.a.

9 Months LIBOR = 12% p.a.

Calculate 3 months FRA after 6 months.

(Page No. 01)



$$FRA\ 6\times9 = \left(\frac{1.09}{1.045} - 1\right) \times 100 \times \frac{12}{3}$$

$$= 17.22\%\ p.a.$$

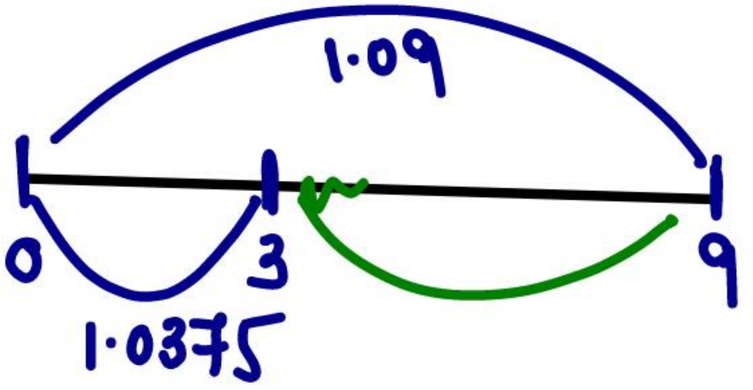
EXAMPLE – 05

3 Months LIBOR = 15% p.a.

9 Months LIBOR = 12% p.a.

Calculate 6 months FRA after 3 months .

(Page No. 01)



FRA 3×9

$$\left[\frac{1.09}{1.0375} - 1\right] \times 100 \times \frac{12}{6} = 10.12\% \text{ p.a.}$$

EXAMPLE – 06

6 Months LIBOR = 12% p.a.

12 Months LIBOR = 10% p.a.

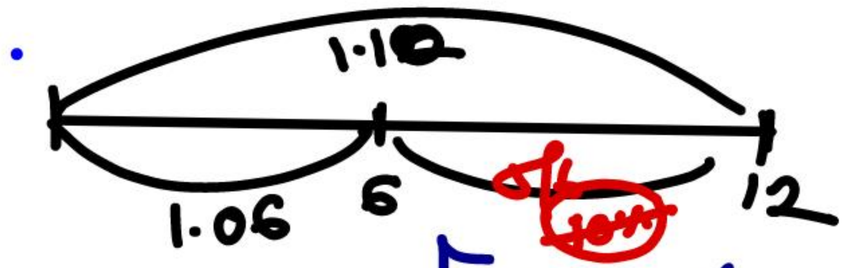
(i) Calculate 6 months FRA after 6 months.

(ii) Calculate Arbitrage gain in Actual FRA 6 × 12 is 10%/11%

(iii) Calculate Arbitrage gain if Actual FRA 6 × 12 is 5%/6%

(Page No. 02)

① Theoretical FRA



$$FRA\ 6\times12 = \left[\frac{1.10}{1.06} - 1\right] \times 100 \times \frac{12}{6}$$

$$= 7.55\%\ p.a.$$

② Actual FRA 6×12 is 10%/11%

Since FRA is overpriced, hence Contract to Invest @ 10% p.a.

Arbitrage process

Today

- Borrow ₹ 100000 at 12 month LIBOR @ 10% P.Q
- Invest at 6 months LIBOR @ 12% P.Q.
- Contract to Invest after 6 month @ 10% P.Q.

[Sell FRA 6×12 @ 10% P.Q]

After 1 YEAR

Cash Inflows	100000 × 1.06 × 1.05 =	₹ 111300
Cash outflows	100000 × 1.10 =	₹ 110000
	Arbitrage Gain	₹ 1300

- Investment
  LIBOR के गिरने का डर
  Short position (Sell)
- Borrowing
  LIBOR के बढ़ने का डर
  Long position (Buy)

to borrow at FRA

Process

Today

- Borrow ₹ 100000 @ 6 month LIBOR @ 12% P.A.
- Invest at 12 month LIBOR @ 10% P.A.
- Buy FRA 6×12 @ 6% P.A

After 1 YEAR

Cash Inflows = ₹ 100000 × 1.10 = ₹ 110000

Cash outflows = ₹ 100000 × 1.06 × 1.03 = ₹ 109180

Gain 820

QUESTION – 05 (Imp)

The following market data is available:

Spot USD/JPY 116.00 ¥/$

Deposit rates p.a.	USD	JPY
3 Months	4.50%	0.25%
6 Months	5.00%	0.25%

Forward Rate Agreement (FRA) for Yen is Nil.

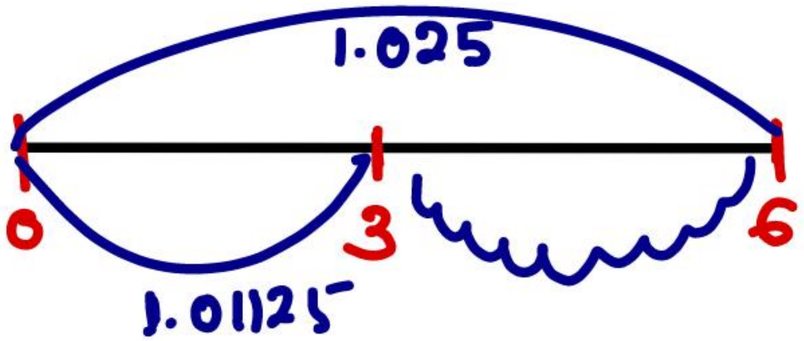
1. What should be 3 months FRA rate at 3 months forward? FRA 3×6
2. The 6 & 12 months LIBORS are 5% & 6.5% respectively. A bank is quoting 6/12 USD FRA at 6.50 – 6.75%. Is any arbitrage opportunity available?

Calculate profit in such case.

(Practice Manual)

(Page No. 08)

1 FRA 3×6

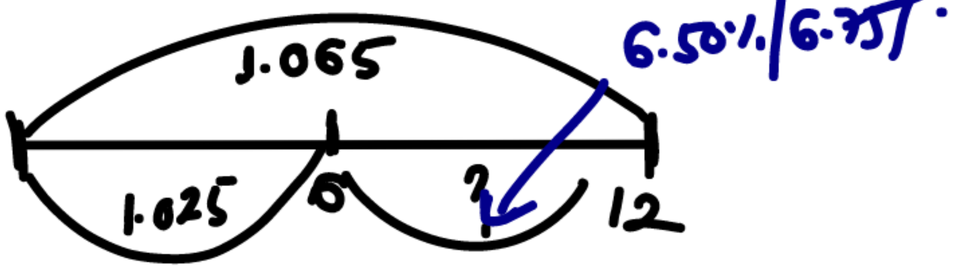


$$FRA = \left[\frac{1.025}{1.01125} - 1\right] \times 100 \times \frac{12}{3}$$

$$= 5.44\% \text{ P.a.}$$

2. Arbitrage

- Theoretical FRA 6×12



$$\text{Theoretical FRA} = \left[\frac{1.065}{1.025} - 1\right] \times 100 \times \frac{12}{6}$$

$$= 7.80\% \text{ p.a.}$$

Since FRA is underpriced, hence
Buy FRA 6×12 @ 6.75%

process

Today

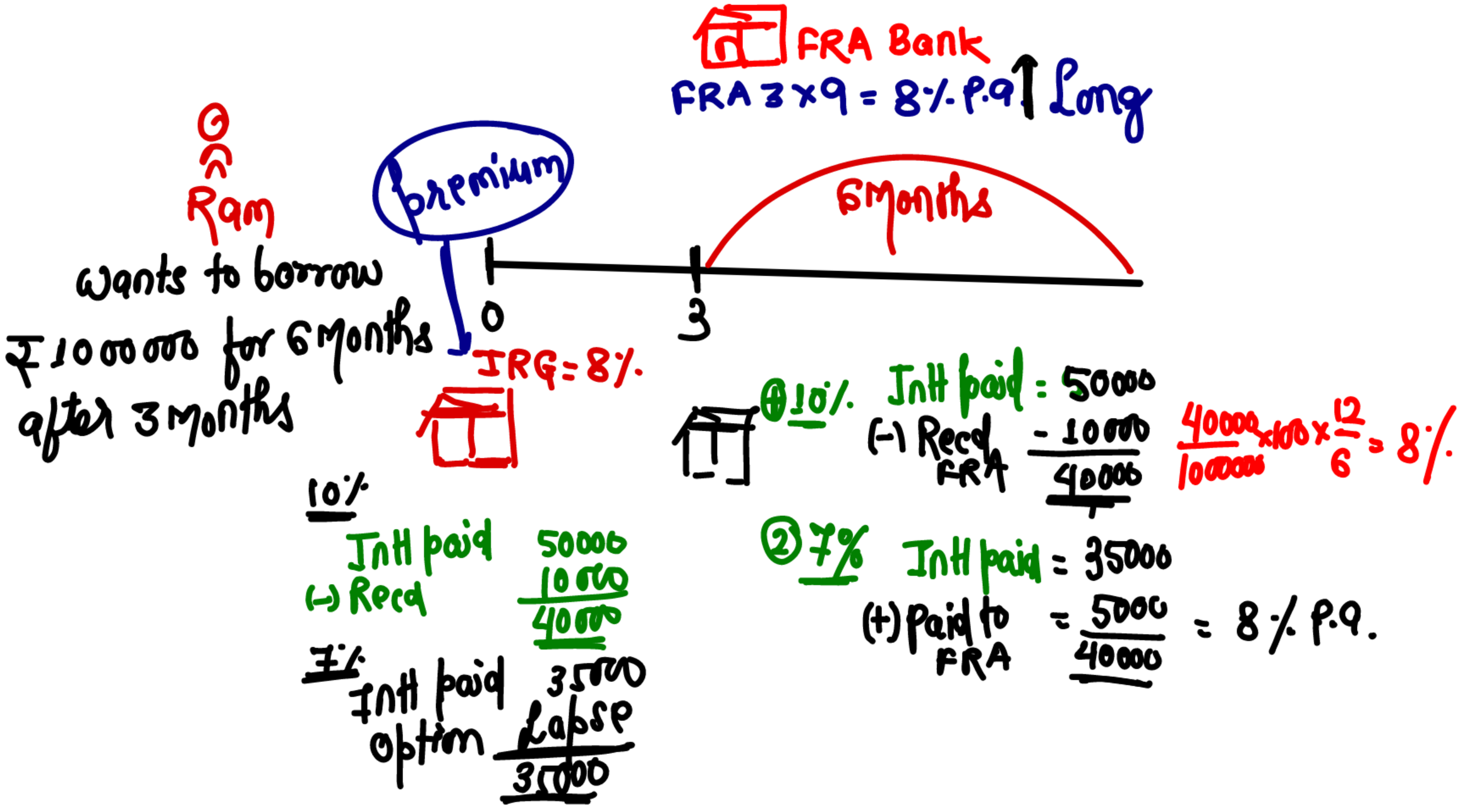
- Borrow $1 at 6 month LIBOR @ 5% p.a.
- Invest at 12 month LIBOR @ 6.50% p.a.
- Buy FRA 6×12 @ 6.75% p.a.

After 1 YEAR

Cash Inflows $1 (1.065) $1.065

Cash outflows $1 × 1.025 × 1.03375 = $1.060

Gain = $0.05


FRA Bank
FRA 3×9 = 8% p.a
Long
Ram
wants to borrow
₹ 10 00 000 for 6 months
after 3 months
premium
6 months
0
3
IRG = 8%
10%
Intt paid 50000
(-) Recd 10000
40000
3%
Intt paid 35000
option Lapse
35000
@ 10%
Intt paid = 50000
(-) Recd FRA - 10000
40000
40000/1000000 × 100 × 12/6 = 8%
@ 7%
Intt paid = 35000
(+) Paid to FRA = 5000
40000
= 8% p.a.

QUESTION – 06

Two companies ABC Ltd. and XYZ Ltd. approach the DEF Bank for FRA (Forward Rate Agreement). They want to borrow a sum of ₹ 100 crores after 2 years for a period of 1 year. Bank has calculated Yield Curve of both companies as follows:

Year	XYZ Ltd.	ABC Ltd.
1	3.86	4.12
2	4.20	5.48
3	4.48	5.78

*The difference in yield curve is due to the lower credit rating of ABC Ltd. compared to XYZ Ltd.

(i) You are required to calculate the rate of interest DEF Bank would quote under 2V3 FRA, using the company's yield information as quoted above.

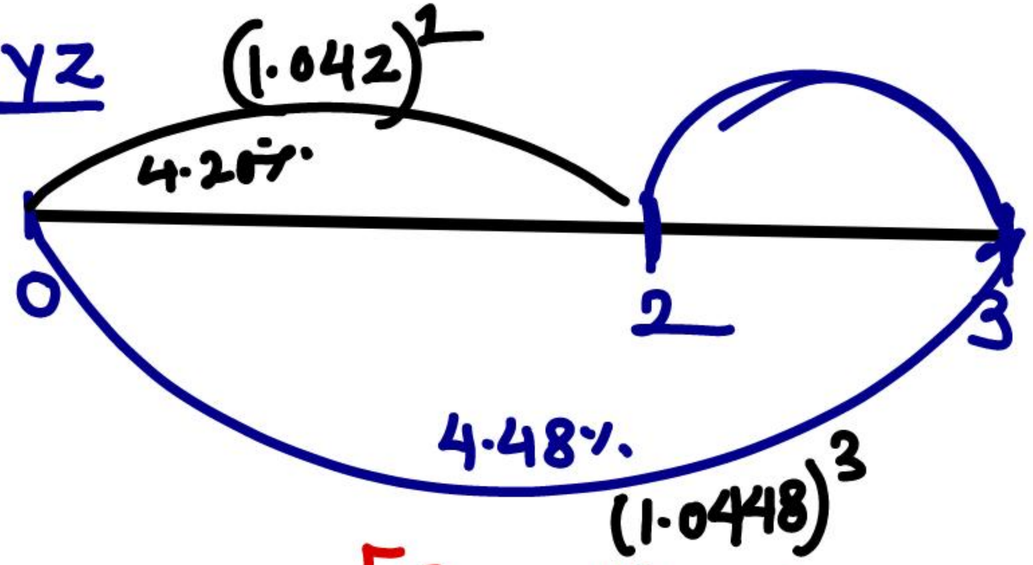
(ii) Suppose bank offers Interest Rate Guarantee for a premium of 0.1% of the amount of loan, you are required to calculate the interest payable by XYZ Ltd. if interest rate in 2 years turns out to be

(a) 4.50% (b) 5.50%

(RTP November – 2020 & PM)

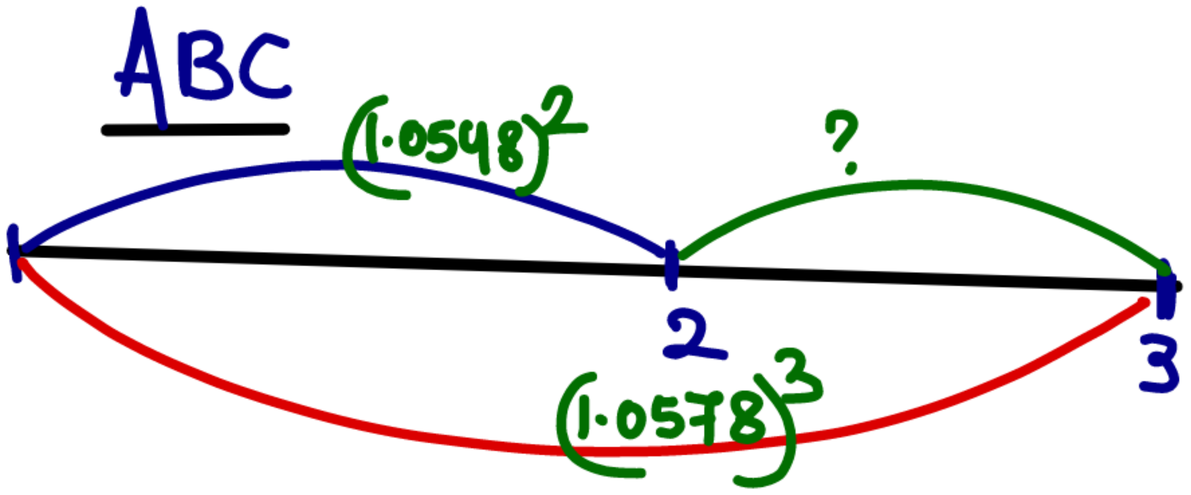
① Theoretical FRA 2×3

XYZ



$$FRA\ 2\times3 = \left[\frac{(1.0448)^3}{(1.042)^2} - 1\right] \times 100$$

$$= 5.042\%\ p.a.$$



$$FRA\ 2\times3 = \left[\frac{(1.0578)^3}{(1.0548)^2} - 1\right] \times 100 = 6.38\%\ p.a.$$

(ii) Interest payable by XYZ Ltd

XYZ buys Interest Rate Guarantee for 1 YEAR after 2 years @ 5.042% (Call option) & paid premium ₹100 Cr. × 0.1% = ₹0.1 Cr.

(a) 4.5% P.A.

Int paid on Loan (₹100 Cr. × 4.5%) = ₹4.50 Cr.

Int Rate Guarantee payoff = Lapsed

premium = ₹0.10 Cr.

Interest payable = ₹4.60 Cr.

(a) 5.50% P.A.

Int paid on Loan (₹100 Cr. × 5.50%) = ₹5.50 Cr.

Int Rate Guarantee payoff (5.50% − 5.042%) × 100 Cr. = (0.458 Cr.)

premium = ₹0.10 Cr.

Int payable ₹5.14 Cr.

Ignore opp. cost on premium

PART III Euro dollar future

Contract Size ₹50000

March = 3 Month 92

Ram

Wants to borrow ₹1000000 after 3 Months for 6 Months

Int paid : ₹50000

5000

4500

Quotation of Euro dollar future

100 - LIBOR

[अगर हम Borrower है Rate बढ़ने का डर है, But Euro dollar future में short position नहीं]

(1) Ram should take short position on Euro dollar future at 92

(ii) No. of Contracts

[Eurodollar future "3 months period से ज्यादा के लिए नहीं होता है]

$$\text{No. of Contracts} = \frac{\text{Borrowing Amt}}{\text{Contract size}} \times \frac{\text{Duration of Loan}}{\text{3 Months}}$$

$$= \frac{₹1000000}{50000} \times \frac{6 \text{ Months}}{3 \text{ Months}}$$

$$= 40 \text{ Contracts}$$

(iii) If Rate of Intt after 3 Months [10%) [F = 90]

Intt paid on Loan = ₹50,000

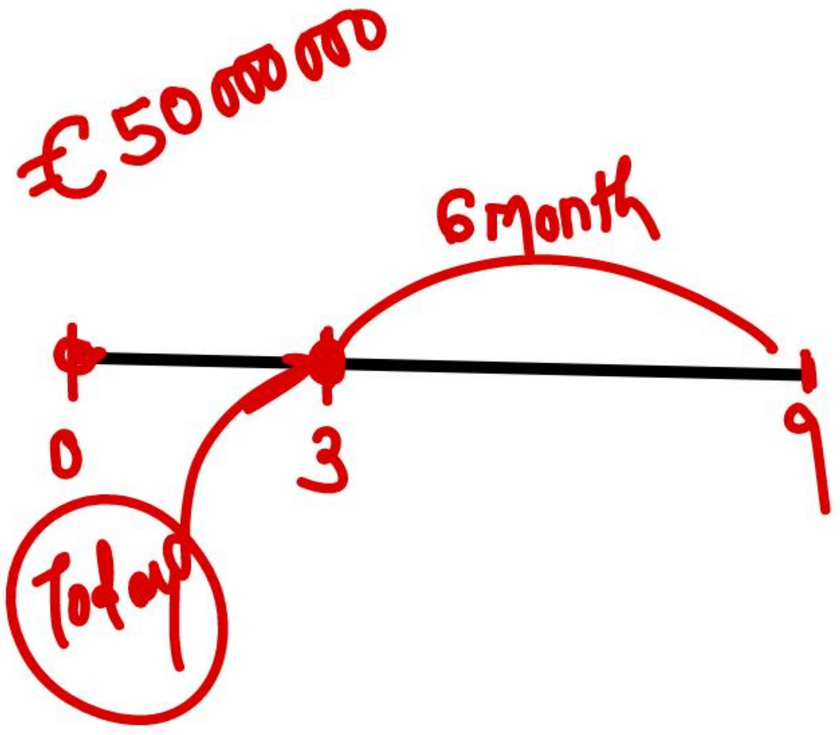
$[1000000 \times 10\% \times \frac{6}{12}]$

Gain on short position

[92 - 90] = 2%

$2\% \times 40 \times ₹50000 \times \frac{3}{12} = \frac{₹10000}{₹40000}$

$EC = \frac{40000}{1000000} \times 100 \times 12\% = 8\% \text{ PA}$



QUESTION – 07

Electra space is consumer electronics wholesaler. The business of the firm is highly seasonal in nature. In 6 months of a year, firm has a huge cash deposits and especially near Christmas time and other 6 months firm cash crunch, leading to borrowing of money to cover up its exposures for running the business.

It is expected that firm shall borrow a sum of €50 million for the entire period of slack season in about 3 months.

A Bank has given the following quotations:

Spot 5.50% - 5.75%

3 × 6 FRA 5.59% - 5.82%

3 × 9 FRA 5.64% - 5.94%

3 month €50,000 future contract maturing in a period of 3 months is quoted at 94.15 (5.85%).

You are required to determine:

(a) How a FRA, shall be useful if the actual interest rate after 3 months turnout to be: (i) 4.5% (ii) 6.5%

(b) How 3 months Future contract shall be useful for company if interest rate turns out as mentioned in part (a) above.

(Page No. 11)

€ 1485000

€ 5000000 × 1/2 × 12%

€ 1125000

€ 360000

(5.94 - 4.5) × €5000000 × 6/12

€ 1485000

QUESTION – 07

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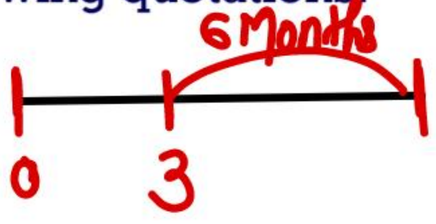


3 month €50,000 future contract maturing in a period of 3 months is quoted at 94.15 (5.85%).

You are required to determine:

(i) FRA Hedging

Electra space wants to borrow after 3 months for 6 months & afraid from interest Rate rising. In order to Hedge Risk, it should take Long position (Buy FRA) 3 × 9 ⑨

5.94% p.a.

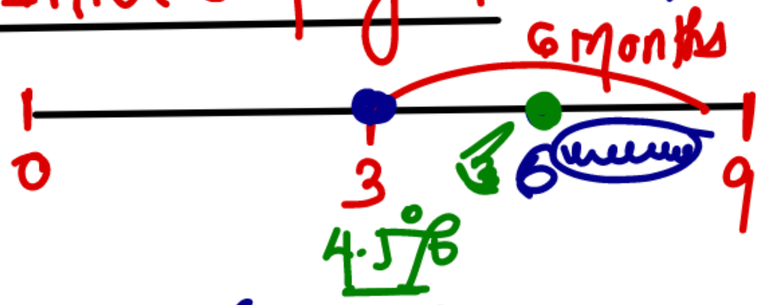
(ii) Interest Rate future

- Electra Space should take short position at 94.15 ↓ on IRF
- $$\text{No. of Contracts} = \frac{\text{Borrowing Amt}}{\text{Contract Size}} \times \frac{\text{Duration of Loan}}{\text{3 Months}}$$

$$= \frac{€5000000}{€50000} \times \frac{6\text{ Months}}{3\text{ Months}}$$

= 2000 Contract short

• Interest payable 94.15↓



(i) Rate 4.5% (95.50)

Intt paid on Loan (€50000000 × 4.5% × 6/12) €1125000

Loss on IRF (94.15 − 95.50) = 1.35%

1.35% × 2000 × €50000 × 3/12 €337500

€1462500

(ii) Rate = 6.5% (93.5)

Intt paid (€50000000 × 6.5% × 6/12) €1625000

Gain on IRF (94.15 − 93.50) = 0.65%

(0.65% × 2000 × €50000 × 3/12) (€162500)

€1462500

EC = €1462500 / €50000000 × 100 × 12/6 = 5.85% p.a.

(a) How a FRA, shall be useful if the actual interest rate after 3 months turnout to be:

(i) 4.5% (ii) 6.5%

(b) How 3 months Future contract shall be useful for company if interest rate turns out as mentioned in part (a) above.

(Page No. 11)

(ii) Rate 6.5%

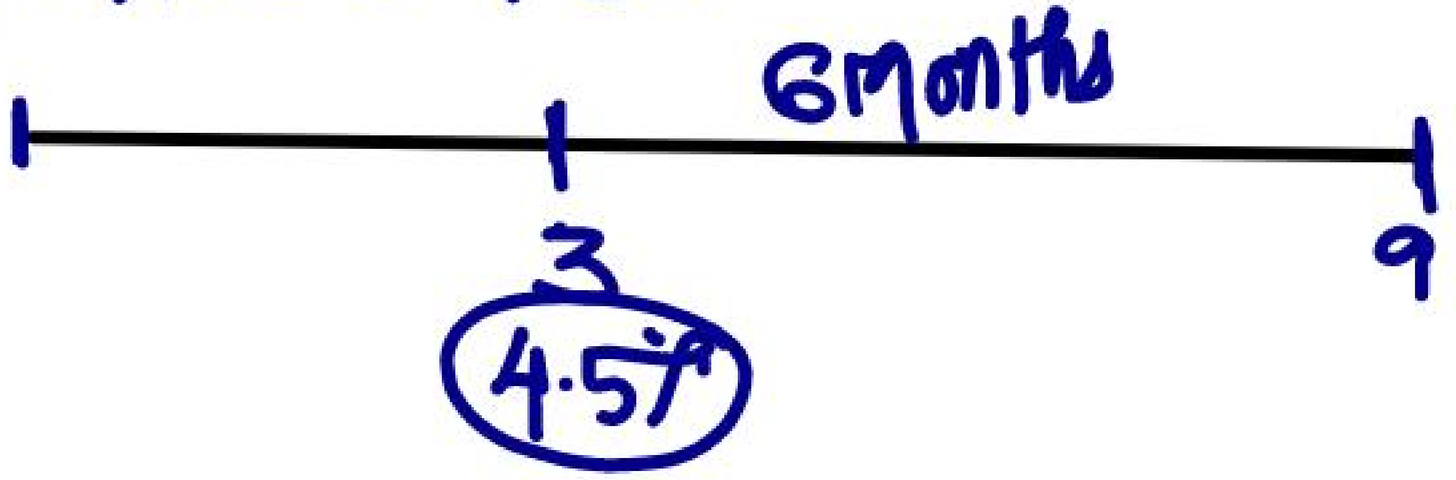
Intt paid on Loan (€50000000 × 6.5% × 6/12) €1625000

Electra space will Receive (0.065 − 0.0594) × 50000000 × 6/12 = €140000

€1485000

Calculation of Interest payable

(i) Rate = 4.5% 5.94% T



Intt paid on Loan (€50000000 × 4.5% × 6/12) = €1125000

Electra space paid to FRA [5.94% − 4.50%] × €50000000 × 6/12 €360000

Interest payable €1485000

$$\text{Effective Rate} = \frac{€1485000}{€50000000} \times 100 \times \frac{12}{6}$$

= 5.94% p.a.

QUESTION – 08

Espaces plc is consumer electronics wholesaler. The business of the firm is highly seasonal in nature. In 6 months of a year, firm has a huge cash deposits and especially near Christmas time and other 6 months firm cash crunch, leading to borrowing of money to cover up its exposures for running the business.

It is expected that firm shall borrow a sum of £25 million for the entire period of slack season in about 3 months.

The banker of the firm has given the following quotations for Forward Rate Agreement (FRA):

Spot	5.50% - 5.75%
3 × 6 FRA	5.59% - 5.82%
3 × 9 FRA	5.64% - 5.94%

3-month £50,000 future contract maturing in a period of 3 months is quoted at 94.15.

You are required to:

(a) Advise the position to be taken in Future Market by the firm to hedge its interest rate risk and demonstrate how 3 months Future contract shall be useful for the firm, if later interest rate turns out to be (i) 4.5% and (ii) 6.5%

(b) Evaluate whether the interest cost to Espace plc shall be less had it adopted the route of FRA instead of Future Contract.

Note:- Ignore the time value of money in settlement amount for future contract.

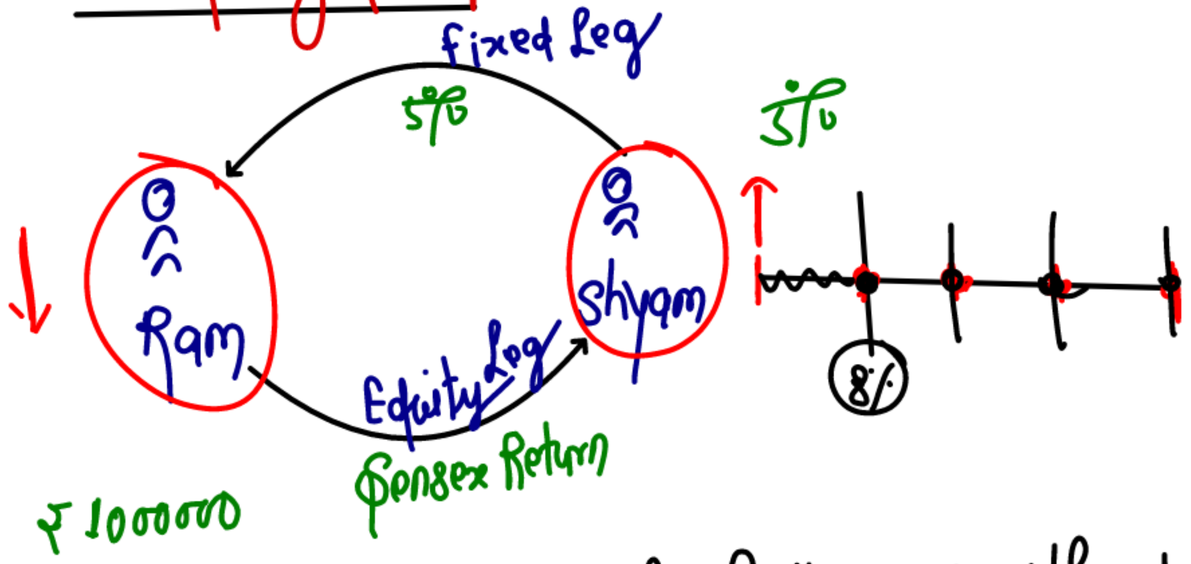
(RTP May - 2021)

(Page No. 13)

PART IV Financial Swap

1. Equity Swap
2. Plain Vanilla (generic Swap)
3. Overnight Index Swap
4. Two party Swap
5. Swap structuring
6. Swap pricing

(1) Equity Swap



Swap is multiple Netting with Netting feature & there are two Legs

(i) fixed Leg

(ii) floating Leg

QUESTION – 20

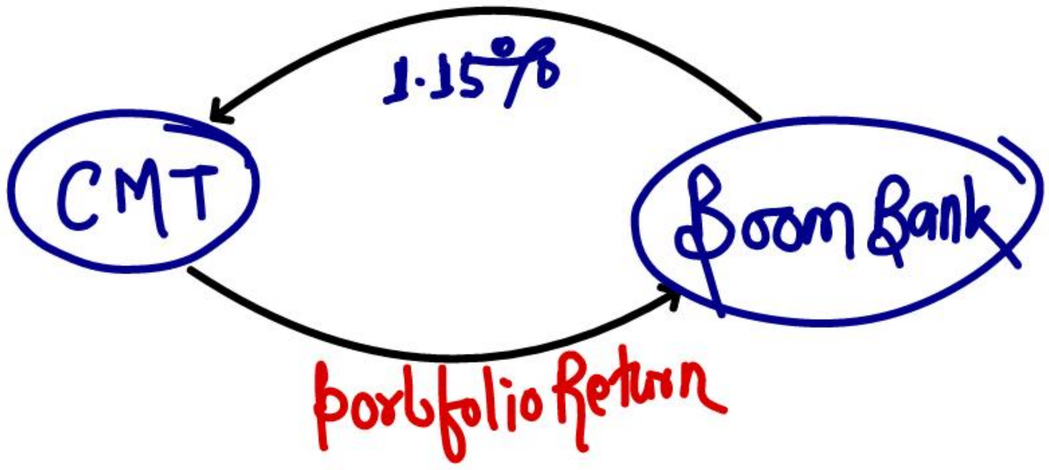
CMT Pension Fund has a portfolio of shares of diversified companies valued at ₹ 800 crore enters into a swap arrangement with Boom Bank on the terms that it will get 1.15% quarterly on notional principal of ₹ 800 crore in exchange of return on portfolio which is exactly tracking the Sensex which is presently 43,200.

You are required to determine the net payment to be received/ paid if Sensex turns out to be 43,720, 43,560, 44,160 and 43,920 at the end of each quarter.

Note: Make calculation in ₹ crore and round off calculations upto 4 decimal points.

(MTP: Oct – 2021)

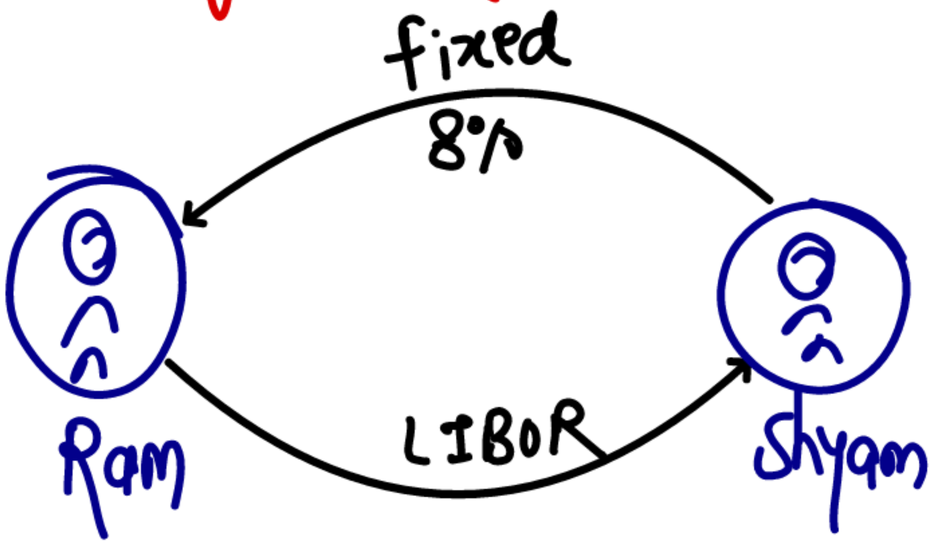
(Page No. 29)

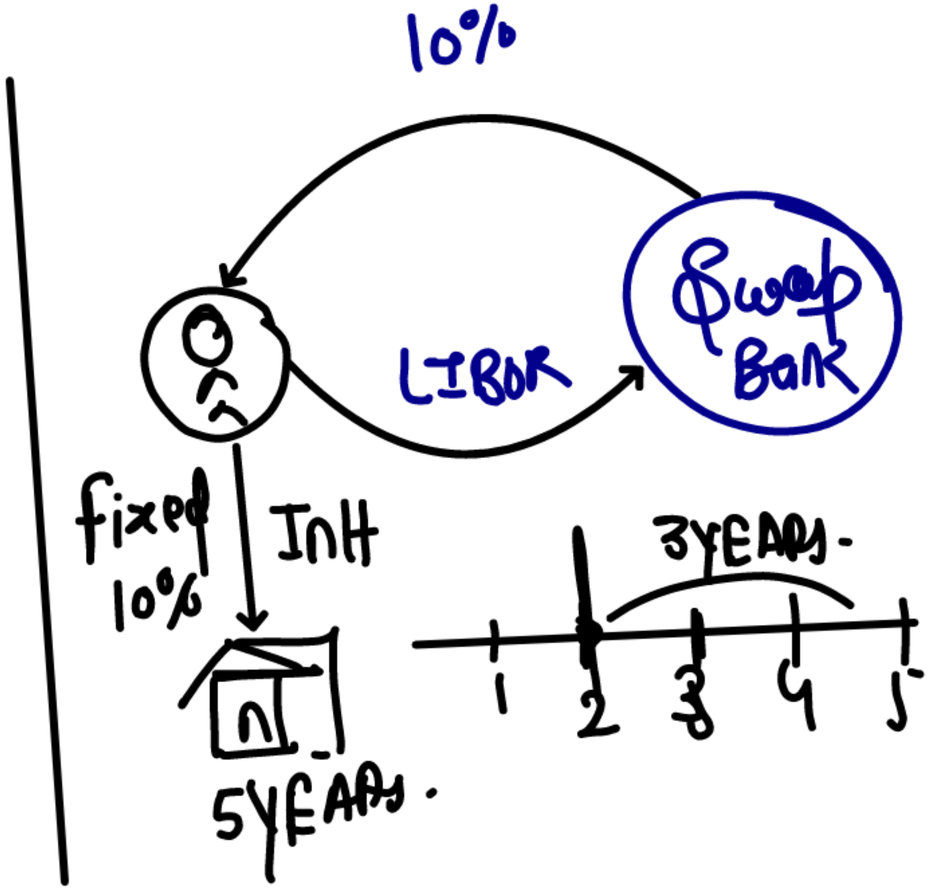


43200 Calculation of Net payment ₹800 cr.

Quarter	Sensex	Return (%)	Return (₹)	fixed Return (₹)(1.15%)	Net payable / Receivable
I	43720	1.2037%	9.6296	9.2000	-0.4296
II	43560	-0.3660%	-2.9280	9.2000	12.1280
III	44160	1.3774%	11.0192	9.2000	-1.8192
IV	43920	-0.543%	-4.348	9.2000	13.5480

(ii) Plain Vanilla Swap (Generic Swap)





QUESTION – 09

Suppose a dealer quotes 'All-in-cost' for a generic swap at 8% against six month LIBOR flat. If the notional principal amount of swap is ₹ 5,00,000.

(i) Calculate semi-annual fixed payment.

(ii) Find the first floating rate payment for (i) above if the six month period from the effective date of swap to the settlement date comprises 181 days and that the corresponding LIBOR was 6% on the effective date of swap.

In (ii) above, if the settlement is on 'Net' basis, how much the fixed rate payer would pay to the floating rate payer?

Generic swap is based on 30/360 days basis.

(SM, PM & Exam November - 2018)

(Page No. 15)

QUESTION – 10

P Ltd., a dealer quotes 'All-in-cost' for a generic swap at 6% against six months LIBOR flat. If the Notional principal amount of swap is ₹ 8,00,000:

(i) Calculate semi-annual fixed payment.

(ii) Find the first floating rate payment for (i) above if the six month period from the effective date of swap to the settlement date comprises 181 days and that the corresponding LIBOR was 5% on the effective date of swap. (Consider up to three decimal places).

(iii) In question number (ii) above, if the settlement is on 'Net' basis, how much the fixed rate payer would pay to the floating rate payer? Note: Generic swap is based on 30/360 days basis.

(Exam July – 2021 & November - 2010)

(Page No. 16)

1 YEAR = 365 days

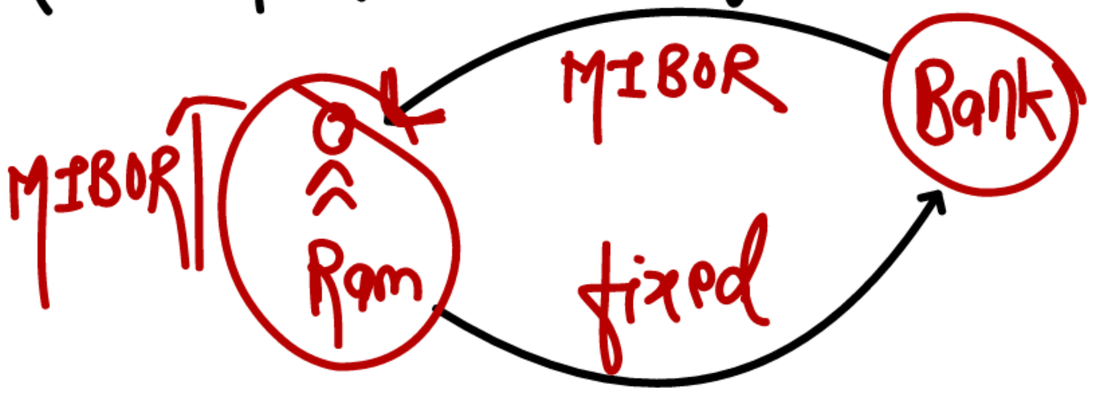
1500000 mt × 8% ÷ 365 mt
mRC × 7% ÷ 365 mt mRC

1500000

Day		principal	Int
1	8% p.a	1500000	329
2	7% p.a	1500329	288
3	6% p.a	1500617	247
4	9% p.a	1500863	370
			1234

3. Overnight Index Swap

Overnight Index Swap is plain Vanilla Swap in which one Leg is fixed & another Leg is MIBOR (Mumbai Inter Bank OFFER Rate) Subject to daily compounding



QUESTION – 13

Derivative Bank entered into a swap arrangement on a principal of ₹ 10 crores and agreed to receive MIBOR overnight floating rate for a fixed payment on the principal. The swap was entered into on Monday, 19th August, 2019 and was to commence on 20th August, 2019 and run a period of 7 days.

Respective MIBOR rates for Tuesday to Monday were:

8.15%, 7.98%, 7.95%, 8.12%, 8.15%, 7.75%.

If Fixed Rate of Interest is 8% then evaluate

(i) The nature of this swap arrangement.

(ii) The Net Settlement amount

Note:

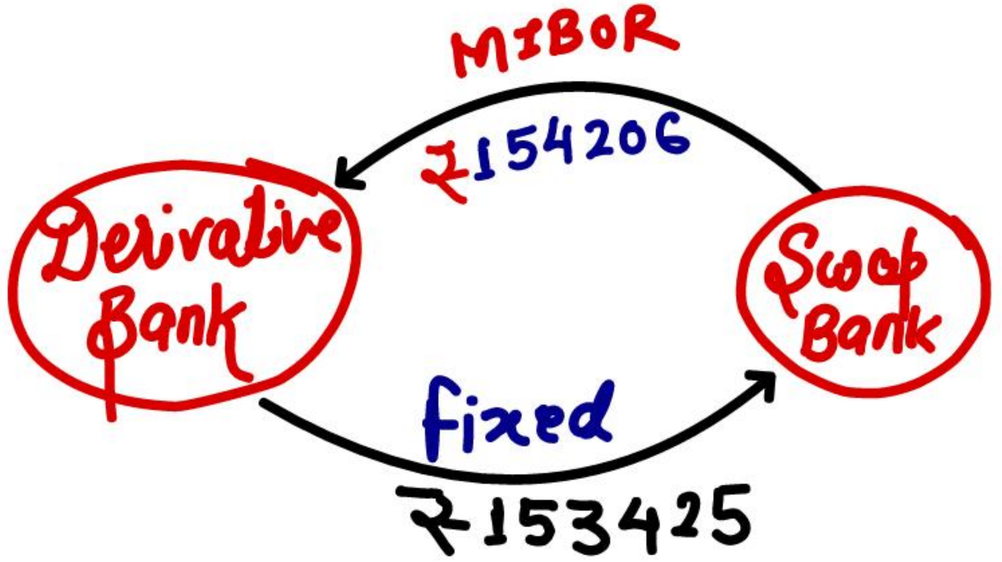
(1) Sunday is Holiday.

(2) Work in rounded rupees and avoid decimal working.

(3) Consider 365 days in a year.

(RTP November – 2021)

(Page No. 19)



(i) It is plain Vanilla Overnight Index Swap on MIBOR.

Fixed Rate payment = $10000000 \times 8\% \times 7/365$

= ₹153425

Eg Notional principal = ₹ 100000000

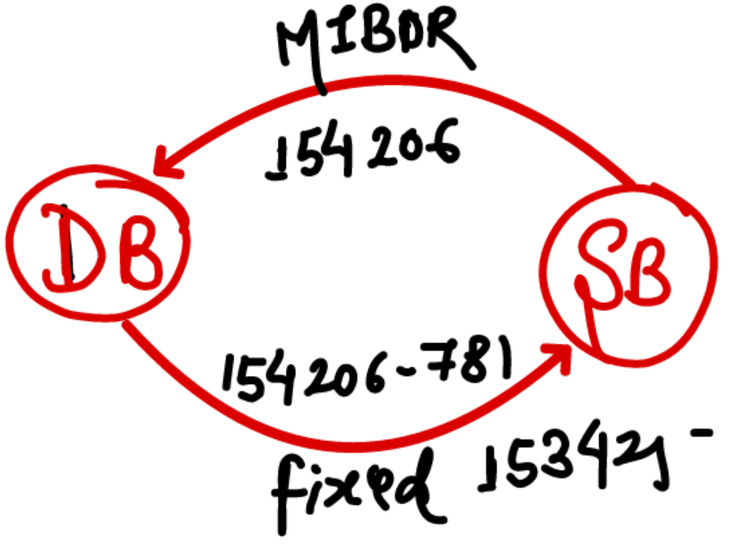
Swap = 7 days

Derivative Bank will receive MIBOR & pay fixed

In Net Settlement, Derivative Bank will Receive ₹ 781

MIBOR Int Amt = ₹ 154206

fixed Rate = ?



$$\text{Rate} = \frac{153425}{10000000} \times 100 \times \frac{365}{7}$$

$$= 8\% \text{ p.a.}$$

Net Settlement: Derivative Bank will receive ₹781

MIBOR Interest Amt

Days	MIBOR	principal	Interest
Tuesday	8.15%	10000000	22329
Wednesday	7.98%	10022329	21868
Thurs.	7.95%	10044197	21790
Friday	8.12%	10065987	22261
Sat & Sunday	8.15%	10088248	44697
Monday	7.75%	10132945	21261
			₹154206

10000000 M +
× 8.15% ÷ 365
M + MRC × 7.98%
÷ 365 M + MRC
× 7.95%

QUESTION – 11

Derivative Bank entered into a plain vanilla swap through on OIS (Overnight Index Swap) on a principal of ₹ 10 crores and agreed to receive MIBOR overnight floating rate for a fixed payment on the principal. The swap was entered into on Monday, 2nd August, 2010 and was to commence on 3rd August, 2010 and run for a period of 7 days.

Respective MIBOR rates for Tuesday to Monday were:

7.75%, 8.15%, 8.12%, 7.95%, 7.98%, 8.15%.

If Derivative Bank received ₹ 317 net on settlement, calculate Fixed rate and interest under both legs.

Notes:

(i) Sunday is Holiday.

(ii) Work in rounded rupees and avoid decimal working.

(Exam November – 2010, SM & PM)

(Page No. 17)

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QUESTION – 12

Punjab Bank has entered into a plain vanilla swap through on Overnight Index Swap (OIS) on a principal of ₹2 crore and agreed to receive MIBOR overnight floating rate for a fixed payment on the principal. The swap was entered into on Monday, 24th July, 2017 and was to commence on 25th July, 2017 and run for a period of 7 days.

Respective MIBOR rates for Tuesday to Monday were:

8.70%, 9.10%, 9.12%, 8.95%, 8.98% and 9.10%.

If Punjab Bank received ₹507 net on settlement, calculate Fixed rate and interest under both legs.

Notes:

(i) Sunday is a Holiday.

(ii) Workout in rounded rupees and avoid decimal working.

(iii) Consider a year consists of 365 days.

(Exam May - 2018)

(Page No. 18)

QUESTION – 14

Bharat Bank Ltd. has entered into a plain vanilla swap through on Overnight Index Swap (OIS) on a principal of ₹ 1 crore and agreed to receive. MIBOR overnight floating rate for a fixed payment on the principal. The swap was entered into on Monday. 10th July 2017 and was to commence on and from 11th July 2017 and run for a period of 7 days.

Respective MIBOR rates for Tuesday to Monday ware:

8.75%, 9.15%, 9.12%, 8.95%, 8.98% and 9.15%

If Bharat Bank Ltd. received ₹ 417 net on settlement, calculate fixed rate and interest under both legs.

Notes:(i) Sunday is a holiday

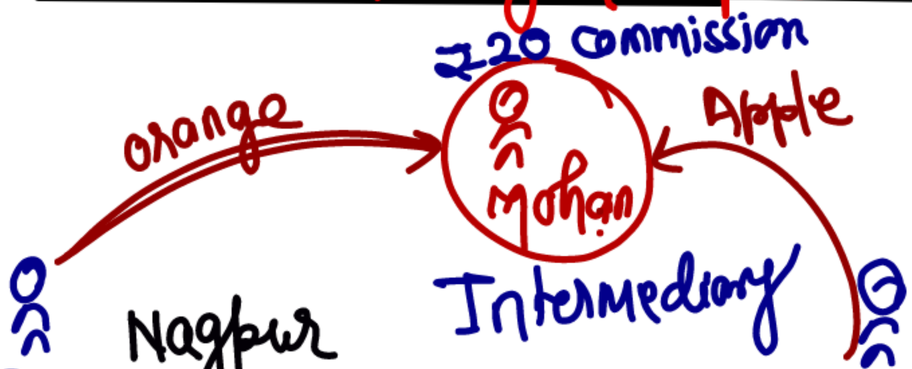
(ii) Work in rounded rupee and avoid decimal working

(iii) Consider 365 days in a year.

(Exam November - 2017)

(Page No. 20)

(iv) Two party Swap (Imp)



Apple = ₹100 per kg
Orange : ₹10 per kg

Apple = ₹10 per kg
Orange : ₹100 per kg

Calculation of EC

Difference in price (Apple)	= ₹90
Difference in price (Orange)	= ₹90
Total Gain :	₹180
(-) Commission :	₹20
Net Gain	₹160

EC

Ram (Apple) = ₹100 − (160 × 1/2)
= ₹20

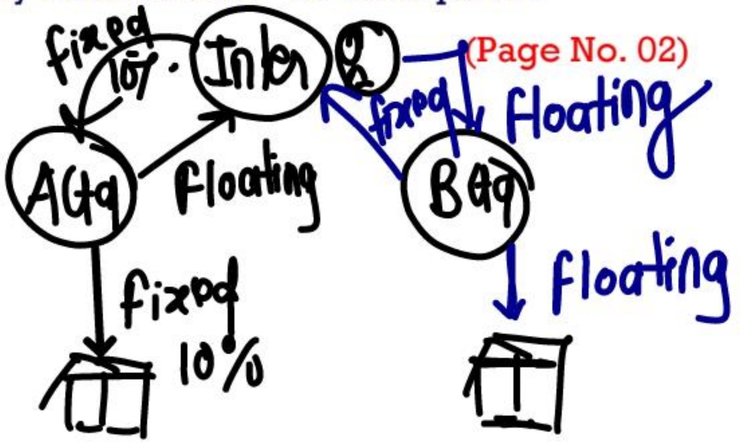
Shyam (orange) = ₹100 − (160 × 1/2) = ₹20

EXAMPLE – 07

	A Ltd.	B Ltd.
Fixed Rate	10%	12%
Floating Rate	LIBOR + 4%	LIBOR + 1%

A Ltd. wants to borrow at floating Rate & B Ltd wants to borrow at fixed Rate. Design a swap between A Ltd & B Ltd So that Effective Cost should be less then their Actual Borrowing.

Intermediary Commission = 50 Basis points



(Page No. 02)

- A Ltd wants to borrow at floating & B Ltd wants to borrow fixed.

Swap design

- A Ltd enjoys absolute advantage in fixed & B Ltd enjoys absolute advantage in floating.

On Swap, A Ltd should borrow at fixed Rate & enter into swap in which A will Receive fixed & pay floating.

B Ltd should borrow at floating & enter into swap in which B will receive floating & pay fixed

Effective Rate of Intt

Total Intt without Swap

Agd (Floating) LIBOR + 4%

Bgd (fixed) 12%

(A) LIBOR + 16%

Total Intt with Swap

Agd (fixed) 10%

Bgd (Floating) LIBOR + 1%

(B) LIBOR + 11%

Gain (A - B) 5%

(-) Commission 0.5%

Net Gain 4.5%

EC = Desired Borrowing − Share in Net Gain

Agd = LIBOR + 4 − (4.5 × 1/2)

= LIBOR + 1.75%

Bgd = 12 − (4.5 × 1/2)

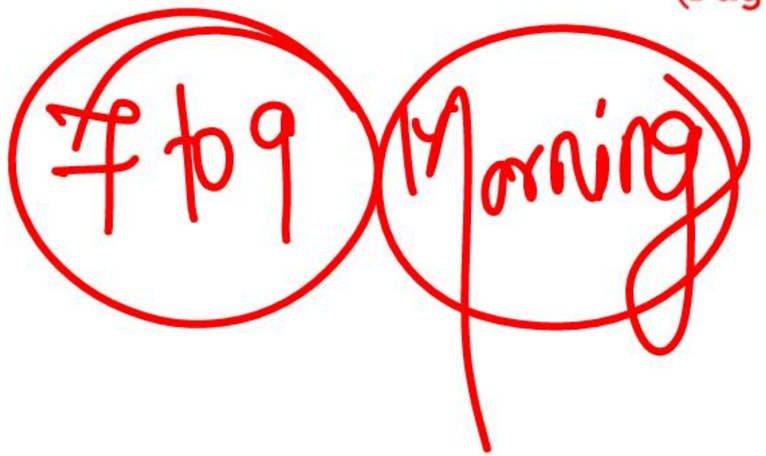
= 9.75%

EXAMPLE – 08

	A Ltd	B Ltd
Fixed Rate	10%	12%
Floating Rate	LIBOR + 1%	LIBOR + 4%

A Ltd wants to borrow at fixed rate & B Ltd Wants to borrow at floating Rate. Design a financial swap & Intermediary Commission 50 Basis points.

(Page No. 02)



QUESTION – 15

IB an Indian firm has its subsidiary in Japan and Zaki a Japanese firm has its subsidiary in India and face the following interest rates:

Company	IB	Zaki
INR floating rate	BPLR + 0.50%	BPLR + 2.50%
JPY (Fixed rate)	2%	2.25%

Zaki wishes to borrow Rupee Loan at a floating rate and IB wishes to borrow JPY at a fixed rate. The amount of loan required by both the firms is same at the current exchange rate. A financial institution may arrange a swap and requires 25 basis points as its commission. Gain, if any, is to be shared by the firms equally.

You are required to find out:

(i) Whether a swap can be arranged which may be beneficial to both the firms?

IM wishes to borrow USD at floating rate and JI JY at fixed rate. The amount required by both the

(ii) What rate of interest will the firms end up paying?

(Exam November - 2020)

QUESTION – 17

IM is an American firm having its subsidiary in Japan and JI is a Japanese firm having its subsidiary in USA: They face the following interest rates

	IM	JI
USD Floating rate	LIBOR+0.5%	LIBOR+2.5%

companies is same at the current Exchange Rate. A financial institution requires 75 basis points as commission for arranging Swap. The companies agree to share the benefit/ loss equally.

You are required to find out

(i) Whether a beneficial swap can be arranged?

(ii) What rate of interest for both IM and JI?

(Exam May - 2019)

(Page No. 25)

QUESTION – 16

A Inc. and B Inc. intend to borrow $200,000 and $200,000 in ¥ respectively for a time horizon of one year. The prevalent interest rates are as follows:

Company	¥ Loan	$ Loan
A Inc	5%	9%
B Inc	8%	10%

The prevalent exchange rate is $1 = ¥120.

They entered in a currency swap under which it is agreed that B Inc will pay A Inc @ 1% over the ¥ Loan interest rate which the later will have to pay as a result of the agreed currency swap whereas A Inc will reimburse interest to B Inc only to the extent of 9%. Keeping the exchange rate invariant, quantify the opportunity gain or loss component of the ultimate outcome, resulting from the designed currency swap.

(Exam May – 2011, SM & PM)

(Page No. 22)

EXAMPLE – 08

	A Ltd	B Ltd
Fixed Rate	10%	12%
Floating Rate	LIBOR + 1%	LIBOR + 4%

A Ltd wants to borrow at fixed rate & B Ltd Wants to borrow at floating Rate. Design a financial swap & Intermediary Commission 50 Basis points.

(Page No. 02)

- A Ltd wants to borrow at fixed Rate & B Ltd wants to borrow at floating Rate

Swap

- A Ltd enjoys absolute advantage in fixed as well as floating but Comparative advantage in floating Rate

  Hence A Ltd should borrowing at floating & B Ltd should borrow at fixed.

Effective Rate of InH.

Total Interest without Swap

A Ltd (fixed)

B Ltd (Floating)

Total InH with Swap

A Ltd (Floating)

B Ltd (fixed)

		10%
		LIBOR+4%
(A)		LIBOR+14%
		LIBOR+1%
		12%
(B)		LIBOR+13%
	Gain (A-B)	1%
	(-) Commission	0.5%
	Net Gain =	0.5%

Effective Rate

= Desired Borrowing - Share in Net Gain

A = 10% - (0.5 x 1/2)

= 9.75%

B = LIBOR+4% - (0.5 x 1/2)

= LIBOR+3.75%

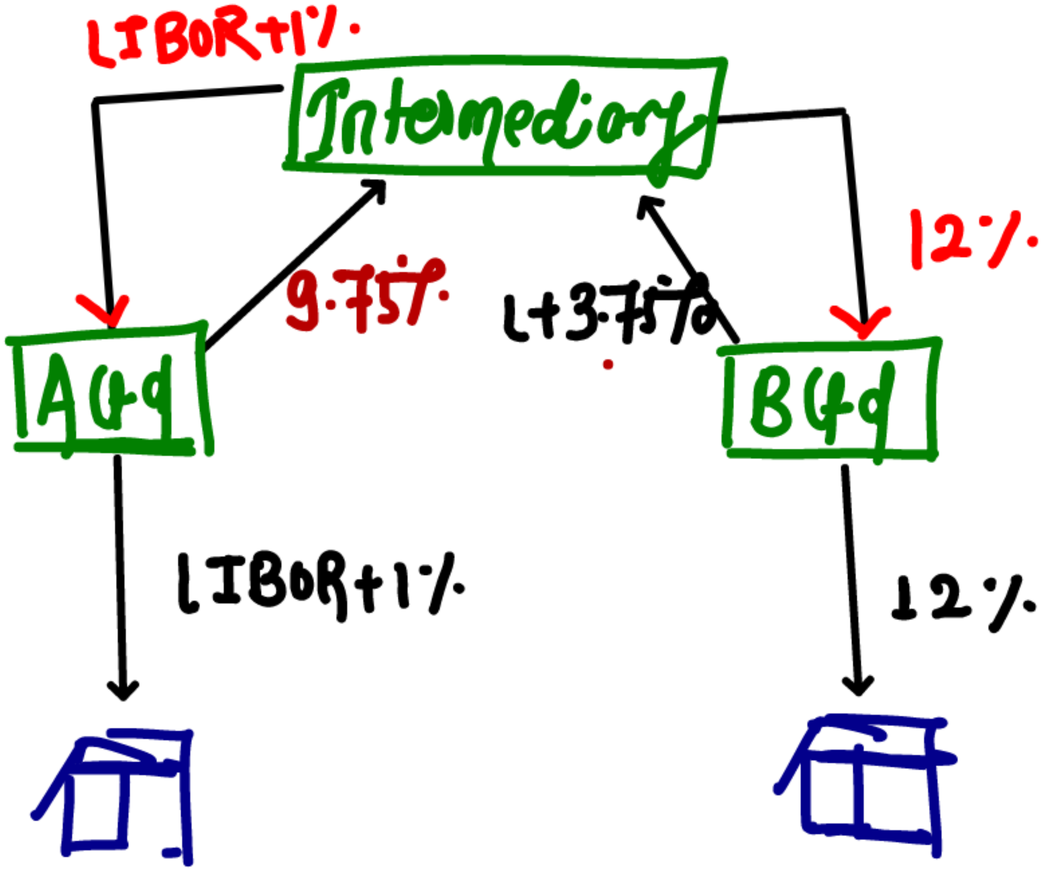
Swap design

Add

Int paid to Bank	LIBOR + 1%
Int Recd from Intermediary	LIBOR + 1%
Int paid to Intermediary	9.75%
EC	9.75%

Bad

INT paid to Bank	12%
INT Recd from Intermediary	12%
INT paid to Intermediary	LIBOR + 3.75%
EC	LIBOR + 3.75%


LIBOR+1%
Intermediary
12%
9.75%
LIBOR+3.75%
A Ltd
B Ltd
LIBOR+1%
12%

QUESTION – 15

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You are required to find out:

(i) Whether a swap can be arranged which may be beneficial to both the firms?

~~IM wishes to borrow USD at floating rate and JI JY at fixed rate. The amount required by both the~~

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(Exam November - 2020)

(Page No. 21)

QUESTION – 17

IM is an American firm having its subsidiary in Japan and JI is a Japanese firm having its subsidiary in USA: They face the following interest rates

	IM	JI
USD Floating rate	LIBOR+0.5%	LIBOR+2.5%

companies is same at the current Exchange Rate. A financial institution requires 75 basis points as commission for arranging Swap. The companies agree to share the benefit/ loss equally.

You are required to find out

(i) Whether a beneficial swap can be arranged?

(ii) What rate of interest for both IM and JI?

(Exam May - 2019)

(Page No. 25)

QUESTION – 16

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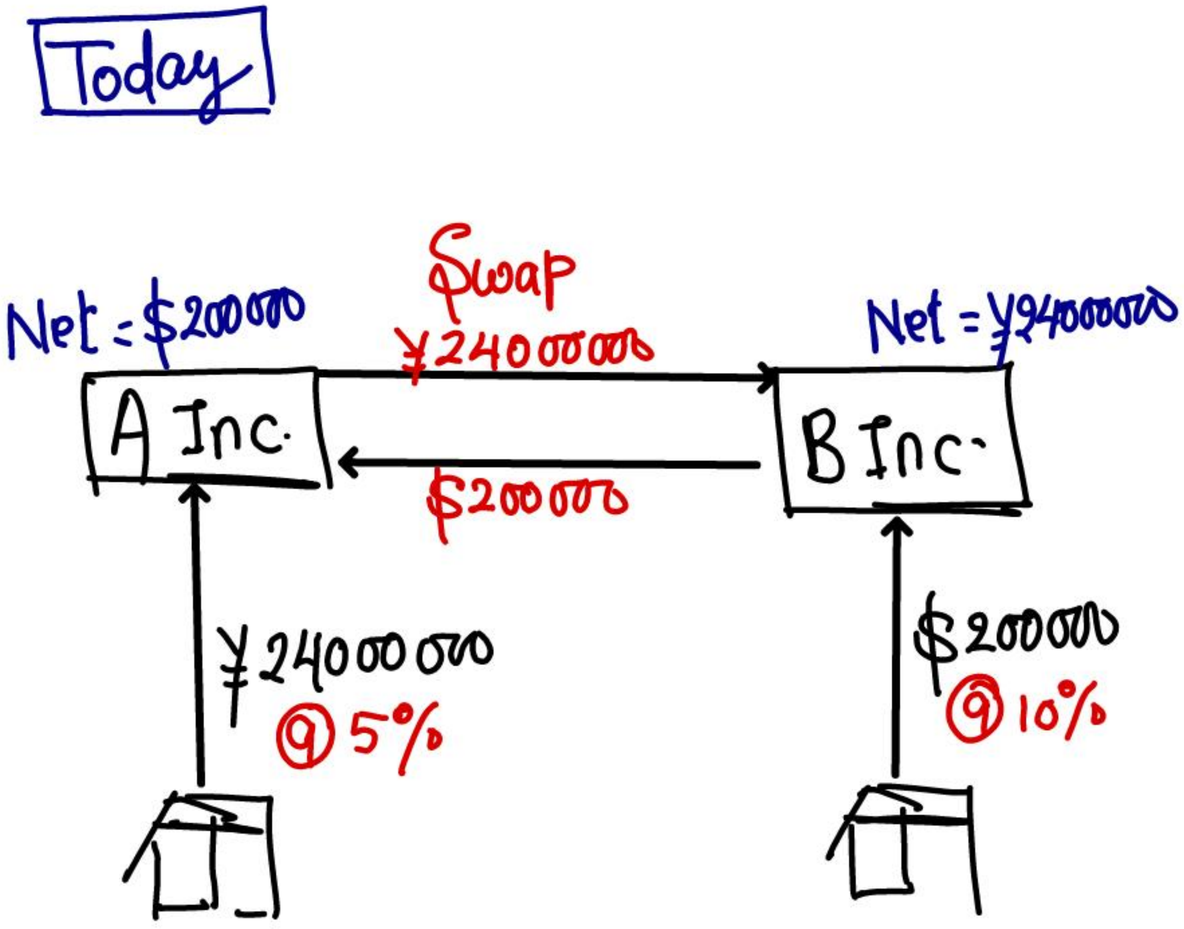
The prevalent exchange rate is $1 = ¥120.

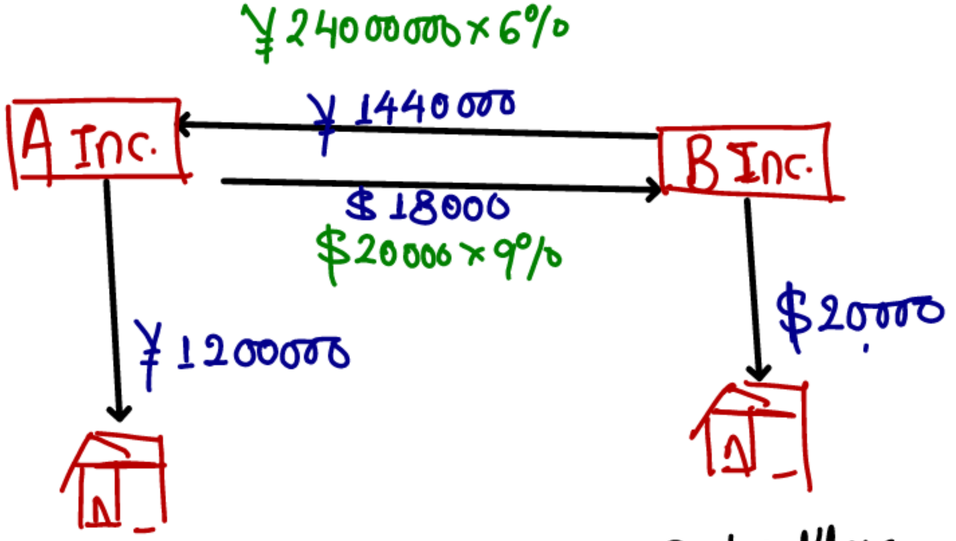
They entered in a currency swap under which it is agreed that B Inc will pay A Inc @ 1% over the ¥ Loan interest rate which the later will have to pay as a result of the agreed currency swap whereas A Inc will reimburse interest to B Inc only to the extent of 9%. Keeping the exchange rate invariant, quantify the opportunity gain or loss component of the ultimate outcome, resulting from the designed currency swap.

(Exam May – 2011, SM & PM)

(Page No. 22)



After 1 YEAR



Cash outflows = $18000 − ¥240000

$$= \$18000 - \frac{¥240000}{¥120}$$

$$= \$16000$$

$$EC(\%) = \frac{\$16000}{\$200000} \times 100 = 8\%$$

Gain = 9% − 8% = 1%

$20000 × 1% = $200

Cash outflows

= ¥1440000 + $2000

= ¥1440000 + ($2000 × 120)

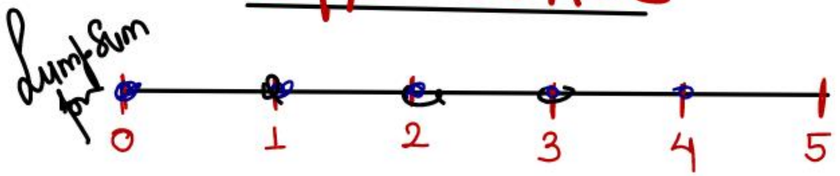
= ¥1680000

$$EC(\%) = \frac{¥1680000}{¥24000000} \times 100 = 7\%$$

Gain = 8% − 7% = 1%

= ¥24000000 × 1% = ¥240000

Cap, Collar & Floor



Interest Rate Cap

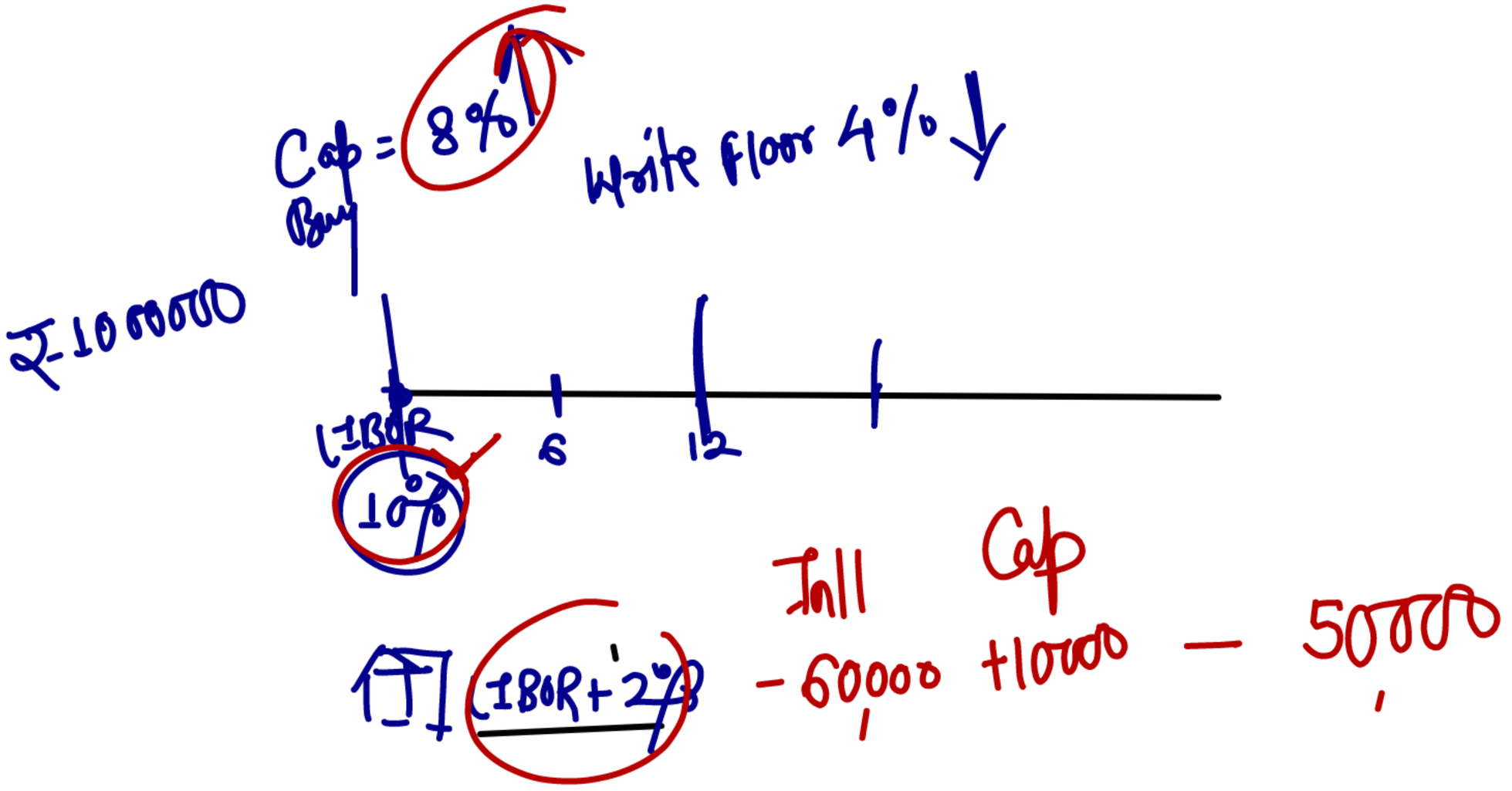
Cap is portfolio of Call option. If we borrow & afraid from Intt Rate rising then Buy Cap. Premium is to be paid in Advance.

Interest Rate Floor

Floor is a portfolio of put option. If we Invest & afraid from Intt Rate falling then Buy Floor

Interest Rate Collar

Collar is a strategy in which Buy Cap & Sell Floor


Cap = 8%
Buy
Write Floor 4%
₹ 10 00000
LIBOR
10%
6
12
LIBOR + 2%
Cap
-60,000 +10000 — 50000

QUESTION – 22

XYZ Inc. issues a £ 10 million floating rate loan on July 1, 2013 with resetting of coupon rate every 6 months equal to LIBOR + 50 bp. XYZ is interested in a collar strategy by selling a Floor and buying a Cap. XYZ buys the 3 year Cap and sell 3 year Floor as per the following details on July 1, 2013:

Notional Principal Amount	$ 10 million
Reference Rate	6 months LIBOR
Strike Rate	4% for Floor and 7% for Cap
Premium	0*

*Since Premium paid for Cap = Premium received for Floor

Using the following data you are required to determine:

(i) Effective interest paid out at each reset date.

(ii) The average overall effective rate of interest p.a.

Reset Date	LIBOR (%)
31-12-2013	6.00
30-06-2014	7.00
31-12-2014	5.00
30-06-2015	3.75
31-12-2015	3.25
30-06-2016	4.25

(Practice Manual)

(Page No. 31)

$10000000 Cap: 7%↑ Floor: 4%↓ 1 YEAR = 365 days

Reset date	LIBOR (%)	payment date	No. of days	Int on loan (L+0.50%)	Cap Payoff	Floor Payoff	Effective Int.
31/12/2013	6.00	30/06/2014	181 days	322329	0	0	322329
30/06/2014	7.00	31/12/2014	184 days	378082	0	0	378082
31/12/2014	5.00	30/06/2015	181 days	272740	0	0	272740
30/6/2015	3.75	31/12/2015	184 days	214247	0	12603	226850
31/12/2015	3.25%	30/06/2016	182 days	186986	0	37397	224383
30/06/2016	4.25%	31/12/2017	184 days	239452	0	0	239452
			1096 days				1663836

$$\text{Effective Int} = \frac{1663836}{10000000} \times \frac{365}{1096} \times 100 = 5.54\% \text{ p.a.}$$

QUESTION – 23

MPD Ltd. issues a ₹ 50 Million Floating Rate Loan on July 1, 2018 with resetting of coupon rate every 6 Months equal to LIBOR + 50 bps.

MPD is interested in an Interest rate Collar Strategy of selling a Floor and buying a cap. MPD buys the 3 years cap and sell 3 years Floor as per the following details on July 1, 2018:

Principal Amount	₹ 50 Million
Strike Rate	5% for Floor & 8% for Cap
Reference Rate	6 months LIBOR
Premium	NIL, since premium paid for cap = premium received for Floor

The Reset dates & Interest rates p.a., on that dates are:

Reset Date	**31/12/ 2018**	**30/06/ 2019**	**31/12/ 2019**	**30/06/ 2020**	**31/12/ 2020**	**30/06/ 2021**
LIBOR(%)	7.00	8.00	6.00	4.75	4.25	5.25

Using the above data, you are required to determine:

(i) Effective Interest paid out at each six reset dates, (Round off to the nearest rupee)

(ii) Average overall effective rate of interest p.a. (round off to 2 decimals)

(Exam May-2022) (Page No. 33)

QUESTION – 22

XYZ Inc. issues a £ 10 million floating rate loan on July 1, 2013 with resetting of coupon rate every 6 months equal to LIBOR + 50 bp. XYZ is interested in a collar strategy by selling a Floor and buying a Cap. XYZ buys the 3 year Cap and sell 3 year Floor as per the following details on July 1, 2013:

Notional Principal Amount	$ 10 million
Reference Rate	6 months LIBOR
Strike Rate	4% for Floor and 7% for Cap
Premium	0*

*Since Premium paid for Cap = Premium received for Floor

Using the following data you are required to determine:

(i) Effective interest paid out at each reset date,

(ii) The average overall effective rate of interest p.a.

QUESTION – 24

A textile manufacturer has taken floating interest rate loan of ₹ 40,00,000 on 1st April, 2012. The rate of interest at the inception of loan is 8.5% p.a. interest is to be paid every year on 31st March, and the duration of loan is four years. In the month of October 2012, the Central bank of the country release following projections about the interest rates likely to prevail in future.

Dates	Interest Rate
31st March, 2013	8.75%
31st March, 2014	10.00%
31st March, 2015	10.50%
31st March, 2016	7.75%

(i) Advise how borrower can hedge the risk arising out of expected rise in the rate of interest when he is interested in pegging his interest cost at 8.50% p.a. and if option on Interest Rate is available at 0.75% p.a.

① A Textile manufacturer has taken floating Rate Loan & as per Central Bank projection, it is Expected that Intt rate will rise in future & he afraids from Intt Rate rising & wants to keg interest Rate on Loan, hence he should buy Interest Rate cap.

(ii) Assume that the premium negotiated by both the parties at the above-mentioned rate which is to be paid on upfront basis and the actual rate of interest on the respective due dates happens to as follows:

Dates	Interest Rate
31st March, 2013	10.20%
31st March, 2014	11.50%
31st March, 2015	9.25%
31st March, 2016	8.25%

EVALUATE how the settlement will be executed on the respective interest due dates.

(Exam Nov – 2017, SM, PM, RTP May – 2022 & MTP March – 22)

(Page No. 34)

Features of Cap

Notional principal = ₹ 4000000

Strike price = 8.5%

Duration of Cap = Upto 31/3/2016 [4 YEARS]

Cost of Cap [premium] = ₹ 4000000 × 0.75%

= ₹ 30000 p.a.

(ii) Settlement of Cap

8.5% ↑

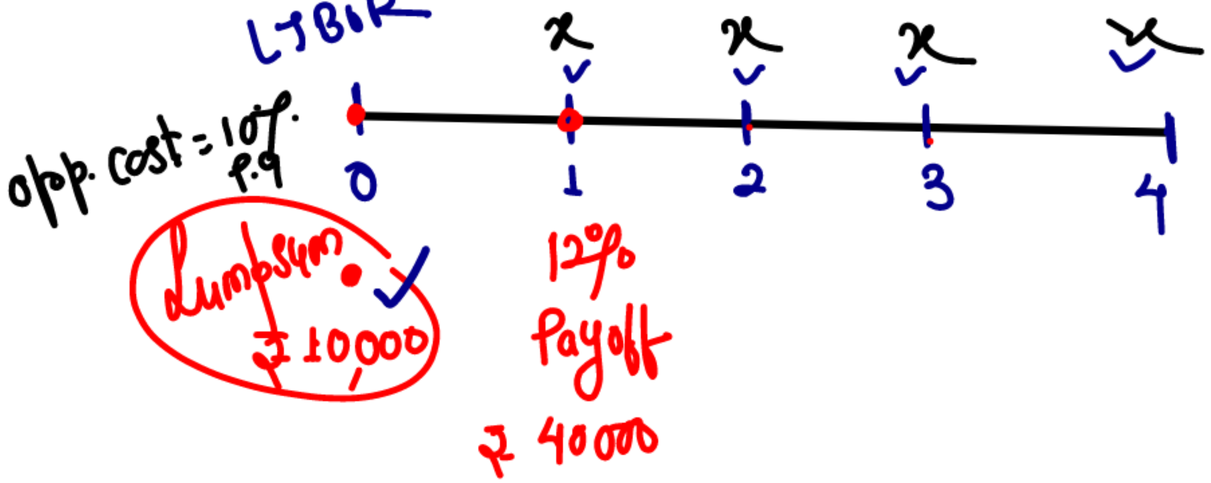
Reset Date	Int paid On Loan	Cap pay off		Effective Int
		Action	Payoff	
31/3/2013	10.20%	Ex.	1.7%	8.5%
31/3/2014	11.50%	Ex.	3%	8.5%
31/3/2015	9.25%	Ex.	0.75%	8.5%
31/3/2016	8.25%	Lapse	0	8.25%

Int Rate cost can not Exceed 8.5% p.a. but cost of Pegging ₹ 30000 p.a.

Premium = ₹10,00,000 Loan 4 YEARS

Cap = 8% ↑

LIBOR



$₹10000 = (x \times 0.909) + (x \times 0.8\%) + (x \times 0.70\%) (x \times 0.6\%)$

$10000 = 3.170x$

$x = \frac{10000}{3.170} = 3155$

Premium Amortisation

$= \frac{\text{Lumpsum premium}}{\text{PVAF}}$

$= \frac{₹10000}{3.170}$

$= 3155$

QUESTION – 25

XYZ Limited borrows £ 15 Million of six months LIBOR + 10.00% for a period of 24 months. The company anticipates a rise in LIBOR, hence it proposes to buy a Cap Option from its Bankers at the strike rate of 8.00%. The lump sum premium is 1.00% for the entire reset periods and the fixed rate of interest is 7.00% per annum. The actual position of LIBOR during the forthcoming reset period is as under:

Reset Period	LIBOR
1	9.00%
2	9.50%
3	10.00%

You are required to show how far interest rate risk is hedged through Cap Option.

For calculation, work out figures at each stage up to three decimal points and amount nearest to £. It should be part of working notes.

(Study Material & Practice Manual)

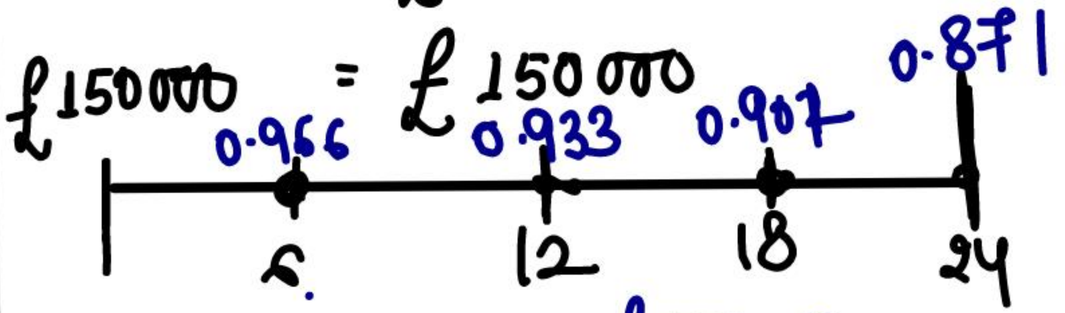
(Page No. 36)

1. Amortisation of premium

Lumpsum premium

= £15000000 × 1%

= £150000



$$\text{Amortisation} = \frac{£150000}{(PVAf, 3.5\%, 4)}$$

$$= \frac{£150000}{3.671} = £40861$$

£150000

Calculation of payoff

Cap 8%↑

Reset period	LIBOR(%)	Addition Int on Loan	Cap		
			Gross Payoff	premium	Net payoff
1	9.00	£75000	£75000	£40861	£34139
2	9.50%	£112500	£112500	£40861	£71639
3	10.00%	£150000	£150000	£40861	£109139
		£337500			£214917

Due to Cap, We Save Int Cost by £214917

IV Swab Structuring (RTP)

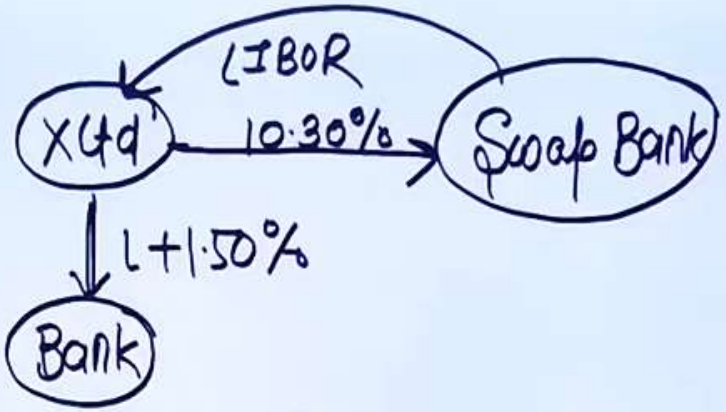
Question – 18

(a) X Ltd. wants to borrow fixed rate funds for 5 year. It can do so at an interest rate of 13% p.a. Also floating rate funds are available at a spread of 150 basis points over LIBOR. It approaches a swap bank which quotes 5-year fixed to floating swap at 20/30 basis points over 5-year treasuries vs. LIBOR. How should the firm reduce the cost of its fixed rate funding given that 5-year treasuries are yielding 10%.

(b) Another firm Y Ltd. had borrowed 7-year fixed rate funds 2 years ago at 14%. It is now expecting interest rates to fall and therefore wants to convert its fixed rate liability into floating rate liability. Explain how Y Ltd. can achieve this objective.

(Page No. 32)

(a)



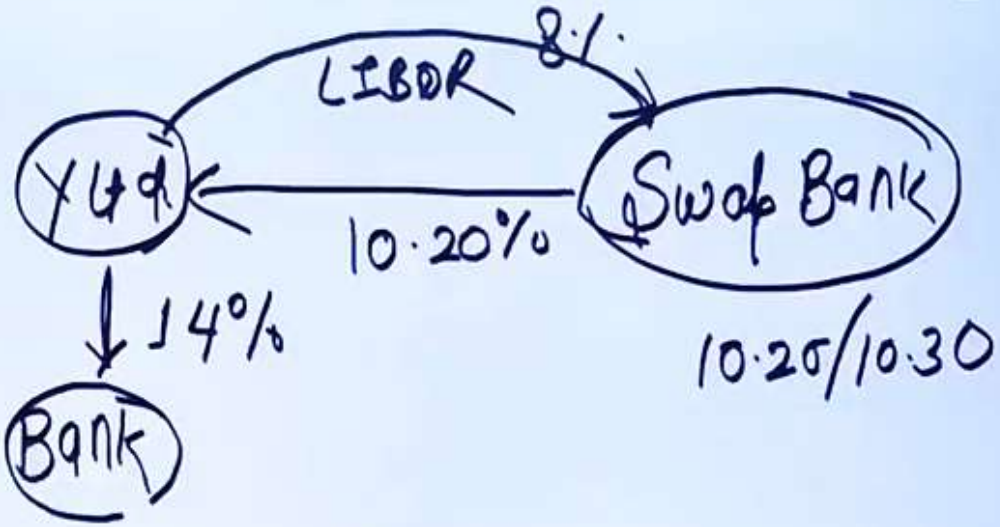
X Ltd. wants to borrow at fixed Rate & Cost of funding at fixed is 13%.

Alternative X Ltd should borrow at L+1.50% (Floating) & Enter into Swap in which X Ltd will pay fixed & 10.30% & Receive LIBOR

EC = Outflows - Inflows

= L+1.50+10.30-L = 11.80%

(b)



Y Ltd already borrowed at fixed rate & wants to convert it into floating.

In this situation, Y Ltd should enter into swap in which Y Ltd will pay LIBOR & receive fixed

EC = 14 + LIBOR - 10.20 = L + 3.80%

Question – 19

ABC Bank is seeking fixed rate funding. It is able to finance at a cost of six months LIBOR + 1/4% for ₹ 200 million for 5 years. The bank is able to swap into a fixed rate at 7.5% versus six month LIBOR treating six months as exactly half a year.

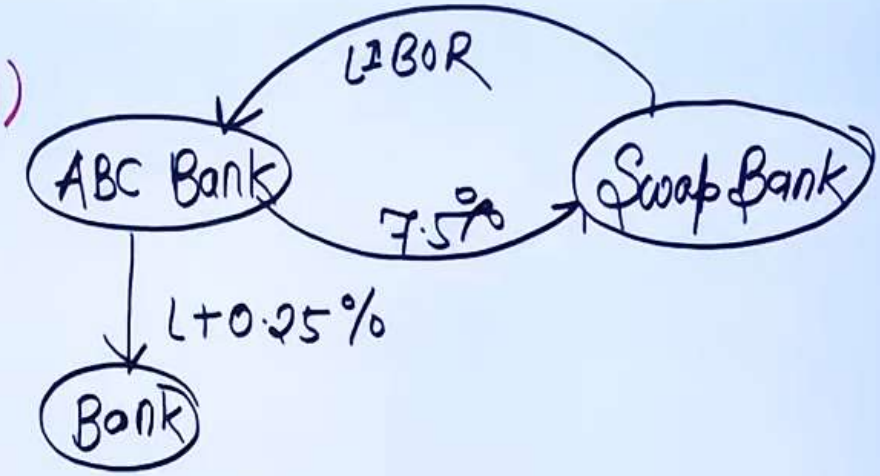
i. What will be the "all in cost" funds to ABC Bank?

ii. Another possibility being considered is the issue of a hybrid instrument which pays 7.5% for first three years and LIBOR – 1/4% for remaining two years.

Given a three year swap rate of 8%, suggest the method by which the bank should achieve fixed rate funding.

(Page No. 34)

(i)



Intt on Loan - L+0.25%

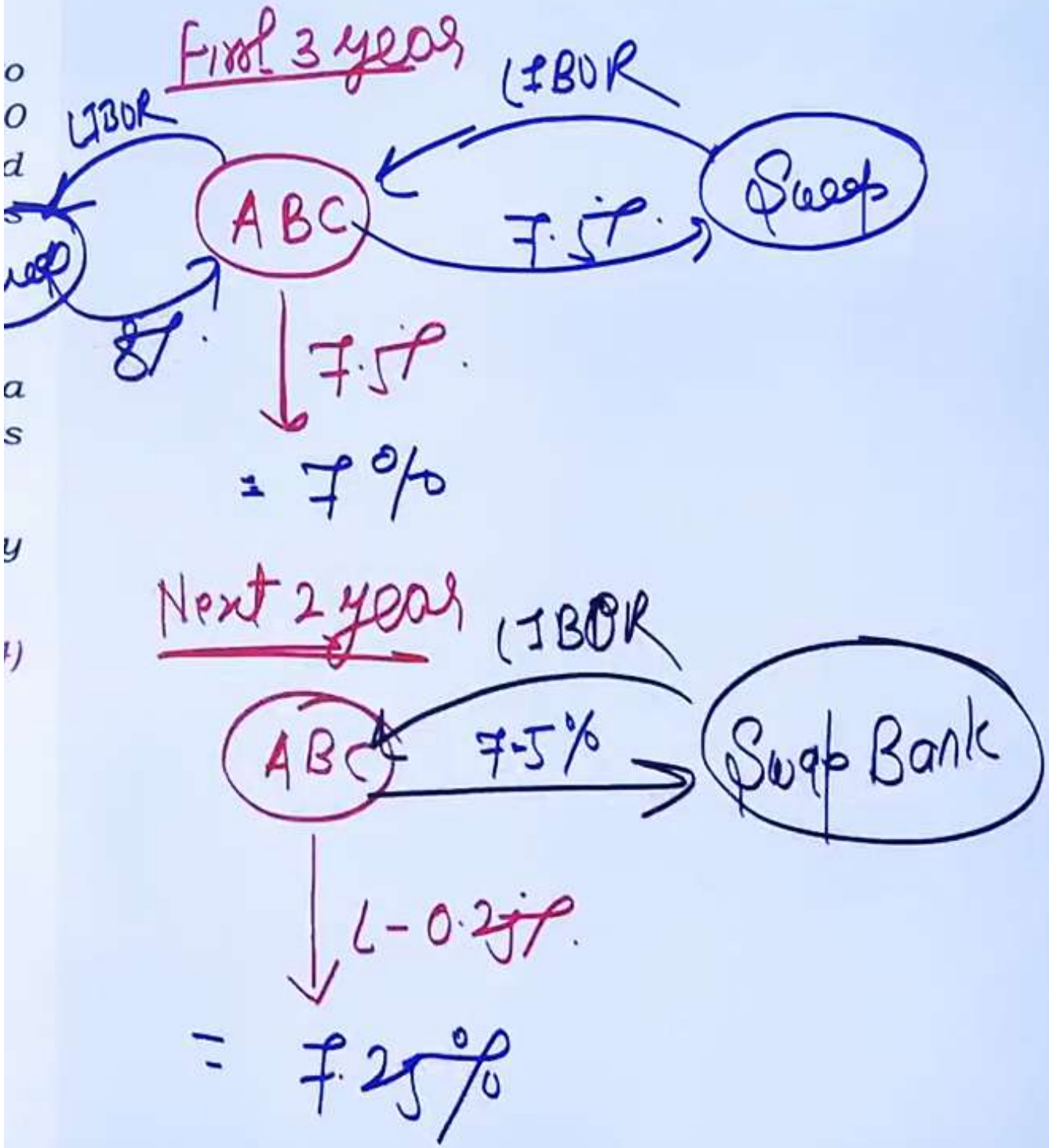
Pay to Swap Bank - 7.50%

Receive from Swap Bank LIBOR

EC = 7.75%

Intt Amt = 20000000 × 7.75% × 6/12

= ₹ 775000


First 3 years
LIBOR
LIBOR
ABC
Swap
7.5%
8%
7.5%
= 7%
Next 2 years
LIBOR
ABC
7.5%
Swap Bank
L-0.25%
= 7.25%

Question – 19

ABC Bank is seeking fixed rate funding. It is able to finance at a cost of six months LIBOR + 1/4% for ₹ 200 million for 5 years. The bank is able to swap into a fixed rate at 7.5% versus six month LIBOR treating six months as exactly half a year.

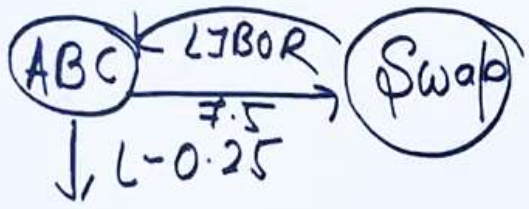
i. What will be the "all in cost" funds to ABC Bank?

ii. Another possibility being considered is the issue of a hybrid instrument which pays 7.5% for first three years and LIBOR – 1/4% for remaining two years.

Given a three year swap rate of 8%, suggest the method by which the bank should achieve fixed rate funding.

(Page No. 34)

Next 2 years

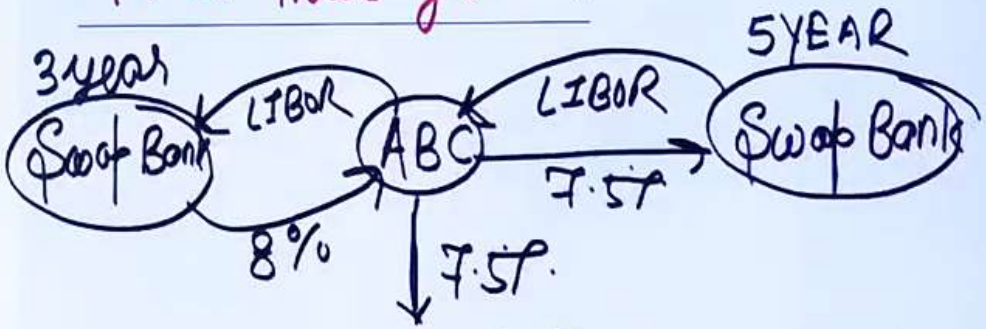


EC = 7.5 + L − 0.25 − L

= 7.25%

(11)

First Three years



ABC Issues hybrid instruments & pay fixed Rate (7.5%) on Loan for first 3 years & Enter into 5 year Swap & 3 years Swap

EC = 7.5 + 7.5 − 8 = 7%

Part 5: Swap Pricing & Valuation

In Swap Pricing, we find out rate of interest of fixed leg & decide whether we should enter into financial swap or not.

Periodical fixed rate of interest is calculated as under

d_t = Discounting rate of last year

$\sum dn$ = Cumulative discounting factors

$$\text{Periodical fixed rate} = \frac{1-d_t}{\sum dn}$$

Question – 20

Question 21 Page 30

A corporation enters into a $10 million notional principal interest rate swap. The swap calls for a corporation to pay fixed rate and receive floating rate on LIBOR. The payment will be made every 90 days for one year and will be based on the adjustment factor 90/360. The term structure of LIBOR when the swap is initiated is as follows:

Days	90	180	270	360
Rate (%)	7.00	7.25	7.45	7.55

Note that at the initiation of the swap, the fixed rate is set at such a rate that the value of the swap is zero.

You are required to:

i. Determine the fixed rate on the swap.

i. Calculate the first net payment on the swap.

Calculation of fixed Rate

Term	Rate	periodical Rate	(factors $\frac{1}{1+r}$)
90 day	7.00%	1.75%	0.9828
180 days	7.25%	3.625%	0.9650
270 days	7.45%	5.5875%	0.9471
360 days	7.55%	7.55%	0.9298
		Σdn =	3.8247

$$\text{periodical fixed Rate} = \frac{1 - d_L}{\Sigma dn} = \frac{1 - 0.9298}{3.8247} = 1.835\%$$

$$= 1.835 \times \frac{360}{90} = 7.34\% \text{ (p.a)}$$