$$= \frac{50\ \text{Cr.}(8.60\% - 8.30\%) \times 3/12}{1 + (8.60\% \times 3/12)}$$

$$= \frac{₹\ 3,75,000}{1.0215}$$

$$= ₹\ 3,67,107$$

Interest paid on loan (50 Cr × 8.6% × $\frac{3}{12}$) = ₹ 1,07,50,000

Net settlement (₹ 3,67,107 × 1.0215) = ₹ 3,75,000

Effective Cost = ₹ 1,03,75,000

Effective rate $= \frac{1,03,75,000}{50\ \text{Cr.}} \times 100 \times \frac{12}{3}$

= 8.30% p.a.

(2) If Rate 7.8%

In this situation P Ltd. will pay to FRA bank

Effect of FRA

Final settlement $= \frac{50\ \text{Cr.}(7.8\% - 8.30\%) \times 3/12}{1 + (7.8\% \times 3/12)}$

$= \frac{₹\ 6,25,000}{1.0195}$

= ₹ 6,13,046

Effective Rate of Interest

Interest paid on Loan (50 Cr. × 7.8% × 3/12) = ₹ 97,50,000

(+) Net Settlement (₹ 6,13,046 × 1.0195) = ₹ 6,25,000

= ₹ 1,03,75,000

Effective Rate $= \frac{1,03,75,000}{50\ \text{Cr.}} \times 100 \times \frac{12}{3}$

= 8.30% p.a.

Question – 03

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.

(b) The settlement amount.

(Assume 360 days in a year)

(SM TYK – 02)

Solution:

(i) Calculation of profit/Loss to TM Fincorp.

TM bought FRA 6 × 9 at 5.25%. On maturity 3 months MIBOR is 5.50% hence TM will Make profit (5.50% – 5.25%) i.e., 0.25% on 25 basic.

(ii) Settlement Amount

$$\text{Settlement Amount} = \frac{N\,(RR-FR)\,DTm/360}{1+(RR\times DTm/360)}$$

$$= \frac{1,00,00,00,000\,(5.50\% - 5.25\%)\,90/360}{1+(5.50\,\%\times 90/360)}$$

$$= \frac{1,00,00,00,000\times 0.0625\%}{1.01375}$$

= ₹ 6,16,523

Question – 04

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?

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.

Solution:

(i) Calculation of FRA 3 × 6

$$1 + (5\% \times 6/12) = [1 + (4.5\% \times 3/12)] \times (1 + r)$$

$$1.025 = 1.01125 \times (1 + r)$$

$$r = \left(\frac{1.025}{1.01125}\right) - 1 \times 100$$

$$= 1.3595\%$$

$$\text{FRA } 3 \times 6 = 1.3597 \times \frac{12}{3}$$

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

(ii) Calculation of Theoretical 6 × 12 FRA

$$1 + \left(6.5\% \times \frac{12}{12}\right) = \left[1 + \left(5\% \times \frac{6}{12}\right)\right] \times (1 + r)$$

$$1.065 = (1.025)\,(1 + r)$$

$$r = \left(\frac{1.065}{1.025} - 1\right) \times 100 \times \frac{12}{6}$$

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

Arbitrage:

Action: Since Actual FRA is less than theoretical FRA, it means FRA is underpriced, hence buy FRA 6.75% p.a. i.e. contract to borrow.

Process:

Today

– Borrow $ 1 @ 5% p.a. for 6 months

– Invest $ 1 @ 6.5% p.a. for 12 Months

– Contract to borrow @ 6.75% p.a. after 6 months for 6 months

After 12 Months

Cash Inflows

$ 1 (1.065) = $ 1.065

Cash outflows

$ 1 (1.025) (1.03375) = $1.060

Arbitrage = $ 0.005

PART 2: INTEREST RATE GUARANTEE

Question – 05

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)

Solution:

(i) Calculation of Theoretical FRA 2 × 3

XYZ

$(1.0448)^3 = (1.0420)^2 (1 + r)$

$1.14057 = 1.08576 (1 + r)$

$r = \left(\frac{1.14051}{1.08576}\right) - 1 \times 100$

$= 5.04\%$ p.a.

ABC

$(1.0578)^3 = (1.0548)^2 (1 + r)$

$1.1836 = 1.1126 (1 + r)$

$r = \left(\frac{1.1836}{1.1126} - 1\right) \times 100$

$= 6.38\%$ p.a.

(ii) Calculation of Interest payable by XYZ: XYZ buys interest rate guarantee for 1 year after 2 years @ 5.04% & paid premium ₹ 100 Cr. × 0.1% = ₹ 0.1 Cr. (Call Option)

(a) 4.5% p.a.

Interest paid on loan (₹ 100 Cr. × 4.5%)	= ₹ 4.50 Cr.
Interest rate guarantee payoff	= Lapsed
Premium	= ₹ 0.10 Cr.
Interest payable	= ₹ 4.60 Cr.

(b) 5.50% p.a.

Interest paid on loan (₹ 100 Cr. × 5.50%)	= ₹ 5.50 Cr.
Interest rate guarantee (5.50% – 5.04%) × 100 Cr.	= (0.46 Cr.)
Premium	= ₹ 0.10 Cr.
Interest payable	= ₹ 5.14 Cr.

PART 3: INTEREST RATE FUTURE (EURO DOLLAR FUTURE)

Question – 06

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.

Solution:

(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 @ 5.94% p.a.

Calculation of Interest payable

(i) Rate 4.5%

Interest paid on loan (€ 5,00,00,000 × 4.5% × 6/12)	= € 11,25,000
Electra space paid to FRA [5.94% – 4.5%] × € 5,00,00,000 × 6/12	= € 3,60,000
Interest payable	= € 14,85,500

(ii) Rate 6.5%

Interest paid on loan (€ 5,00,00,000 × 6.5% × 6/12)	= € 16,25,000
Electra space will receive [0.065 – 0.0594] × € 5,00,00,000 × 6/12	= € 1,40,000
Interest payable	= € 14,85,000

$$\text{Effective Cost} = \frac{€\ 14,85,000}{€\ 5,00,00,000} \times 100 \times \frac{12}{6} = 5.94\%\ \text{p.a.}$$

(II) Interest Rate Future

* Electra space should take short position at 94.15 on IRF

* $$\text{No. of contracts} = \frac{\text{Borrowing Amount}}{\text{Contract Size}} \times \frac{\text{Duration of Loan}}{\text{3 Months}}$$

$$= \frac{€\ 5,00,00,000}{€\ 50,000} \times \frac{\text{6 Months}}{\text{3 Months}}$$

= 2,000 Contract short

Interest Payable

(i) Rate 4.5% (100 – 4.5 = 95.50)

Interest paid on loan (€ 5,00,00,000 × 4.5% × 6/12)	= € 11,25,000
Loss on IRF (94.15 – 95.50)	= 1.35%

(1.35% × 2,000 × € 50,000 × 3/12) = € 3,37,500

= € 14,62,500

(ii) Rate 6.5% (100 – 6.5 = 93.50)

Interest paid on loan (€ 5,00,00,000 × 6.5% × 6/12) = € 16,25,000

Gain on IRF (94.15 – 93.50) = 0.65%

(0.65% × 2,000 × € 50,000 × 3/12) = (€ 1,62,500)

= € 14,62,500

$$\text{Effective Cost} = \frac{€\ 14,62,500}{€\ 5,00,00,000} \times 100 \times \frac{12}{6} = 5.85\%\ \text{p.a.}$$

PART 4: FINANCIAL SWAP

(I) EQUITY SWAP

Question – 07

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 October – 2021)

Solution:

(i) Calculation of net settlement in each quarter

Quarter	Sensex Return (%)	Sensex Return (₹)	Fixed return (₹) (1.15%)	Net payable/ receivable
I	$\frac{43,720 - 43,200}{43,200} \times 100$	9.6296	9.20 Cr.	- 0.4296 Paid

	= 1.2037%			
II	$\frac{43,560-43,720}{43,700} \times 100$ = -0.3660%	-2.9280	9.20 Cr.	12.128 Received
III	$\frac{44,160-43,560}{43,560} \times 100$ = 1.3774%	11.0192	9.20 Cr.	-1.8192 Paid
IV	$\frac{43,920-44,160}{44,160} \times 100$ =-0.5435%	-4.3480	9.20 Cr.	13.5480 Received

(II) PLAIN VANILLA SWAP

Question – 08

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 TYK – 04, Exam November – 2018)

Solution:

(i) Calculation of semi Amount fixed payment

= ₹ 5,00,000 × 8% × 6/12

= ₹ 20,000

(ii) Calculation of floating rate payment

= ₹ 5,00,000 × 6% × 181/360

= ₹ 15,083

(iii) Calculation of Net settlement

Net Amount paid by fixed rate payer = 20,000 – 15,083

= ₹ 4,917

Question – 09

Suppose a dealer bank quotes for a generic swap "AIC 8%/8.20% vs. 6M LIBOR Flat". Notional principal amount of swap is ₹ 1 Million, and the same is for a period of three years, reset after every six months.
In this context, answer the following questions:

(1) Interpret the dealer bank quote.

(2) If a firm is buying a swap, what is the nature of cash flows?

(3) If a firm is selling a swap, what is the nature of cash flows?

(4) Calculate semi-annual fixed payment for the buyer of swap at the end of every six months.

(5) If the six month period from the effective date of swap to the settlement date comprises of 181 days and that the corresponding LIBOR was 5% on the effective date of swap, then what will be the first floating rate payment for the buyer?

(6) If the settlement is on "Net Basis", how much the buyer of swap has to pay or receive at the end of first six months? [Assume 30/360 days basis]

(Exam November – 2023)

Solution:

(1) Interpretation of dealer bank quote:

- Ø AIC in the dealer bank quote refers to 'All in cost' i.e. cost of swap all inclusive.
- Ø First part of the quote i.e. '8%/8.20% refers to the fixed leg part and the second part of the quote i. e. '6m LIBOR Flat' refers to the floating leg part.
- Ø The difference in the fixed rates i.e. 20 bps refers to the margin charged by the Bank on the fixed leg of transactions.