Interest Rate Risk Management

Companies with low profit margins may be extremely sensitive to Interest rate Increases.
There are 2 types of Interest Rates:

- Fixed Interest Rate: It remains constant throughout loan or investment term
- Floating Interest Rate: Fluctuate based on market conditions or benchmark rate. Eg: LIBOR + 3%

When company borrows at fixed rate, then there is generally no risk of interest rate increase. But when company borrows at floating rate, then there is a risk of increase in interest rate

So In this chapter we are going to study some methods to hedge this Interest rate risk.

Following methods are given in this chapter:
1. Forward rate Agreement 2. Interest rate Options 3. Interest rate Futures 4. Interest rate Swaps

FORWARD RATE AGREEMENT: Entering into Forward Contract on Interest rate
Suppose RG wants to take a loan of ₹ 10,00,000 for 3 months after 6 months and Bank has quoted

FRA 6x9 = 8.10% / 8.50%

Deposit Rate Borrowing Rate

1. It means RG can borrow 10 Lakh for 3 months after 6 months @ 8.50% p.a [CASE 1]
It is technically also called as Buy FRA / Long Position on FRA

2.It means RG can invest 10 Lakh for 3 months after 6 Months @ 8.10% p.a [CASE 2]
It is technically also called as Sell FRA / Short Position on FRA

These contracts are generally settled net Basis.

For Instance, In case 1 Actual Interest in market is

Actual Int Rate = 10%	Actual Int Rate = 6%
FRA rate = 8.5%	FRA rate = 8.5%
Bank will Compensate 1.5% (10- 8.5) to RG	RG will compensate 2.5% [8.5- 6] to Bank

Bank Quotes FRA in following format.

Examples:

3X6 FRA= Loan/ Invest for 3 months after 3 months
6x9 FRA =Loan/ Invest for 3 months after 6 months

Net Settlement Amount (Final Profit/Loss on FRA) $\frac{N(RR-FR)(\frac{dtm}{DY})}{1+RR(\frac{dtm}{DY})} \times 100$

N= Notional Principal Amount of Agreement
RR = Reference rate (Actual Rate)
FR = FRA rate
dtm= Maturity of Forward Contract in Days/Months
DY = Total Days / Months in a year

Therefore in CASE 1	In CASE 2
If RR > FRA = Profit on net settlement	If RR >FRA = Loss on net settlement
If RR < FRA =Loss on net settlement	If RR < FRA = Profit on net settlement

Theoretical FRA rate: Fair FRA rate for a future period based on current market rates. This is the rate at which company will be indifferent between short term and Long term Borrowing.

Eg:- 6 Months Borrowing rate from now is 5% pa
3 Months Borrowing rate from now is 3% p.a.

If I Borrow today 1 Rs for 6 months, after 6 months I will Pay: $1[1+\frac{5\times\frac{6}{12}}{100}]=1.025$

If I Borrow today 1 Rs for 3 months, after 3 months I will Pay: $1[1+\frac{3\times\frac{3}{12}}{100}]=1.0075$

Calculate theoretical FRA Borrowing rate for 3x3 months which means we need to calculate 3 months borrowing rate after 3 months : $1.0075[1+\frac{R\times\frac{3}{12}}{100}]$=1.025

Therefore 3×3 FRA=6.95%

So Formulate to calculate, Theoretical FRA rate

$$[1+\frac{3\times\frac{3}{12}}{100}]\ [1+\frac{R\times\frac{3}{12}}{100}] = [1+\frac{5\times\frac{6}{12}}{100}]$$

Short Term Long Term Periods

Therefore ,Standard Formula is

$$\left[1+\frac{R1}{100}\right]\left[1+\frac{R2}{100}\right]=\left[1+\frac{R3}{100}\right]$$

I1= 1st short term Period Eg= First 3 months
I2= 2nd short term Period Eg = Next 3 months
I3 = Long Period Eg = Total 6 months

USING INTEREST RATE FUTURES (IRF) FOR HEDGING

IRF is contract to deliver interest bearing asset at future period at predetermined price. For eg: RG agrees to sell Bond at ₹1000 after 3 months, which means RG sold future contract at 1000

Interest rates and Bond prices have Inverse relationship.
When Interest Rate Rises, Bond Prices Fall and so Future contract price also falls. and VICE VERSA

We use above relationship to hedge Against the risk of interest rate changes causing a loss to the company. Lets understand how,

Let's say this Interest rate future has Zero Coupon Bond as underlying Asset.
Generally, ZCB are issued at Discount.
For Eg: ZCB has a face value of is 100, issued at a price of Rs 90, redeemable after 1 years at Face value This means Interest component is 100 – 90 = 10

Lets say, Interest component is 15, then Price at which ZCB will be issued will be 100 – 15 = 85.
Likewise, Price of future contract having Zero Coupon Bond as underlying Asset will be determined as follows: = 100 - Interest Rate

CASE 1: Company is a Borrower

Then Increase in Interest rate will be adverse for Company
Increase in Interest rate reduces Prices of Future Contract Therefore, Company will sell future contract today. If Interest rate does increase in Future, Price of Future contract will go down and Company can buy the Future contract at Low price, leading to profits on future contract

CASE 2: Company is a Investor

Then Decrease in Interest rate will be adverse for company
Decrease in Interest rate increase the Prices of Future Contract Therefore, Company will Buy Future contract today. If Interest rate does decrease in Future, Price of future contract will increase and Company can sell the future contract at High price, leading to profits on Future Contract

Profit/Loss on Future Contract=
No. of Contracts × Contracts Size × Difference b/w Initial Contract Price & Settlement Price × Period/12

Net Amount Received/Paid on Maturity

CASE 1: Company is a Borrower

Actual Interest Paid on Borrowings	xxx
+/- Profit /(Loss) on Future Contract	xxx/(xxx)
	xxx

CASE 2: Company is a Investor

Actual Interest Received on Borrowings	xxx
+/- Profit /(Loss) on Future Contract	xxx/(xxx)
	xxx

Note: No. of Future Contracts to be Bought/Sold

$$= \frac{Loan/Deposit\ \ Amount}{Future\ Contract\ Size} \times \frac{Duration\ in\ Months}{Future\ Contract\ Period\ in\ Months}$$

Cheapest to Deliver Bonds

A Person enters into a Future Contract to sell a Bond after a specified period at a specified price.

This Person Expects that Price of Bond will go down in Future, Hence he will at maturity purchase Bond at Low price and sell it a high Price.

Now at maturity which Bond to Deliver is decided as per the following formula=

[Future Settlement Price × Conversion Factor] - Quoted Price of Deliverable Bond

As per above calculation, Bond which yields maximum profit or minimum Loss will be selected for delivery. Logic of above formula explained in class / Revision videos

Interest Rate Options (Also called Interest Rate Guarantee)

CAP/CALL OPTION: Right of Buyer of Option to receive Interest from seller of option at each reset date in case actual Interest turns out to be More than Strike rate agreed in Call Option.

Amount to be Received= Loan Amount x [Actual Interest Rate - Strike Rate] x $\frac{\text{Period}}{365/12}$

In case Actual Interest turns out to be lower than Strike Rate, Buyer will do nothing and has no obligation. Seller of call option generally charges premium for entering into this arrangement which is paid by buyer at the beginning of the arrangement

Premium Amount = (Loan Amount X Premium)

Note: Cap option is Used by Borrower of money, So that Actual Interest Rate does not exceed a particular Strike Rate.

For Eg: RG Ltd. took loan of 10 crores at LIBOR+ 10%. Payable on 31.03.2025. Loan taken on 01.4.2024 On 01-4-2024, RG Ltd buys call option at strike rate LIBOR = 8% Option premium paid is 0.1%

On 31.03.2025, Lets say Actual LIBOR turns out to be 9% In this case, seller pays the difference to RG Ltd. Amount to be received by RG Ltd = 10 crores x (9%-8%)=10,00,000

Option Premium Paid is 10 crores x 0.1% = 1,00,000

Net Benefit Derived = 10L - 1L = 900,000

FLOOR/PUT OPTION:

Used by the depositor of money income so that Interest does not fall below a particular interest rate.

So Buyer of Floor Option will receive amount from seller in case actual Interest rate turns out to be Lower than Strike rate agreed in floor option.

Amount to be Received =Principal Amount x [Strike Rate - Actual Interest rate) x $\frac{\text{Period}}{365/12}$

In case Actual Interest rate is more than strike rate, then nothing is to Done.

As studied in cap option, premium is paid by Buyer in Floor option as well to seller of floor option.

Interest Rate Collars:

Strategy involving Buying Cap option and Selling Floor option

Consequences:

- Right to receive amount on Cap Option.

Obligation to lay amount on Floor option

Interest Rate Swaps

Arrangement in which Parties agree to swap their respective Interest obligations

Example:

- RG Ltd can Borrow at Fixed Rate of 10%. Floating Rate of LIBOR + 5%
- NT Ltd can Borrow at fixed Rate of 12% .Floating Rate of LIBOR +3%

RG Ltd wants to Borrow at Floating Rate of Interest. NT Ltd wants to borrow at Fixed Rate of Interest So Both these Parties enters into Interest Rate Swaps,

Where NT Ltd Borrows at LIBOR +3% and RG Ltd Borrows at 10% and swaps there respective interest Payments. This is called Plain Vanilla Swap or Generic Swap or Coupon Swap which involves exchange of Fixed rate loan to floating rate Loan.

Note: Fixed Interest Payments on above swap are calculated assuming each month has 30 days, which means total 360 days in a year.

Fixed Interest Payment FORMULA = $\frac{(N)(A/c)(Days)}{360days}$

N = Principal Amount

A/C (All in Cost) = Fixed Rate

Overnight Index Swap –

It is a type of plain vanilla Swap where floating rate payments are compounded daily.

Is Question asks you to arrange an Interest rate Swap which is benefitting both the Parties, then follow below steps:

STEP-1 Calculate gain arising to both the respective parties in case swap is agreed upon between RG Ltd & NT Ltd

In our example, RG Ltd wants Floating rate borrowing, whose cost would have been LIBOR+ 5%, but NT Ltd borrowed at LIBOR + 3% =

Therefore gain = LIBOR +5% (-) LIBOR+ 3% = 2%----------(1)

NT Ltd wants to borrow at fixed rate whose cost would have been 12%, instead RG Ltd borrowed at 10%. =Therefore gains =12% - 10% = 2%----------(2)

Adding 1 and 2 = Total gains = 2%+2% = 4%

Step-2 Assume swap arrangement is agreed through an Intermediary bonk which charges a commission of 1%, then net gains to both parties will be = 4%-1% = 3%

Step-3 Assuming net gain is to be shared by both the parties in equal ratio.

Net gains to both Parties

RG Ltd = 1.5%

NT Ltd = 1.5%

Step-4 Calculation of effective cost

RG Ltd

Interest Payment if Loan took directly = LIBOR+ 5%

(-) Net Gain from SWAP =(1.5%)

Effective Cost =LIBOR+3.5%

NT Ltd

Interest Payment if Loan took directly = 12%

(-) Net Gain from SWAP =(1.5%)

Effective Cost =10.5%