EKAGRATA
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CA FINAL - AFM SCHEDULE

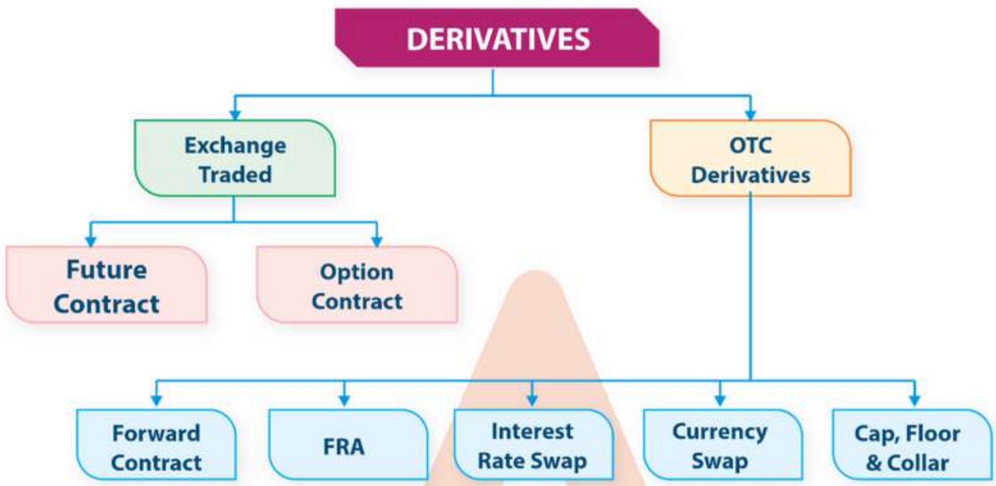
CA FINAL - AFM (ADVANCED FINANCIAL MANAGEMENT) By CA Gaurav Jain					
YT REVISION WITH IMPORTANT QUESTIONS & TEST - MAY 2025 - STUDY PLAN YT - EACH LEC IS 1.5 HRS					
Date	**Day**	**Time**	**Duration**	**Topics**	**Mode**
04-Feb-25	Tuesday	6:00-7:00 PM	1	REVISION SCHEDULE	YT LIVE
05-Feb-25	Wednesday	7:00-8:30 PM	1.5	DERIVATIVES-FUTURES	YT LIVE
06-Feb-25	Thursday	7:00-8:30 PM	1.5	DERIVATIVES-FUTURES	YT LIVE
07-Feb-25	Friday	7:00-8:30 PM	1.5	DERIVATIVES-FUTURES	YT LIVE
08-Feb-25	Saturday	7:00-8:30 PM	1.5	DERIVATIVES-OPTIONS	YT LIVE
10-Feb-25	Monday	7:00-8:30 PM	1.5	DERIVATIVES-OPTIONS	YT LIVE
11-Feb-25	Tuesday	7:00-8:30 PM	1.5	DERIVATIVES-OPTIONS	YT LIVE
12-Feb-25	Wednesday	7:00-8:30 PM	1.5	FOREX	YT LIVE
13-Feb-25	Thursday	7:00-8:30 PM	1.5	FOREX	YT LIVE
14-Feb-25	Friday	7:00-8:30 PM	1.5	FOREX	YT LIVE
15-Feb-25	Saturday	7:00-8:30 PM	1.5	FOREX	YT LIVE
17-Feb-25	Monday	7:00-8:30 PM	1.5	FOREX	YT LIVE
18-Feb-25	Tuesday	7:00-8:30 PM	1.5	IRRM	YT LIVE
19-Feb-25	Wednesday	7:00-8:30 PM	1.5	IRRM	YT LIVE
20-Feb-25	Thursday	7:00-8:30 PM	1.5	PORTFOLIO MANAGEMENT	YT LIVE
21-Feb-25	Friday	7:00-8:30 PM	1.5	PORTFOLIO MANAGEMENT	YT LIVE
22-Feb-25	Saturday	7:00-8:30 PM	1.5	PORTFOLIO MANAGEMENT	YT LIVE
24-Feb-25	Monday	7:00-8:30 PM	1.5	PORTFOLIO MANAGEMENT	YT LIVE
25-Feb-25	Tuesday	7:00-8:30 PM	1.5	SECURITY VALUATION	YT LIVE
26-Feb-25	Wednesday	7:00-8:30 PM	1.5	SECURITY VALUATION	YT LIVE
27-Feb-25	Thursday	7:00-8:30 PM	1.5	CORPORATE VALUATION	YT LIVE
28-Feb-25	Friday	7:00-8:30 PM	1.5	CORPORATE VALUATION	YT LIVE
01-Mar-25	Saturday	7:00-8:30 PM	1.5	CORPORATE VALUATION	ZOOM
03-Mar-25	Monday	7:00-8:30 PM	1.5	MERGER & ACQUISITION	YT LIVE
04-Mar-25	Tuesday	7:00-8:30 PM	1.5	MERGER & ACQUISITION	YT LIVE
05-Mar-25	Wednesday	7:00-8:30 PM	1.5	MERGER & ACQUISITION	YT LIVE
06-Mar-25	Thursday	7:00-8:30 PM	1.5	MUTUAL FUNDS	YT LIVE
07-Mar-25	Friday	7:00-8:30 PM	1.5	MUTUAL FUNDS	YT LIVE
08-Mar-25	Saturday	7:00-8:30 PM	1.5	TEST	ZOOM
10-Mar-25	Monday	7:00-8:30 PM	1.5	BOND VALUATION	YT LIVE
11-Mar-25	Tuesday	7:00-8:30 PM	1.5	BOND VALUATION	YT LIVE
12-Mar-25	Wednesday	7:00-8:30 PM	1.5	IFM	YT LIVE
HOLI					
15-Mar-25	Saturday	7:00-8:30 PM	1.5	IFM	YT LIVE
17-Mar-25	Monday	7:00-8:30 PM	1.5	ACB	YT LIVE
18-Mar-25	Tuesday	7:00-8:30 PM	1.5	ACB	YT LIVE
19-Mar-25	Wednesday	7:00-8:30 PM	1.5	ACB	YT LIVE
20-Mar-25	Thursday	7:00-8:30 PM	1.5	MISCELLANEOUS TOPICS	YT LIVE
21-Mar-25	Friday	7:00-8:30 PM	1.5	RISK MANAGEMENT	YT LIVE
22-Mar-25	Saturday	7:00-8:30 PM	1.5	THEORY	YT LIVE
24-Mar-25	Monday	7:00-8:30 PM	1.5	TEST	ZOOM
25-Mar-25	Tuesday	7:00-8:30 PM	1.5	TEST	ZOOM

Derivatives Analysis & Valuation (Futures)

Study Session 6

LOS 1 : Introduction

Why there is a need of Derivatives market?
Difference between Cash Market & Derivatives.

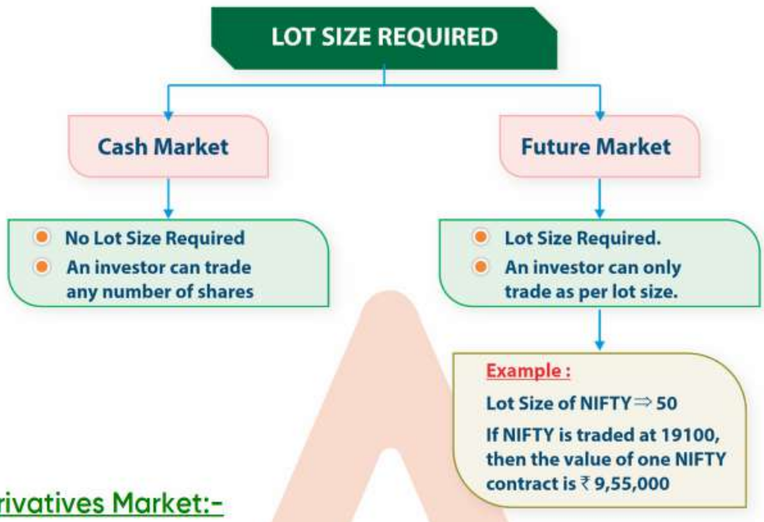


Define Forward Contract, Future Contract.

- Forward Contract, In Forward Contract one party agrees to buy, and the counterparty to sell, a physical asset or a security at a specific price on a specific date in the future. If the future price of the assets increases, the buyer (at the older, lower price) has a gain, and the seller a loss.
- Futures Contract is a standardized and exchange-traded. The main difference with forwards are that futures are traded in an active secondary market, are regulated, backed by the clearing house and require a daily settlement of gains and losses.

Future Contracts differ from Forward Contracts in the following ways:

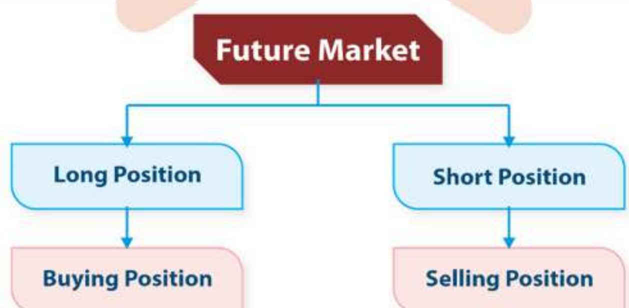
Future Contracts	Forward Contracts
Organized Exchange	Private Contracts
Highly Standardized - Lot size requirement - Expiry Date - MTM	Customized Contracts
No Counterparty default risk	Counterparty default risk exists
Government Regulated	Usually not Regulated



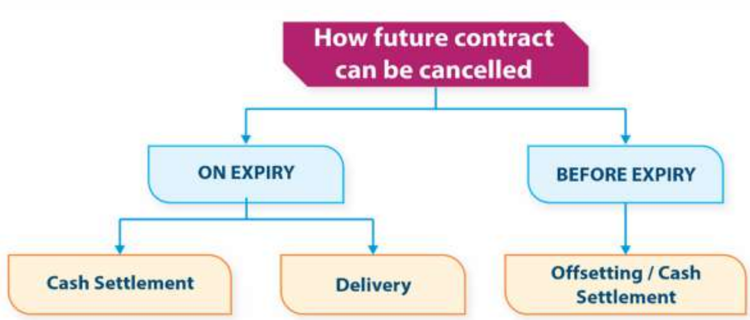
Participants in the Derivatives Market:-

1) Speculators
2) Hedgers
3) Arbitragers

LOS 2 : Position to be taken under Future Market



LOS 3 : How Future Contract can be terminated at or prior to expiration?



How to settle / square-off / covering / closing out a position to calculate Profit / Loss (Cash-Settlement)

LONG POSITION → TO SQUARE OFF → SHORT POSITION

SHORT POSITION → TO SQUARE OFF → LONG POSITION

Gain or Loss under Future Market

Position	If Price on Maturity/ Settlement Price	Gain/ Loss
Long Position	Increase	Gain
	Decrease	Loss
Short Position	Increase	Loss
	Decrease	Gain

Delivery Based Settlement:-

How future contract can be cancelled through Delivery?

- A short can terminate the contract by delivering the goods, and a long can terminate the Contract by accepting delivery and paying the contract price to the short. This is called Delivery. The location for delivery (for physical assets), terms of delivery, and details of exactly what is to be delivered are all specified in the contract.

Note:

- Gain/Loss is net of brokerage charge. Brokerage is paid on both buying & selling.
- Security Deposit is not considered while calculating Profit & Loss A/c.
- Interest paid on borrowed amount must be deducted while calculating Profit & Loss.
- A Future contract is ZERO-SUM Game. Profit of one party is the loss of other party.

LOS 4 : Difference between Margin in the cash market and Margin in the future markets and Explain the role of initial margin, maintenance margin

In Cash Market, margin on a stock or bond purchase is 100% of the market value of the asset.

- Initially, 50% of the stock purchase amount may be borrowed and the remaining amount must be paid in cash (Initial margin).
- There is interest charged on the borrowed amount.

In Future Markets, margin is a performance guarantee i.e. security provided by the client to the exchange. It is money deposited by both the long and the short. There is no loan involved and consequently, no interest charges.

- The exchange requires traders to post margin and settle their account on a daily basis.

Initial Margin

Money deposited in a futures account before any trading takes place and paid by both Long & Short position

Maintenance Margin

Amount of margin that must be maintained.
If the margin balance falls below the MM due to the change in the Contract Price, *additional fund must be deposited to bring the margin balance back-up to the initial margin requirement.*

Variation Margin

Amount which the trader has to bring when maintenance margin is breached.

Note:

- Any amount, over & above initial margin amount can be withdrawn.
- Calculation of Initial Margin if Standard Deviation is given:

$$\boxed{\text{Initial Margin} = \text{Daily Absolute Change} + 3 \text{ Standard Deviation}}$$

QUESTION NO. 2B

Sensex futures are traded at a multiple of 50. Consider the following quotations of Sensex futures in the 10 trading days during February, 2009:

Day's	High	Low	Closing
4-2-09	3306.40	3290.00	3296.50
5-2-09	3298.00	3262.50	3294.40
6-2-09	3256.20	3227.00	3230.40
7-2-09	3233.00	3201.50	3212.30
10-2-09	3281.50	3256.00	3267.50
11-2-09	3283.50	3260.00	3263.80
12-2-09	3315.00	3286.30	3292.00
14-2-09	3315.00	3257.10	3309.30
17-02-09	3278.00	3249.50	3257.80
18-02-09	3118.00	3091.40	3102.60

Abhishek bought one Sensex futures contract on February, 04 .The average daily absolute change in the value of contract is ₹ 10,000 and standard deviation of these changes is ₹2,000. The maintenance margin is 75% of initial margin.

You are required to determine the daily balances in the margin account and payment on margin calls, if any.

Solution :

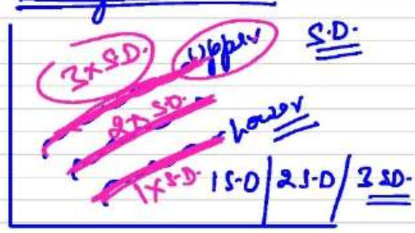
Q.2B

Cal. of Initial Margin:- As per ICAI

⇒ Avg. Daily Absolute change + 3×S.D.

Technical Analysis:-

Bollinger Bands



IM = 10,000 + 3×2000 ⇒ 16,000

MM = 75% of IM

= 75% of 16,000 = 12000

Long Position Lot Size = 50

Days	Settlement Price	Op. Bal.	MTM	Deposit	Cl. Bal.
4-2-09	3296.50	—	—	16000	16000
5-2-09	3294.40	16000	(105)	—	15895
6-2-09	3230.40	15895	−3200	—	12695
7-2-09	3212.30	12695	−905	4210	16000
10-2-09	3267.50	16000	+2760	—	18760
11-2-09	3263.80	18760	(−)185	—	18575
12-2-09	3292	18575	(+)1410	—	19985
14-2-09	3309.30	19985	(+)865	—	20850
17-2-09	3257.80	20050	−2575	—	18275
18/2/09	3102.60	18275	(−)7760	5485	16000

Loss ⇒ (−) 9695 (#)

(#) [3296.50 − 3102.60] × 50 = 9695

LOS 5 : Concept of Compounding

- **COMPOUNDING**
  - **Normal Compounding** [Concept of $(1+r)^n$]
    - **Calculation of EAR**
      - EAR = $(1+\text{periodic rate})^m - 1$
      - Periodic Rate = $\frac{\text{Annual Rate}}{m}$
      - m = No. of compounding Period
    - **Calculation of FV**
      - $FV = PV\left(1+\frac{r}{m}\right)^{m \times n}$
  - **Continuous Compounding** [Concept of e^{rt}]
    - **Calculation of FV**
      - $FV = PV \times e^{rt}$
      - Or
      - $PV = FV \times e^{-rt}$

Example: Computing EAR for Range of compounding frequency.

Using a stated rate of 6%, compute EARs for semi-annual, quarterly, monthly and daily compounding.

Derivatives Analysis & Valuation (Futures)

Solution:

EAR with :

Semi-annual Compounding	$= (1+0.03)^2 - 1$	= 1.06090 – 1	= 0.06090	= 6.090%
Quarterly compounding	$= (1+0.015)^4 - 1$	= 1.06136 – 1	= 0.06136	= 6.136%
Monthly Compounding	$= (1+0.005)^{12} - 1$	= 1.06168 – 1	= 0.06168	= 6.168%
Daily Compounding	$= (1+0.00016438)^{365} - 1$	= 1.06183 – 1	= 0.06183	= 6.183%

Notice here that the EAR increases as the compounding frequency increases.

Concept of e^{rt} & e^{-rt} (Continuous Compounding)

Most of the financial variable such as Stock price, Interest rate, Exchange rate, Commodity price change on a real time basis. Hence, the concept of Continuous compounding comes in picture.
Continuous Compounding means compounding every moment. Instead of (1 + r) we will use e^{rt}

Calculation of a^b

1. $\sqrt{a}$ 12 Times
2. - 1
3. × b
4. + 1
5. × = 12 Times

Calculation of e^b

1. $\sqrt{e}$ 12 Times
2. - 1
3. × b
4. + 1
5. × = 12 Times

Hint : $e^1 = 2.71828$

How to Calculate e^{rt} & e^{-rt}

Example:

$e^0 = 1$	$e^{.25} = 1.28403$
$e^{-.25} = 0.77880$ or $\frac{1}{1.28403} = 0.77880$	$e^{.205} = ?$ $e^{.20} = 1.22140$ $e^{.21} = 1.23368$ $\frac{1.22140+1.23368}{2} \Rightarrow 1.22754$
$e^{.357} = ?$ $e^{.35} = 1.41907$ $e^{.36} = 1.43333$ Since 3rd digit is not 5, in this case we have to use interpolation technique: when power of e increases by 0.01, then value increase by 0.01426 [1.43333 – 1.41907] when power of e increases by 1, then value increases by $\frac{0.01426}{0.01}$ when power of e increases by 0.007, then value increases by $\frac{0.01426}{0.01}$ × 0.007 = 0.00998 Value of $e^{.357} = 1.41907 + 0.00998 = 1.42905$	$e^{-.357}$ $= \frac{1}{1.42905} = 0.69977$

Valuation Rules

Spot Rate
+
Carrying Cost
- Storage Cost
- Interest / opportunity Cost
- Other Costs

\-
Returns

FFP

LOS 6 : Fair future price of security with no income

In case of Normal Compounding

$$\boxed{\text{Fair future price} = \text{Spot Price } (1+r)^n}$$

In case of Continuous Compounding

$$\boxed{\text{Fair future price} = \text{Spot Price} \times e^{rt}}$$

Where

r = risk free interest p.a. with Continuous Compounding.

t = time to maturity in years/ days. (No. of days / 365) or (No. of months / 12)

QUESTION NO. 3B

The 6-months forward price of a security is ₹ 208.18. The borrowing rate is 8% per annum payable with monthly interests. What should be the spot price?

Solution :

Q.3B

t = 6mth

r = 8% p.a.

FFP/AFP = 208.18 Monthly Compounding

NC

SR = ?

$$\boxed{FFP = SR(1+r)^n}$$

or $FFP = SR\left(1+\frac{r}{m}\right)^{m\times n}$

$208.18 = SR\left(1+\frac{.08}{12}\right)^{\cancel{12}\times\frac{6}{\cancel{12}}}$

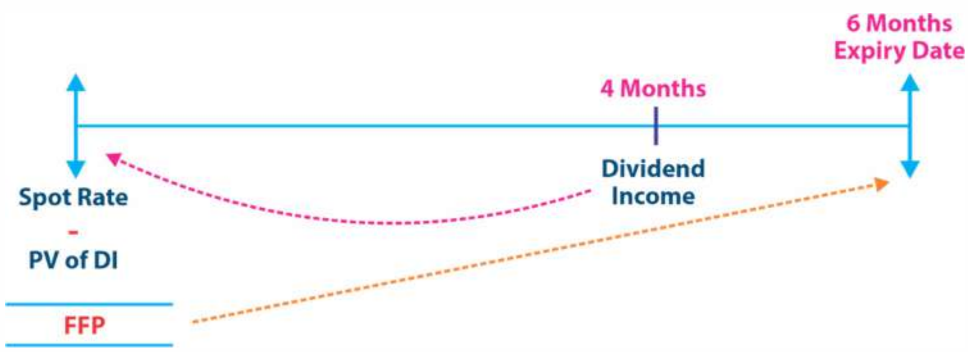
$208.18 = SR(1+0.0067)^6$

$208.18 = SR \times 1.0407$

$SR \Rightarrow ₹199.94$ or 200.04

or 200 (approx)

LOS 7 : Fair Future Price of Security with Dividend Income



In case of Normal Compounding

$$\boxed{\text{Fair Future Price} = [\text{Spot Price} - \text{PV of Expected Dividend}]\,(1+r)^n}$$

In case of Continuous Compounding

$$\boxed{\text{Fair Future Price} = [\text{Spot Price} - \text{PV of Expected Dividend}] \times e^{rt}}$$

PV of DI = Present Value of Dividend Income = Dividend × e^{-rt}
Where t = period of dividend payments

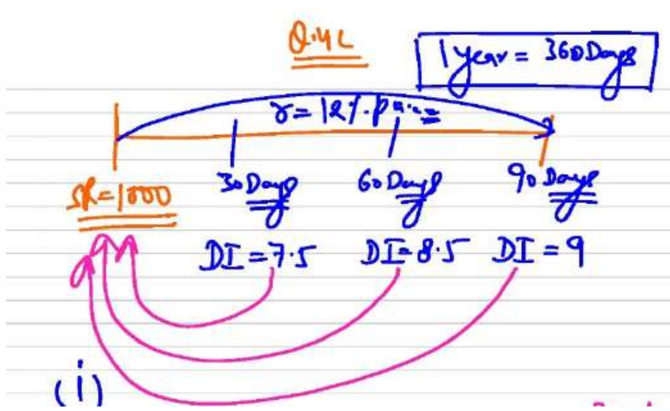
QUESTION NO. 4C

Suppose that there is a future contract on a share presently trading at ₹ 1000. The life of future contract is 90 days and during this time the company will pay dividends of ₹ 7.50 in 30 days, ₹ 8.50 in 60 days and ₹ 9.00 in 90 days.
Assuming that the Compounded Continuously Risk free Rate of Interest (CCRRI) is 12% p.a. you are required to find out:

(a) Fair Value of the contract if no arbitrage opportunity exists.
(b) Value of Cost to Carry.

[Given $e^{-0.01} = 0.9905$, $e^{-0.02} = 0.9802$, $e^{-0.03} = 0.97045$ and $e^{0.03} = 1.03045$]

Solution :



(i)

$$FFP \Rightarrow [SR - PV\,of\,DI - PV\,of\,DI - PV\,of\,DI]\,e^{rt}$$

$$\Rightarrow \left[1000 - \frac{7.5}{e^{.12\times\frac{30}{360}}} - \frac{8.5}{e^{.12\times\frac{60}{360}}} - \frac{9}{e^{.12\times\frac{90}{360}}}\right] e^{\frac{.12\times 90}{360}}$$

$$\Rightarrow \left[1000 - \frac{7.5}{e^{.01}} - \frac{8.5}{e^{.02}} - \frac{9}{e^{.03}}\right] \times e^{.03}$$

$$\Rightarrow \left[1000 - 7.5\times e^{-0.01} - 8.5\times e^{-0.02} - 9\times e^{-0.03}\right] e^{.03}$$

$$\Rightarrow \left[1000 - 7.5\times .9905 - 8.5\times .9802 - 9\times .97045\right] 1.03045$$

$$\Rightarrow [1000 - 7.43 - 8.33 - 8.73]\ 1.03045$$

$$\Rightarrow ₹\ 1005.21$$

(ii) Cost to Carry:-

$$\boxed{FFP = SR + \text{Cost to Carry.}}$$

$$1005.21 = 1000 + \text{cost to Carry}$$

$$\boxed{\text{Cost to Carry} = ₹5.21}$$

LOS 8 : Fair Future Price of security when income is expressed in percentage or when dividend yield is given

DY	DR	DPR
⬇	⬇	⬇
% of MPS	% of FV	% of EPS

In case of Normal Compounding

$$\boxed{\text{Fair Future Price} = \text{Spot Price}\,[1+(r-y)]^{n}}$$

In case of Continuous Compounding

$$\boxed{\text{Fair Future Price} = \text{Spot Price} \times e^{(r-y)\times t}}$$

Where y = income expressed in % or dividend Yield

QUESTION NO. 5B

On 31.8.2011, the value of Stock Index was ₹ 2,200. The risk free rate of return has been 8% per annum. The dividend yield on this Stock Index is as under:

Month	Dividend paid
January	3%
February	4%
March	3%
April	3%
May	4%
June	3%
July	3%
August	4%
September	3%
October	3%
November	4%
December	3%

Assuming that interest is continuously compounded daily, find out the future price of contract deliverable on 31-12-2011. Given: $e^{0.01583} = 1.01593$

Solution :

Q.5B (5 marks)

r = 8% p.a. c.c.

t = 4 mths

SR = 2200

FP = ?

W.No.1 Cal. of Average DY:–

$\Rightarrow \frac{3\% + 3\% + 4\% + 3\%}{4}$

$\Rightarrow 3.25\%$ p.a.

$FP \Rightarrow SR \times e^{[R - DY]t}$

$\Rightarrow 2200 \times e^{[.08 - .0325] \times \frac{4}{12}}$

$\Rightarrow 2200 \times e^{0.01583}$

$\Rightarrow 2200 \times 1.01593$

$FP \Rightarrow \underline{2235.05}$

LOS 9 : Fair Future Price of Commodity with storage cost

In case of Normal Compounding

$$\text{Fair Future Price} = [\text{Spot Price} + \text{PV of S.C}]\,(1+r)^{n}$$

In case of Continuous Compounding

$$\text{Fair Future Price} = [\text{Spot Price} + \text{PV of S.C}] \times e^{rt}$$

Where PV of S.C = Present Value of Storage Cost

Note: Fair Future Price when Storage Cost is given in percentage(%).

$$\text{FFP} = \text{Spot Price} \times e^{(r+s)\times t}$$

Where S = Storage cost expressed in percentage.

LOS 10 : Fair Future Price of commodities with Convenience yield expressed in % (Similar to Dividend Yield)

The benefit or premium associated with holding an underlying product or physical good rather than contract or derivative product i.e. extra benefit that an investor receives for holding a commodity.

In case of Continuous Compounding

$$\text{Fair Future Price} = \text{Spot Price} \times e^{(r-c)\times t}$$

Note: Fair Future Price when convenience income is expressed in Absolute Amount.

$$\text{Fair Future Price} = [\text{Spot Price} - \text{PV of Convenience Income}] \times e^{rt}$$

LOS 11 : Arbitrage Opportunity between Cash and Future Market

- Arbitrage is an important concept in valuing (Pricing) derivative securities. In its Purest sense, arbitrage is riskless.
- Arbitrage opportunities arise when assets are mispriced. Trading by Arbitrageurs will continue until they effect supply and demand enough to bring asset prices to efficient(no arbitrage) levels.
- Arbitrage is based on "Law of one price". Two securities or portfolios that have identical cash flows in future, should have the same price. If A and B have the identical future pay offs and A is priced lower than B, buy A and sell B. You have an immediate profit.

Difference between Actual Future Price and Fair Future Price?

Fair Future Price is calculated by using the concept of Present Value & Future Value.
Actual Future Price is actually prevailing in the market.

Case	Value	Future Market	Cash Market	Borrow/ Invest
FFP < AFP	Over-Valued	Sell or Short Position	Buy	Borrow
FFP > AFP	Under-Valued	Buy or Long Position	Sell #	Investment

Here we assume that Arbitrager already hold shares

QUESTION NO. 8C

Calculate the price of a 6 months futures contract on a share that is currently priced at ₹ 75. The share is expected to pay a ₹ 2 dividend four months from today. The continuously compounded risk free rate is 12%

per annum. The contract size is 100. If the contract value is ₹ 7400 what steps (action) would follow. In case it is ₹ 7800. What would you do?

Solution :

Q.8C V.Imp. RTP

r = 12% p.a. c.c

6mth

4mth

SR = 75×100 = 7500

₹2×100

DI = ₹200

AFP: Case I 7400; Case II 7800

Soln FFP ⇒ [SR − PV of DI] e^{rt}

$$FFP = \left[7500 - \frac{200}{e^{.12\times\frac{4}{12}}}\right] e^{.12\times\frac{6}{12}}$$

$$FFP \Rightarrow \left[7500 - \frac{200}{e^{.04}}\right] e^{.06}$$

$$FFP = \left[7500 - \frac{200}{1.0408}\right] 1.0618$$

$$FFP \Rightarrow [7500 - 192.16]\ 1.0618$$

$$\boxed{FFP \Rightarrow 7759.46}$$

Case I:- If AFP is 7400 as on today:-

FFP = 7759.46 ⟹ AFP = 7400

Under-valued

Arbitrage profit = 359.46

Strategy as on today:-

Future Mkt.	Cash Market	Invest
Long Position	Sell (*)	@7500
@7400	@7500	@12% p.a. for 6 mths

Cal. of Arbitrage Profit:- (on Expiry)
(Delivery based settlement)

⇒ Arbitrager will Buy the stock under future contract & pay ₹7400 — (−) 7400

⇒ Received from Bank with interest:-
$7500 \times e^{rt}$ — + 7963.50

$\Rightarrow 7500 \times e^{.12 \times \frac{6}{12}}$
$\Rightarrow 7500 \times 1.0618$

(*) ⇒ Loss of Dividend Income & Int. on it:- — (−) 204.04

Sell in Cash Mkt — 4 mth — 6 mth — 2 mth

~~2×100 = 200~~

$\Rightarrow 200 \times e^{rt}$ (*)
$= 200 \times e^{.12 \times \frac{2}{12}}$
$= 200 \times e^{.02}$
$= 200 \times 1.0202$

Arbitrage Profit — 359.46

Case II: If AFP = 7800 as on today:-

FFP = 7759.46 ⟹ AFP = 7800
Over-valued

Strategy as on today:-

Future Mkt.	Cash Mkt.	Borrow
Sell i.e. Short Position @ 7800	Buy @ 7500	@ 7500 @ 12% p.a. for 6 mths

Calculation of Arbitrage Profit:-
(Delivery Based Settlement)

⟹ Arbitrager will deliver the stock under future contract & receives cash @ 7800   +7800

⟹ Repayment to Bank with Intt.   (−) 7963.59

$7500 \times e^{.12 \times \frac{6}{12}}$

$= 7500 \times 1.0618$

⟹ Dividend Income & Intt. on it:-   (+) 204.04

Buy — 200 — Intt. on it 2 mths

$200 \times e^{.12 \times \frac{2}{12}}$

$= 200 \times 1.0202$

Arbitrage Profit   ₹ 40.54

Arbitrage [Crux]

- **Over-Valued**
  - Future Market → Short Position
  - Cash Market → Buy
  - **Borrow**
  - Interest → Cost
  - Dividend → Income
- **Under-Valued**
  - Future Market → Long Position
  - Cash Market → Sell
  - **Invest**
  - Interest → Income
  - Dividend → Cost

QUESTION NO. 8E

The NSE-50 Index futures are traded with rupee value being ₹ 100 per index point. On 15th September, the index closed at 1195, and December futures (last trading day December 15) were trading at 1225. The historical dividend yield on the index has been 3% per annum and the borrowing rate was 9.5% per annum.

(i) Determine whether on September 15, the December futures were under priced or overpriced?

(ii) What arbitrage transaction is possible to gain out this mispricing?

(iii) Calculate the gains and losses if the index on 15th December closes at (a) 1260 (b) 1175.

Assume 365 days in a year for your calculations.

Solution :

1 year = 365

Q.8E V.Imp. (2 mark)

Lot size = 100

91 Days

$r = 9.5\%$ p.a.

SR = 1195

DY = 3% p.a.

AFP = 1225

AFP: 1260, 1175

No. of Days :

Sep	Oct.	Nov.	Dec.
15	31	30	15

⇒ 91 Days

1 year = 365 Days

$FFP \Rightarrow SR(1+r)^n - DI$

$\Rightarrow 1195\left(1 + .095 \times \frac{91}{365}\right)$

$$(-)\left(1195 \times 3\% \times \frac{91}{365}\right)$$

FFP ⇒ 1223.30 − 8.94 (DI)

⇒ 1214.36

Value = 1214.36 × 100 ⇒ ₹121436

OR

Alt 2 $SR\left[1+(r-Dy)\right]^n$

$$\Rightarrow 1195\left[1+(0.095-0.03)\times\frac{91}{365}\right]$$

⇒ 1214.37

Value = 1214.37 × 100 = 121437

(i) FFP = 1214.37 ⟹ AFP = 1225

over-valued

15th Dec. contract is over-valued

(ii) Strategy as on today:-

Future Mkt.	Cash Mkt.	Borrow
Sell i.e. Short Position @1225	Buy. @ 1195	@1195 @9.5% p.a. for 91 Days

(iii) Cal. of Arbitrage Profit:-

(Cash Settlement)

Case I:- If on Expiry AFP = 1260

Future Mkt.	Cash Mkt.
Short Position @1225 $\xrightarrow{\text{T.O. / square off}}$ Long Position @1260	Buy @1195 $\rightarrow$ Sell @1260
Loss ⇒ 35×100 ⇒ 3500	Profit ⇒ 65×100 ⇒ 6500

Overall Profit ⇒ + 3000

Int. Cost ⇒ (−) 2830.35

$[1195 \times 100] \times 9.5\% \times \frac{91}{365}$

Dividend Income ⇒ + 893.80

$[1195 \times 100] \times 3\% \times \frac{91}{365}$

Arbitrage Profit ₹ 1063.45

Case II:- If on Expiry AFP = 1175

Future Mkt.	Cash Mkt.
Short Position @1225 $\xrightarrow{\text{Square off}}$ Long Position @1175	Buy @1195 $\rightarrow$ Sell @1175
Profit ⇒ 50×100 ⇒ 5000	Loss ⇒ 20×100 = 2000

Overall Profit ⇒ + 3000

Interest Cost ⇒ (−) 2830.35

DI ⇒ (+) 893.80

Arbitrage Profit ₹ 1063.45

Derivatives Analysis & Valuation (Futures)

LOS 12: Complete Hedging by using Index Futures & Beta

Hedging is the process of taking an opposite position in order to reduce loss caused by Price fluctuation.

- The objective of Hedging is to reduce Loss.
- Complete Hedging means profit/ Loss will be Zero.

Position to be taken:

a) Long Position should be hedged by Short Position.

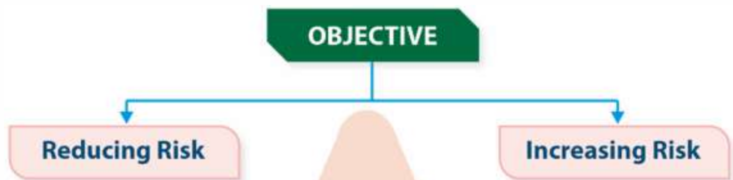
b) Short Position should be hedged by Long Position.

Value of Position to be taken:

Value of Position for Complete hedge should be taken on the basis of Beta through index futures.

Value of Position for Complete Hedge = Current Value of Portfolio × Existing Stock Beta

LOS 13: Value of Position for Increasing & Reducing Beta to a Target Level



Alternative 1 (Hedging Using Index Future)

Step 1 : Decide Position

Step 2 : Value of Position

Case I: When Existing Beta > Target Beta

Objective: Reducing Risk

Value of Index Position = Value of Existing Portfolio × [Existing Beta – Desired Beta]

Action: Take Short Position in Index & keep your current position unchanged.

Case II: When Existing Beta < Target Beta

Objective: Increase Risk

Value of Index Position = Value of Existing Portfolio × [Desired Beta – Existing Beta]

Action: Take Long Position in Index & keep your current position unchanged

Step 3 : No. of future contracts to be sold or purchased for increasing or reducing Beta to a Desired Level using Index Futures.

$$\text{No. of Future Contract to be taken} = \frac{\text{Value of Index Position}}{\text{Value of one Future Contract}}$$

Alternative 2 (Hedging Using Risk free Investment or Borrowing)

Case 1: Reducing Risk
SELL SOME SECURITIES AND REPLACE WITH RISK-FREE INVESTMENT

Step1: Equate the weighted Average Beta formulae to the new desired Beta
Target Beta = $Beta_1 \times W_1 + Beta_2 \times W_2$ (Beta of Risk free investment is Zero)

Step2: Use the weights and decide

Case 2: Increasing Risk
BUY SOME SECURITIES AND BORROW AT RISK-FREE RATE

Step1: Equate the weighted Average Beta formulae to the new desired Beta
Target Beta = $Beta_1 \times W_1 + Beta_2 \times W_2$ (Beta of Risk free investment is Zero)

Step2: Use the weights and decide

Concept:- Relationship between the normal compounding risk-free rate & continuous compounding R_F rate:-

$R_{F\,(NC)} \longrightarrow R_{F\,(CC)}$ rate

Using Natural log.
$\ln(x)$

$\Rightarrow \boxed{R_{F(CC)} \Rightarrow \ln(1 + R_{F(NC)})}$

(Natural logs)

$\Rightarrow \boxed{\text{Inverse of } e^x \Rightarrow \ln(x)}$

Example: $R_{F(CC)} \Rightarrow \ln(1 + R_{F(NC)})$

$R_{F(NC)} \Rightarrow 10.5\% \Longrightarrow R_{F(CC)} = ?$

$R_{F(CC)} = \ln(1 + .105)$

$\Rightarrow \ln(1.105)$

$\Rightarrow$

Derivatives Analysis & Valuation (Futures)

Derivatives Analysis & Valuation (Futures)

W.No:- Table $\ln(1.105) = ?$

$\ln 1.10 \Rightarrow 0.0953$

$\ln 1.11 \Rightarrow 0.1044$

Simple Avg:-

$\Rightarrow \dfrac{0.0953 + 0.1044}{2}$

$\Rightarrow 0.0998$

$\ln(1.105) = 0.0998$ or 9.98%

$R_F (NL) \longrightarrow (CC) R_F$

$$\boxed{R_{F(NC)} = 10.5\% \Rightarrow R_{F(CC)} = 9.98\%}$$

CC

$e^{0.0998} \Rightarrow ?$ .0098

$e^{.09} \Rightarrow 1.0942$

$e^{.10} \Rightarrow 1.1052$

$.01 \qquad 0.011$

$1 = \dfrac{0.011}{0.01} \times .0098$

$\Rightarrow 0.0108$

$e^{0.0998} \Rightarrow 1.0942 + 0.0108$

$\Rightarrow 1.105$ Hence Proved

$$\boxed{\text{Inverse of } e^x = \ln(x)}$$ Hence Proved

Crux:- $$\boxed{R_{FCC} \Rightarrow \ln(1 + R_{F(NC)})}$$

QUESTION NO. 10C

On January 1, 2013 an investor has a portfolio of 5 shares as given below:

Security	Price	No. of Shares	Beta
A	349.30	5,000	1.15
B	480.50	7,000	0.40
C	593.52	8,000	0.90
D	734.70	10,000	0.95
E	824.85	2,000	0.85

The cost of capital to the investor is 10.5% per annum.

You are required to calculate:

a) The beta of his portfolio.

b) The theoretical value of the NIFTY futures for February 2013.

c) The number of contracts of NIFTY the investor needs to sell to get a full hedge until February for his portfolio if the current value of NIFTY is 5900 and NIFTY futures have a minimum trade lot requirement of 200 units. Assume that the futures are trading at their fair value.

d) The number of future contracts the investor should trade if he desires to reduce the beta of his portfolios to 0.6.

No. of days in a year be treated as 365.

Given: In (1.105) = 0.0998, $e^{(0.015858)} = 1.01598$

Solution :

Q.10C

(a) Cal. of Portfolio Beta :-

Sec	Shares	MPS	MV	β	$\beta_i I_1$
A	5000	349.30	1746500	1.15	2008475
B	7000	480.50	3363500	0.40	1345400
C	8000	593.52	4748160	0.90	4273344
D	10,000	734.70	7347000	0.95	6979650
E	2000	824.85	1649700	0.85	1402245

$\Sigma I_1 \Rightarrow$ 188,54,860   160,09,114

$$\beta_p = \frac{\Sigma \beta_i I_1}{\Sigma I_1} \Rightarrow \frac{16009114}{18854860}$$

Existing $\beta_p \Rightarrow$ 0.85 times

(b) Cal. of Theoritical Value of Nifty futures for Feb 2013:-

$FFP = SR \times e^{rt}$

$\Rightarrow 5910 \times e^{rt}$

$\Rightarrow 5910 \times e^{.0998 \times \frac{58}{365}}$

$\Rightarrow 5910 \times e^{0.015858}$

$\Rightarrow 5910 \times 1.01598$

FFP $\Rightarrow 5994.28$

W.No: $\ln(1.105) = 0.0998 \rightarrow$ CC R_F rate

$t \Rightarrow$ 1st Jan to 28th Feb. 2013

30 Days + 28 Day = 58 Days

(c) Target Beta = 0

(Perfect hedging / full hedging)

No. of Contracts of Nifty needs to sell to get full hedge:-

Existing β_P = 0.85

Target β_P = 0

Objective:- To reduce the risk

Long Position (Portfolio) $\longrightarrow$ Short Nifty futures

No. of contracts to be Shorted:-

$= \frac{\text{Value of Position in Index futures}}{\text{Value of one contract}}$

$$\Rightarrow \frac{1,88,54,860\,[0.85 - 0]}{5994.28 \times 200}$$

FH & pH $\Rightarrow \frac{160,26,631}{1198856} \Rightarrow 13.37$ or 13 lots (Shorted)

(d) Target Beta = 0.60

Objective:- To reduce risk

No. of contracts to be Shorted:-

$$\Rightarrow \frac{Vp\,[\text{Existing Beta} - \text{Target Beta}]}{\text{Value of one Contract}}$$

$$\Rightarrow \frac{18854860\,[0.85 - 0.60]}{5994.28 \times 200}$$

$$\Rightarrow \frac{4713715}{1198856} \Rightarrow 3.93$$ or 4 lots

QUESTION NO. 10H

The Following data relate to A Ltd.'s Portfolio:

Shares	X Ltd.	Y Ltd.	Z Ltd.
No. of Shares (lakh)	6	8	4
Price per share (₹)	1000	1500	500
Beta	1.50	1.30	1.70

The CEO is of opinion that the portfolio is carrying a very high risk as compared to the market risk and hence interested to reduce the portfolio's systematic risk to 0.95. Treasury Manager has suggested two below mentioned alternative strategies:

(i) Dispose off a part of his existing portfolio to acquire risk free securities, or

(ii) Take appropriate position on Nifty Futures, currently trading at 8250 and each Nifty points multiplier is ₹ 210.

You are required to:

(a) Interpret the opinion of CEO, whether it is correct or not.

(b) Calculate the existing systematic risk of the portfolio,

(c) Advise the value of risk-free securities to be acquired,

(d) Advise the number of shares of each company to be disposed off,

(e) Advise the position to be taken in Nifty Futures and determine the number of Nifty contracts to be bought/sold; and

(f) Calculate the new systematic risk of portfolio if the company has taken position in Nifty Futures and there is 2% rise in Nifty.

Note: Make calculations in ₹ lakh and upto 2 decimal points.

Solution :

Q10 H

W.No.1 Cal. of Existing Beta Portfolio / Existing Systematic Risk:-

Shares	No. of Shares (lakh)	MPI	MV (₹ lakh)	W_i	β_i	$\beta_i W_i$
X Ltd.	6	1000	6000	6/20	1.5	1.5×6/20
Y Ltd.	8	1500	12000	12/20	1.30	1.3×12/20
Z Ltd.	4	500	2000	2/20	1.70	1.7×2/20
			20,000			βp = 1.4 times

(a) Yes, the opinion of CEO is correct as the current portfolio is more riskier than Market as the Beta (SR) of Portfolio is higher than Mkt. Beta

i.e. 1.4 > 1

(b) Since, the Beta of existing Portfolio is 1.4 times, the Systematic Risk of the current Portfolio is 1.40 times.

(c) Existing βp = 1.4 times
Target βp = 0.95 times

Objective: To reduce the risk

Action: Sell some securities from the existing portfolio (in the same prop) & buy Rf securities.

$\boxed{\beta p = \beta_i W_i}$

Assume, Existing Portfolio = A

RF Security = β

$0.95 = \beta_A W_A + \beta_B \times W_B$

$0.95 = 1.40 \times W_A + \underbrace{0 \times W_B}_{=0}$

$W_A \Rightarrow \frac{0.95}{1.40} \Rightarrow 0.68$

$W_{RF} \Rightarrow 1 - 0.68 = 0.32$

$\underline{\quad 1 \quad}$

Shares to be disposed off to reduce the Beta to 0.95

= 20000 lakhs × 32% ⇒ 6400 lakhs

& Invest in the RF Security with the same amount is ₹ 6400 lakhs

(d) No. of shares of each company to be disposed - off :-

Shares	Proportionate Amt. Disposed off (₹ lakhs)	MPS	No. of Shares (in lakh)
X Ltd.	6400 × 6/20 ⇒ 1920	1000	1.92
Y Ltd.	6400 × 12/20 ⇒ 3840	1500	2.56
Z Ltd	6400 × 2/20 ⇒ 640	500	1.28
	6400		

(e) Existing β_p = 1.40

Target β_p = 0.95

Obj :- To reduce the risk

Long Position Portfolio $\xrightarrow[\text{the risk}]{\text{To reduce}}$ Short Nifty Index futures

20000 lakh 9000 lakh

No. of contracts to be sold :-

$$\Rightarrow \frac{\text{Value of Position in Index futures}}{\text{Value of one contract}}$$

$$\Rightarrow \frac{20000 \text{ lakh } [1.40 - 0.95]}{8250 \times 210}$$

$$\Rightarrow \frac{9000 \text{ lakhs}}{17.325 \text{ lakh}} \Rightarrow 519.48$$

or

519 contracts

(f) V.Imp

Long Position (Portfolio) $\xrightarrow{\text{To reduce the risk}}$ Short Nifty futures

₹20,000 lakhs ₹9000 lakh

$\beta_P = 1.40$

⇑ 2% × 1.40 ⇑ 2%

⇒ 2.8%

Cal. of Profit & Loss :-

Profit in Portfolio	Loss in Index futures
⇒ 20,000 lakh × 2.8%	9000 lakh × 2%
Profit ⇒ 560 lakhs	⇒ 180 lakh
	or
	8250 × 2% × 210
	Loss × 519 lots
	⇒ 179.83 lakh

Overall Profit ⇒ 380.17 lakh

$$\% \text{ Profit} \Rightarrow \frac{380.17 \text{ lakh}}{} \times 100$$

20,000 lakh

$\Rightarrow$ 1.90%

Revised Beta $\Rightarrow \dfrac{\text{Change in Hedge Portfolio return}}{\text{Change in Mkt. return}}$

$\Rightarrow \dfrac{1.90\%}{2\%} \Rightarrow$ 0.95 times

$\Downarrow$

Target Beta

Hence Proved

$\boxed{\text{New Systematic Risk = 0.95 times}}$

LOS 14 : Partial Hedge

> Value of position in Index Future =
> Value of existing Portfolio × Existing beta × percentage (%) to be Hedge

- It result into Over-Hedged or Under-Hedged Position
- There may be profit or loss depending upon the situation.

QUESTION NO. 11

On April 1, 2015, an investor has a portfolio consisting of eight securities as shown below :

Security	Market Price	No. of Shares	Beta Value
A	29.40	400	0.59
B	318.70	800	1.32
C	660.20	150	0.87
D	5.20	300	0.35
E	281.90	400	1.16
F	275.40	750	1.24
G	514.60	300	1.05
H	170.50	900	0.76

The cost of capital for the investor is 20% p.a. continuously compounded. The investor fears a fall in the prices of the shares in the near future. Accordingly, he approaches you for the advice to protect the interest of his portfolio.

You can make use of the following information :

a) The current NIFTY value is 8500.

b) NIFTY futures can be traded in units of 25 only.

c) Futures for May are currently quoted at 8700 and Futures for June are being quoted at 8850.

You are required to calculate :

(i) the beta of his portfolio.

(ii) the theoretical value of the futures contract for contracts expiring in May and June.

Given ($e^{0.03}$ = 1.03045, $e^{0.04}$ = 1.04081, $e^{0.05}$ = 1.05127)

(iii) the number of NIFTY contracts that he would have to sell if he desires to hedge until June in each of the following cases :

A. His total portfolio

B. 50% of his portfolio

C. 120% of his portfolio

Solution :

Q.11

1st April

Current Nifty = 8500 Spot rate

May.

AFP = 8700

June.

AFP = 8850

(i) Cal. of Beta Portfolio :- [Existing Beta]

Security	No. of Shares	MPS	MV	β	$\beta_1 I_1$
A	400	29.40	11760	0.59	6938.40
B	800	318.70	254960	1.32	336547.20
C	150	660.20	99030	0.87	86156.10
D	300	5.20	1560	0.35	546
E	400	281.90	112760	1.16	130801.60
F	750	275.40	206550	1.24	256122
G	300	514.60	154380	1.05	162099
H	900	170.50	153450	0.76	116622
			994450		1095832.30
					$\Sigma \beta_1 I_1$

$$\beta_P = \frac{\Sigma \beta_1 I_1}{\Sigma I_1}$$

$$\Rightarrow \frac{1095832.30}{994450}$$

$$\boxed{\beta_P \Rightarrow 1.102 \text{ times}}$$

(ii) Cal. of Theoritical Value of Nifty futures:-

FFP of May Contract:-

1^{st} April ⟶ May Contract
[2 mths]

$$FFP \Rightarrow SR \times e^{rt}$$
$$\Rightarrow 8500 \times e^{.20 \times \frac{2}{12}}$$
$$\Rightarrow 8500 \times e^{0.0333} \approx 0.0033$$
$$\Rightarrow 8500 \times 1.0339$$

FFP (May) ⇒ 8788.15

W.No:-

$$e^{0.03} \Rightarrow 1.03045$$
$$e^{0.04} \Rightarrow 1.04081$$

0.01 ⇒ 0.01036

$$1 \Rightarrow \frac{0.01036}{0.01} \times 0.0033$$
$$\Rightarrow 0.0034$$

$$e^{0.0333} = 1.03045 + 0.0034$$
$$\Rightarrow 1.0339$$

FFP for June Contracts:-

1st April ⟶ June

t ⇒ 3 mths

$FFP = SR \times e^{rt}$

$\Rightarrow 8500 \times e^{.20 \times \frac{3}{12}}$

$\Rightarrow 8500 \times e^{0.05}$

$\Rightarrow 8500 \times 1.05127$

FFP (June) ⇒ **8935.80**

(ii) Short ⟶ June

Hint:-

FFP — AFP

8935.80 ⇓ Valuation — 8850 Exchange

(iii) **Cal of No. of Lots/contracts to be sold/short:-**

$$\Rightarrow \frac{\text{Value of Position in Index futures}}{\text{Value of one contract}}$$

$$\Rightarrow \frac{\text{Value of Portfolio} \times \beta \times \text{\%age to be Hedged}}{\text{Value of one contract}}$$

(A) **Total Portfolio to be Hedge:-**

(100%)

No. of Contract to be Shorted:-

$$\Rightarrow \frac{994450 \times 1.102 \times 100\%}{8850 \times 25}$$

$$\Rightarrow \frac{1095883.90}{221250} \Rightarrow 4.953$$

or

5 lots

(b) 50% Portfolio to be Hedge:-

No. of Contract to be Shorted:-

$$\Rightarrow \frac{994450 \times 1.102 \times 50\%}{8850 \times 25}$$

$$\Rightarrow \frac{547941.95}{221250} \Rightarrow 2.4765$$

or 2 lots

As per ICAI 2.4765 or 2.50 or 3 lots

(c) 120% Portfolio to be hedge:-

No. of Contract to be Shorted:-

$$\Rightarrow \frac{994450 \times 1.102 \times 120\%}{8850 \times 25}$$

$$\Rightarrow \frac{1315060.68}{221250} \Rightarrow 5.944$$

or

6 lots

LOS 15 : Beta of a Cash and Cash Equivalent

Beta of a cash and Risk free security is Zero.

QUESTION NO. 12B

Current value of BSE Index (SR)	5000
Value of portfolio	₹ 10,10,000

Risk free interest rate	9% p.a.
Dividend yield on Index	6% p.a
Beta of portfolio	1.5

We assume that a future contract on the BSE index with four months maturity is used to hedge the value of portfolio. One future contract is for delivery of 50 times the index. Based on the above information. Calculate:

a) Fair Future Price of Future Contract.

b) Calculate the gain on short futures position after 4 months with the help of index if it turns out to be 4,500 in three months.

Solution :

Q.12B V.Imp (3 marks) (2 times)

Note:- In certain problems of Beta management using index futures, Actual Price as on today is missing, In that case, we can calculate fair future price (FFP) & assume that futures are fairly priced i.e.

$\boxed{FFP = AFP}$

W.No.1 (a) Cal. of FFP :- (Fair future Price) (Valuation)

$FFP \Rightarrow SR\left[1+(r-DY)\right]^n$

$\Rightarrow 5000\left[1+(0.09-0.06)\times\frac{4}{12}\right]$

$\Rightarrow 5000 \times 1.01$

$FFP/AFP \Rightarrow 5050$

(#) Futures are fairly priced.

4 mths

FFP = 5050

Existing βp = 1.50

Target $\beta_p \Rightarrow 0$ (Perfect Hedging)

Obj:- To reduce the risk

Long Position (Portfolio) → Short Index Futures

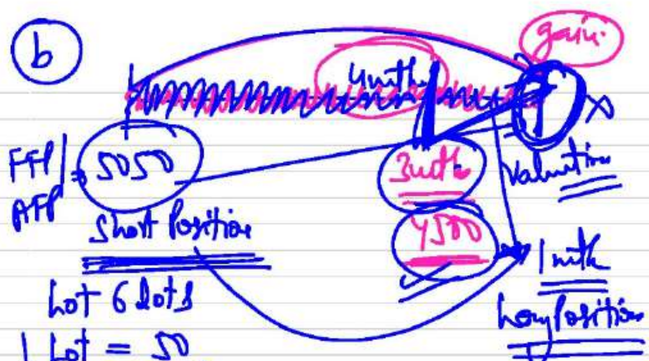
No. of contracts to be shorted:-

$$\Rightarrow \frac{V_p\left[\text{Existing } \beta_p - \text{Target } \beta\right]}{\text{Value of one contract}}$$

$$\Rightarrow \frac{10,10,000\left[1.50-0\right]}{5050 \times 50}$$

$$\Rightarrow \frac{15,15,000}{2,52,500} \Rightarrow$$ 6 lots (Shorted)

(b)



Lot 6 lots
1 Lot = 50

SR = 4500
r = 9% p.a.
DY = 6% p.a.

⇒ It is given after 3 mth but gain can be calculated after 4 months. (on Expiry)

Therefore, Fair future price after

4 months needs to be Calculated:—

$$FFP = SR\left[1 + (r - DY)\right]^n$$

$$\Rightarrow 4500\left[1 + (.09 - .06) \times \frac{1}{12}\right]$$

$$\Rightarrow 4511.25$$

Cal. gain on Short future position:—

6 lots — To square off

Short Position → Long Position

5050 → 4511.25

Gain in Short future Position

$$\Rightarrow [5050 - 4511.25] \times 50 \times 6$$

$$\Rightarrow ₹\ 161625$$

QUESTION NO. 12C

Ram buys 10000 shares of X Ltd. at a price of ₹ 22 per share whose Beta value is 1.5 and sells 5000 shares of A Ltd. at a price of ₹ 40 per share having a Beta value of 2. He obtains a complete hedge by Nifty futures at ₹ 1000 each. He closes out position at the closing price of the next day when the share of X Ltd dropped by 2%, share of A Ltd. appreciated by 3 % and Nifty futures dropped by 1.5%. What is the overall profit / Loss to Ram?

Solution :

Q.12C

Target β = 0

X Ltd.

Long Position $\xrightarrow{\text{Complete Hedge}}$ Short Position Nifty futures

10,000 shares @ ₹22 each

⇒ ₹ 2,20,000

Existing β = 1.5 times

2,20,000 [1.5 − 0]

⇒ ₹ 3,30,000

A Ltd.

Short Position $\xrightarrow{\text{For Complete Hedge}}$ Long Index

5000 Shares @ ₹40 each

⇒ ₹2,00,000

Δ = 2

Futures (Nifty)

200000 [2 − 0]

⇒ 4,00,000 ✓

Net Position in Nifty Index future ⇒ 70,000 Long Position

No. of Lots to be long :–

⇒ ₹70,000 / ₹1000 ⇒ 70 lots (Long)

Cal. of overall P/L :–

XLtd.

Long Position
2,20,000 ⇓ 2%
Loss ⇒ 4400 ✓

Altd.
Short Position
₹20,000 ⇑ 3%
Loss ⇒ 6000 ✓

Nifty Index futures ↓ 1.5% Loss = 1050 ✓
Long Position
70,000

Overall Loss ⇒ ₹ 11,450 ✓

Extra Part :– If only this line is given in the question :–

Nifty futures drop by 1.5% ✓

X Ltd. ↓ 1.5×1.5 ⇒ 2.25%

A Ltd. ↓ 1.5% × 2 = 3%

X Ltd. Long Position
2,20,000 × 2.25% ↓ ⇒ Loss = 4950

A Ltd Short Position
2,00,000 × 3% ↓ ⇒ Profit = 6000

Nifty Index future
Long Position 70,000 ↓ 1.5% ⇒ Loss ⇒ 1050

Overall P/L NIL

This is the case of Perfect Hedging.

QUESTION NO. 12D

A trader is having in its portfolio shares worth ₹ 85 Lakhs at current price and cash ₹ 15 Lakhs. The Beta of the share portfolio is 1.6. After 3 months the price of shares dropped by 3.2 %.

Determine:

a) Current portfolio beta.

b) Portfolio beta after 3 Months if the trader on current date goes long position on ₹ 100 Lakhs Nifty Futures.

Solution :

Q.12D V.V.V.Imp Strategy (5 marks)

(a) Cal. of Current Portfolio Beta:-

	β	Invt.	W_i	$\beta_P = \beta_i W_i$
Share Portfolio	1.60	85 lakh	.85	1.60×.85
Cash	0	15 lakh	.15	0×.15
		100 lakh	1	β_P = 1.36 times

$\boxed{\text{Existing } \beta_P = 1.36 \text{ times}}$

(b) If Shares will falls by 3.2% after 3 mths & Beta of Shares Portfolio is 1.6 times

It means mkt. will falls by

- - - - - - - .

If Mkt. falls by x% → Shares falls by.
$x \times 1.6$
$\Rightarrow$ 3.2%

$x \times 1.6 = 3.2\%$

$x \Rightarrow \frac{3.2}{1.6} \Rightarrow 2\%$

OR

$\beta_p \Rightarrow \frac{\text{change in Portfolio return}}{\text{change in Mkt. Return}}$

$1.6 \Rightarrow \frac{3.2\%}{x\%}$

$x = \frac{3.2}{1.6} \Rightarrow 2\%$

Mkt. will falls by 2% after 3 mths

Revised Position:- (after 3 mths)

Long Position in Nifty 100 lakhs

⇒ Value of Nifty after 3 mths

Long Position 100 lakh ⇓ 2%   Loss in Nifty = 2 lakhs ⇓ MTM

OR

Nifty 100 lakh — 2% fall — 98 lakh ⇒

Revised Value of Portfolio

1) Cash Balance after 3 mths

15 lakh − 2 lakh (MTM) ⇒ 13 lakhs

2) Equity Shares Portfolio

85 lakhs ↓ 3.2%

85 lakh − 3.2% ⇒ 82.28 lakh

Total Value of Portfolio after 3 mths ⇒ ₹ 95.28 lakhs

Change in Portfolio Returns $\boxed{\frac{\Delta}{Base}}$

$$\Rightarrow \frac{100\text{ lakh} - 95.28\text{ lakh}}{100\text{ lakh}} \times 100$$

Final Answer: ⇒ 4.72% fall in Portfolio return

β_p after 3 mths:-

$$\Rightarrow \frac{\text{Change in Portfolio Returns}}{\text{Change in Market Returns}}$$

⇒ 4.72% ⇒ 2.36 times

2%

Revised β_p = 2.36 times

$\boxed{\text{Long P} \rightarrow \text{Portfolio} + \text{Long Position Index Nifty}}$

LOS 16 : Concept of Contango & Backwardation

Contango vs Backwardation

Contango and backwardation are terms used to describe the observed difference between the spot, or cash, price and futures prices for a commodity.

What is contango?

Contango describes an upward sloping curve where the prices for future delivery are higher than the spot price (e.g., the price of gold delivered in 1 year is $1,400/oz and the spot price is $1,200/oz). Contango is common in the gold industry, where the commodity is non-perishable and there are storage costs.

Contango exists for multiple reasons including inflation, carry costs (storage and insurance), and expectations that real prices will be higher in the future.

What is backwardation?

Backwardation describes a downward sloping curve where the prices for future delivery are lower than the spot price (e.g., the price of oil delivered in 3 months is $40/bbl and the spot price is $50/bbl).

Backwardation exists for various reasons, including short-term events that can cause the spot price to rise above future prices. For example, if a major drought causes wheat crops to suffer then the spot price may spike up above the future prices, when growing conditions are expected to be normal again.

QUESTION NO. 13

Mr. SG sold five 4-Month Nifty Futures on 1st February 2020 for ₹ 9,00,000. At the time of closing of trading on the last Thursday of May 2020 (expiry), Index turned out to be 2100. The contract multiplier is 75.

Based on the above information calculate:

(i) The price of one Future Contract on 1st February 2020.

(ii) Approximate Nifty Sensex on 1st February 2020 if the Price of Future Contract on same date was theoretically correct. On the same day Risk Free Rate of Interest and Dividend Yield on Index was 9% and 6% p.a. respectively.

(iii) The maximum Contango/ Backwardation.

(iv) The pay-off of the transaction.

Note: Carry out calculation on month basis.

Solution :

Q13

4mths

AFP ⇒ 1st Feb 2400

May 2020 Expiry 2100

5 lots Short Position

Value = 9,00,000

Lot size = 75

(i) Price of one future contract on 1st Feb:-

Value of one contract = $\frac{9,00,000}{5}$

⇒ ₹1,80,000

Price of Nifty future on 1st Feb:-

$\Rightarrow \frac{1,80,000}{75} \Rightarrow 2400$ ✓

(ii) Current Nifty Price on 1st Feb:-
i.e Spot Rate :-

Nifty Future Price on 1st Feb = 2400

(#) Futures are fairly priced

i.e. FFP = AFP = 2400 ✓

Spot Nifty on 1st Feb:-

$FFP = SR\left[1 + (r - DY)\right]^n$

$2400 = SR\left[1 + (.09 - .06) \times \frac{4}{12}\right]$

$2400 = SR(1 + .01)$

$SR = \frac{2400}{1.01} \rightarrow 2376.24$

(iii) Contango / Backwardation:-

$SR = 2376.24$

$FR = 2400$

$FR > SR \rightarrow$ Contango

$Basis = FR - SR$

$= 2400 - 2376.24$

$\Rightarrow 23.76$ ✓

⇒ Here, SR is less than future price, This is a case of contango & maximum contango shall be :-

2400 − 2376.24 = 23.76

(iv) Pay-off of the transaction:-

Futures

Short Position @2400

@2100

To Square-off

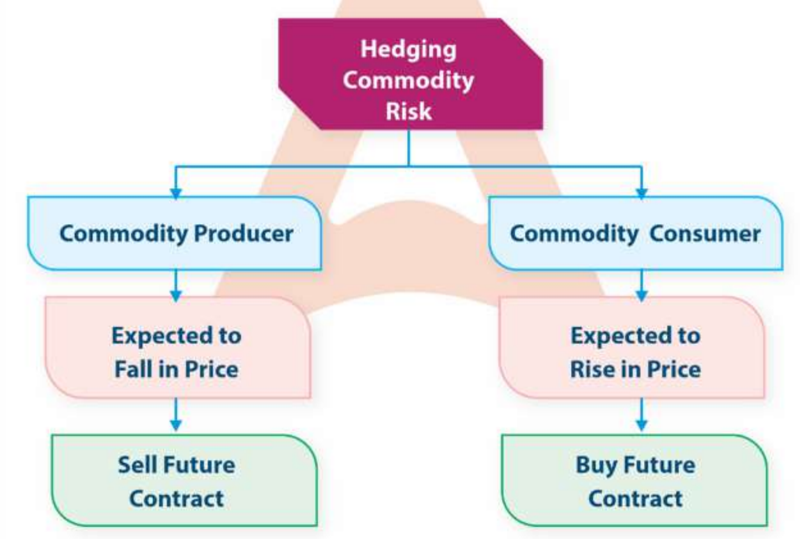
Long-Position

Profit in Short Position:-

⇒ [2400 − 2100] × 75 × 5

⇒ ₹ 112500

LOS 17 : Hedging Commodity Risk Through Futures



QUESTION NO. 14C

Mr. V is a commodity trader and specialized himself in trading of rice.
He has 24,000 Kg. of rice. The following details are available as on date:

Spot price	₹/Kg.	70
3 month's future is trading at	₹/Kg.	68
Expected Lower price after 3 months	₹/Kg.	64
Contract size	500 Kg.	contract
You are required to advise to Mr. V:		

(i) How to mitigate the risk of fall in price.

(ii) How to use the futures market.

(iii) What will be the effective realized price for his sales if, after 3 months, spot price is ₹ 69/ Kg. and the 3 months future contract price is

a. ₹ 72/ Kg.

b. ₹ 67/Kg.

Solution :

Q.14C (ans)

Rice Trader

SR = 70/Kg — 3 mths → SR = 69/Kg.

AFP = 68/Kg. → AFP (i) 72/Kg. (ii) 67/Kg.

Short Position

In order to hedge its position Mr. V (trader) should use future contract & take short position as on today:—

No. of Lots to be shorted:—

$$\Rightarrow \frac{24000 \text{ Kg.}}{500 \text{ Kg.}} \Rightarrow 48 \text{ Lots}$$

Future Price for 3 mths = 68/Kg.

(ii) Mr. V should short 48 future contracts at the price of ₹ 68/Kg. & cancel its position after 3 mths by taking long position in future contract at prevailing future price on expiry.

SR ⇒ 69/Kg.

To square off

Short Position @ 68/Kg. → Long Position (i) @ 72/Kg. (ii) @ 67/Kg.

(iii) After 3 mths, trader would cancel its position in the future contract by taking long position of the same quantity & will sell rice in the spot market @ 69/Kg.

Derivatives Analysis & Valuation (Futures)

Case I:-

Short Position @ 68/kg. → Long Position @ 72/kg.

Loss under the futures contract:-

$\Rightarrow$ ₹[68 − 72] × 48 × 500 kg.

$\Rightarrow$ ₹96,000 (Loss)

Amount realized by selling rice in the spot markets:-

24000 kg. × ₹ 69/kg.

$\Rightarrow$ ₹ 16,56,000

Effective realized price:-

$\Rightarrow$ ₹ 16,56,000 − 96000

$\Rightarrow$ ₹ 15,60,000

Effective realized price/kg:-

$\Rightarrow \dfrac{₹\ 15,60,000}{24000\ kg.} \Rightarrow$ 65/kg.

Case II:

Short Position @ 68/kg. → To square-off → Long Position @ 67/kg

Profit under the futures contract:-

$\Rightarrow$ ₹[68 − 67] × 48 × 500 kg.

⇒ ₹ 24000

Effective Realized Price:-

⇒ 24000 + 16,56,000

⇒ ₹ 16,80,000

Effective Realized Price/Kg:-

$\Rightarrow \frac{16,80,000}{24000} \Rightarrow 70/\text{kg.}$

LOS 18 : Hedge Ratio

The Optional Hedge Ratio to minimize the variance of Hedger's position is given by:-

$$\boxed{\text{Hedge Ratio} = \text{Corr. (r)}\ \frac{\sigma_S}{\sigma_F}}$$

σ_S = S.D of Δ S

σ_F = S.D of Δ F

r = Correlation between Δ S and Δ F

Δ S = Change in Spot Price

Δ F = Change in Future Price

QUESTION NO. 15B

A company is long on 10 MT of copper @ ₹534 per kg (spot) and intends to remain so for the ensuing quarter. The variance of change in its spot and future prices are 16% and 36% respectively, having correlation coefficient of 0.75. The contract size of one contract is 1,000 kgs.

Required:

(i) Calculate the Optimal Hedge Ratio for perfect hedging in Future Market.

(ii) Advice the position to be taken in Future Market for perfect hedging.

Determine the number and the amount of the copper futures to achieve a perfect hedge.

Solution :

The optional hedge ratio to minimize the variance of Hedger's position is given by:

$H=\rho\ \frac{\sigma S}{\sigma F}$

Where

σS = Standard deviation of ΔS (Change in Spot Prices)

σF =Standard deviation of ΔF (Change in Future Prices)

ρ = coefficient of correlation between ΔS and ΔF

H = Hedge Ratio

ΔS = change in Spot price.

ΔF = change in Future price. Accordingly

Standard deviation of ΔS =√(16%)=4% and

Standard deviation of ΔF √(36%)=6% and

$H = 0.75 \times \frac{0.04}{0.06} = 0.5$

Since the company is long position in Spot (Cash) Market it shall take Short Position in Future Market.
Since contact size of one contract is 1,000 Kg,
No. of contract to be short = (10000 kgs)/(1000 kgs) × 0.50 = 5 Contracts
Amount = Rs. 5000 x 534 = Rs. 26,70,000

LOS 19 : Calculation of Rate of Return

	Increase or Decrease in Stock Price ($P_1 - P_0$)
(+)	Dividend Received
(-)	Transaction Cost
(-)	Interest Paid on Borrowed Amount
	Net Amount Received

$$\boxed{\text{Rate of return} = \frac{\text{Net Amount Received}}{\text{Total Initial Equity Investment}} \times 100}$$

QUESTION NO. 16

Mr. V decides to sell short 10000 shares of ABC plc, when it was selling at yearly high of £5.60. His broker requested him to deposit a margin requirement of 45% and commission of £1550 while Mr. V was short the share, the ABC paid a dividend of £0.25 per share. At the end of one year Mr. V buys 10,000 shares of ABC plc at £4.50 to close out position and was charged a commission of £1450.
You are required to calculate the return on investment of Mr. V.

Solution :

Q.16

10,000 Shares

Sell £5.60 | Brokerage £1450, Buy £4.50

Brokerage ⇒ £1550 | Div = £.25

45% Margin

Beginning Investment Value :-

10,000 × £5.60 ⇒ £56000
⇓
45%

Equity Investment of Mr. V :-

$\Rightarrow$ £ 56000 × 45% + £ 1550

$\Rightarrow$ £ 25200 + £ 1550

$\Rightarrow$ £ 26750 (As per ICAI)

Net Profit Received:-

Profit $\Rightarrow$ [£ 5.60 − £ 4.50] × 10,000 $\Rightarrow$ £ 11000

Less: Brokerage:- (£ 1550 + £ 1450) $\Rightarrow$ £ 3000

Less:- Loss of Dividend £ 0.25 × 10,000 $\Rightarrow$ £ 2500

Net Profit Received £ 5500

Cal. of Return:-

$$\Rightarrow \frac{£\,5500}{£\,26750} \times 100 \Rightarrow 20.56\%\ p.a.$$