

LAST MINUTE REVISION

[L M R]

Compilation of Important questions by SFM Praveen for CA final SFM for Nov, 2013 Exam

PORTFOLIO MANAGEMENT

Problem: 1 : Capital Asset Pricing model

Assuming that two securities X and Y are correctly priced on security market line (SML) and expected return from these securities are 9.4% and 13.40% respectively. The Beta of these securities are 0.80 and 1.30 respectively. Mr. A an investment manager states that the return on market index is 9%. You are required to determine,

- Whether the claim of Mr. A is right. If not then what is the correct return on market index.
- Risk free rate of return.

Solution: When CAPM assumptions are holding good, actual return = CAPM return

- $9.4 = R_f + 0.8(R_m - R_f)$(1)
- $13.4 = R_f + 1.3(R_m - R_f)$(2), Solving 1 and 2 equations
- $R_f = 3\%$, $R_m = 11\%$
- His context is wrong, hence $R_f = 3\%$ and $R_m = 11\%$.

CA Final SFM Batch I

Schedule : 21-11-2013 To 09-01-2014

Timings : 6.15 am to 9.30 am

Venue : HBA College, Himayat Nagar

Problem: 2: Portfolio 6

You want to create a portfolio equally as risky as the market and you have ₹ 1000000 to invest. Given this information, fill in the rest of the following table.

Asset	Investment	β
Stock A	₹ 200,000	0.70
Stock B	₹ 250,000	1.10
Stock C	?	1.60
Risk-Free asset	?	0

PF $\beta = 1$ equally risky

Solution:

STOCK	INVESTMENT	WEIGHT	β	WEIGHT * β
A	200,000	0.2	0.7	0.14
B	250,000	0.25	1.1	0.275
C	See below	W_c	1.6	$1.6 * W_c$
R_f	See below	W_{Rf}	0	0

- $W_c + W_{Rf} = 0.55$ (Remember total value of PF is ₹ 10 lakhs.)
- $W_A + W_B + (W_c + W_{Rf}) = 1$
- $W_c + W_{Rf} = 0.55$(1)
- $0.14 + 0.275 + 1.6W_c + 0 = 1$(portfolio β is the weighted avg of Beta s of stocks)
- $W_c = 0.585 / 1.6 = 0.365$
- From (1) $W_{Rf} = 0.184$

Problem: 3: Short Selling

Assume that only two macro economic factors. Factor 1 & factor 2, impact security returns. Investment A, B, C have the following sensitivities to these two factors:

Investment	β_1	β_2
A Ltd.	1.75	0.25
B Ltd	-1.00	2.00
C Ltd	2.00	1.00

We are given the expected risk premium is 4 % on Factor 1 and 8 % on Factor 2. According to the APT, what is the risk premium on each of the three stocks? Suppose we buy ₹ 200000 of A and ₹ 500000 of B and sell ₹ 150000 of C. What is the sensitivity of this portfolio to each of the two factors?

Solution:

Stock	β_1	β_2
A	1.75	0.25
B	-1.00	2.00
C	2.00	1.00

$R_m - R_f$ 4% 8%

$\beta_1 * 4\% + \beta_2 * 8\%$

- A $(1.75)4\% + (0.25)8\% = 0.09$
- B $(-1)4\% + (2)8\% = 0.12$
- C $(2)4\% + (1)8\% = 0.16$

For soft copies mail to :

praveen_302917@yahoo.co.in

Classes will be held by CA. Praveen Kumar having 6 years of experience in Equity markets, Mumbai and Currency markets, Dubai.

Stock	W	β_1	β_2	$Wt \cdot \beta_1$	$Wt \cdot \beta_2$
A	0.36	1.75	0.25	0.63	0.09
B	0.91	-1	2	-0.91	1.82
C	-0.27	2	1	-0.54	-0.27

$$P\beta_1 = -0.82 \quad P\beta_2 = 1.64$$

Problem: 4: Single factor model

An investor has short –listed the following four securities for investment:

Security	A	B	Residual Variance/Random error $\sigma_{\epsilon_i}^2$
A	1.2	1.3	18
B	1.8	0.4	8
C	2.1	1.6	14
D	2.5	1.7	17

- i) Market return is expected to be 16% and standard deviation of the market return is expected to be 4.5%. Which security is preferred by the investor from the point of view of risk and return?
- ii) Assuming that the investor has invested 10%, 20%, 30%, 40% in above securities, find out portfolio risk and portfolio return.

Solution: i)

Stock	α	B	$R_s = \beta \cdot R_m + \alpha$	$\sigma_s^2 = \beta^2 \times \sigma_m^2 + \epsilon^2$	Σs	R_s / σ_s
A	1.2	1.3	22	52.22	7.22	3.04
B	1.8	0.4	8.2	11.24	3.35	2.44
C	2.1	1.6	27.7	65.84	8.11	3.41
D	2.5	1.7	29.7	75.52	8.69	3.41

Conclusion: securities C&D are giving higher return for every 1 unit of risk Investor is taking compared to A&B

ii)

security	β	Wt	$Wt \cdot \beta$	A	$Wt \cdot \alpha$	E_i^2	$Wt \cdot E_i^2$
A	1.3	0.10	0.13	1.2	0.12	18	1.8
B	0.4	0.20	0.08	1.8	0.36	8	0.64
C	1.6	0.30	0.48	2.1	0.63	14	6.72
D	1.7	0.40	0.68	2.5	1	17	11.56

$$\Sigma Wt \cdot \beta = 1.37$$

$$\Sigma Wt \cdot \alpha = 2.11$$

$$\Sigma Wt \cdot E_i^2 = 20.72$$

Return of portfolio (R_p) = $\beta_p \times R_m + \alpha_p = 24.3$ Pf risk = $\beta_p^2 \times \sigma_m^2 + E_i^2 = S.D = 7.66$ **Problem: 5 : Single factor model**

A portfolio has been constructed with the following features:

Security	B	Random Error, σ_{ϵ_i}	Weight
A	1.50	6	.3
B	1.10	10	.2
C	1.30	4	.2
D	0.80	12	.2
E	0.90	7	.1

Find out the risk of the portfolio given that the standard deviation of the market index is 20%.

Solution:

Security	Wt	B	$Wt \times \beta$	E_i	$Wt \times E_i$
A	0.3	1.50	0.45	6	1.8
B	0.2	1.10	0.22	10	2.0
C	0.2	1.30	0.26	4	0.8
D	0.2	0.80	0.16	12	2.4
E	0.1	0.90	0.09	7	0.7

$$1.18$$

$$7.7$$

Risk $\sigma_p^2 = \beta_p^2 \times \sigma_m^2 + \sigma_p^2 = 616.$ $\sigma_p = 24.82\%$ **CA Final SFM Batch II**

Schedule : 21-11-2013 To 09-01-2014

Timings : 6.15 pm to 9.30 pm

Venue : S.R. Nagar

Problem: 7 : Constant Mix Portfolio Theory

Nehru has a fund of ₹ 1 lakhs which he wants to invest in share market with rebalancing target after every 30 days. The market price of SCI is ₹ 50. he wants to know as to how he should rebalance his portfolio under the following situations, according to the theory of Constant mix policy with mix of 60:40

- (1) Immediately to start with.
- (2) 30 days later-being the first day of rebalancing if SCI falls to ₹ 41.
- (3) 30 days further from the above data if the SCI touches ₹ 55.

Solution:

Immediately to start with

Equity: $1200 \times 50 = ₹ 60000$
 Rf = ₹ 40000
 Total = ₹ 100000

Rebalancing after 30 days later

Equity: $1200 \times 41 = ₹ 49200$
 Rf = ₹ 40000
 Total = ₹ 89200

	Equity	Rf
Desired	₹ 53520	₹ 35680
Existing	₹ 49200	₹ 40000
Buy-Eq	₹ 4320	sell Rf ₹ 4320

No. of shares to buy = $4320 / 11 = 105.36$ shares

Total no. of shares $1200 + 105.36 = 1305.36$ shares.

=> Equity 1305.36 shares Rf ₹ 35680

Rebalancing after 30 days further

Equity- $1305.36 \times 55 = ₹ 71795$
 Rf = ₹ 35680
 Total = ₹ 107475

	Equity	Rf
Desired	₹ 64485	₹ 42989
Existing	₹ 71795	₹ 35680
Sell Eq ₹ 7310	Buy Rf ₹ 7310	

No. of shares to sell = $7310 / 55 = 132.9$

=> Equity = 1172.46 shares, Rf = ₹ 42990

Problem: 8 : Theory of constant portfolio proportional Insurance

Sonia has a fund of ₹ 1 lakhs which she wants to invest in share market with rebalancing target after every 10 days to start with for a period of one month from now. The CMP of Ranbaxy is ₹ 500. The floor is ₹ 75,000. She wants to know as to how she should rebalance her portfolio under the following situations, according to the theory of Constant proportion portfolio insurance policy, using 2 as the multiplier:

- (1) immediately to start with.
- (2) 10 days later-being the first day of rebalancing if Ranbaxy falls to ₹ 400
- (3) 10 days further from the above data if the Ranbaxy touches ₹ 650

Solution:

M=2

Amount to be allocated = $2(1,00,000 - 75,000)$
 = ₹ 50,000
 ₹ 1,00,000

Equity ₹ 50,000	Rf = ₹ 50,000
CMP ₹ 500	

No. of shares $50,000 / 500 = 100$ shares

Rebalancing after 10 days later

Share price ₹ 400
 Equity $100 \text{ sh.} \times 400 = ₹ 40,000$
 Rf = ₹ 50,000
 ₹ 90,000

Amount to be invested in equity = $2(90,000 - 75,000) = ₹ 30,000$
 ₹ 90,000

Desired	Eq. ₹ 30,000	Rf = ₹ 60,000
Existing	₹ 40,000	₹ 50,000
Sell	₹ 10,000	Buy ₹ 10,000

No. of shares to sell = $10,000 / 400 = 25$ shares Rf = ₹ 60,000

CMP@650

Equity $75 \times 650 = ₹ 48,750$
 Rf = ₹ 60,000
 Total ₹ 108,750

CA Final SFM Batch III

Schedule : 01-02-2014 To 20-03-2014

Timings : 6.15 am to 9.30 am

Venue : S.R.Nagar

**BANGALORE BATCH: JAN 10 TO JAN 31 AT
SHRADDHA ACADEMY**

CA Final SFM Batch IV

Schedule : 01-02-2014 To 20-03-2014

Timings : 6.30 pm to 9.30 pm

Venue : S.R.Nagar

For online registrations log on to www.sfmpraveen.com

SFM Praveen

Amt to be invested in equity = $2(108750 - 75000) = ₹ 67500$

Rebalancing after 10 days later

₹ 108750

Desired Eq ₹ 67500 Rf ₹ 41250
Existing ₹ 48750 ₹ 60000
Buy ₹ 18750 sell Rf ₹ 18750

No. of shares to buy $18750/650 = 28.84$ shares

Eq-103.84 shares, Rf- ₹ 41250

CA Final SFM Batch I

Schedule : 21-11-2013 To 09-01-2014

Timings : 6.15 am to 9.30 am

Venue : HBA College, Himayat Nagar

Problem: 9: Technical Analysis

The closing prices of the stock of Torrent power Limited on five consecutive days are as under

Days	Closing prices
0	274.90
1	275.60
2	268.00
3	270.00
4	272.00

What is the Relative Strength of the stock?

Solution:

Relative strength of the stock = Average of up closing prices / Average of down closing prices

$= [(274.90 + 275.60 + 272.00) / 3] / 268 = 1.0169$

Problem: 10. Arbitrage portfolio

Mr. Sunil has estimated probable under different macroeconomic conditions for the following three stocks:

Stock	CMP (₹)	Rate of return during different macro economic scenarios		
		Recession	Moderate	Boom
Him Ice Ltd	12	-12%	15%	35%
Kalahari Biotech	18	20%	12%	-5%
Puma Softech	60	18%	20%	15%

Mr. Sunil is exploring if it is possible to make any arbitrage profits from the above information.

Using the above information construct an arbitrage portfolio and show the payoffs under different economic scenarios.

Stock	Buy/Sell	P_0	Recession	Moderate	Boom
Puma Softech	1 * Buy	(60)	70.8	72	69
Him Ice Ltd	2 * Sell	24	(21.12)	(27.6)	(32.4)
Kalahari Biotech	2 * Sell	36	(43.2)	(40.32)	(34.2)
	Total	0	6.48	4.08	2.40
Arbitrage Gain			6.48	4.08	2.40

Problem: 11 : Cut off point

Data for finding out optimal portfolio are given below.

Security	Mean return	β	Unsystematic Risk σ_{ei}^2
Grasim	19	1.0	20
Hero motor	23	1.5	30
Infosys	11	0.5	10
Indian oil	25	2.0	40
SBI	13	1.0	20
Dr Reddy's	9	0.5	50
Tech Mahindra	14	1.5	30

The risk free rate is 5% and the market risk (variance) is 10%. Determine the cut-off point.

Solution: ranking is based on $(R_s - R_f) / \beta$

Security	Mean Return(x)	Beta(β)	E_i^2	$[(R_s - R_f) \beta] / E_i^2$	Cumulative value	β^2 / E_i^2	Cumulative value	Cut off
Grasim	19	1.0	20	0.7	0.7	0.05	0.05	11.67
Hero motor	23	1.5	30	0.9	1.6	0.075	0.125	11.95
Infosys	11	0.5	10	0.3	1.9	0.025	0.15	11.88
Indian oil	25	2.0	40	1	2.9	0.10	0.25	11.15
SBI	13	1.0	20	0.4	3.3	0.05	0.3	10.65
Dr. reddy's	9	0.5	50	0.04	3.34	0.005	0.305	10.60
Tech Mahindra	14	1.5	30	0.45	3.79	0.075	0.38	9.72

Cut Off Point = $[\text{Var.}(m) * \text{Cumulative Value of } (R_m - R_f) \beta] / [1 + \text{Var.}(m) * \text{Cumulative value of } \beta^2 / E_i^2]$

Investor should buy stocks of Grasim, Hero Motor Corp, and Infosys as the benefiting is in increasing trend due to diversification

Problem: 12 : The following information is available in respect of Security X

Equilibrium Return	15%
Market Return	15%
7% Treasury Bond Trading at	\$140
Covariance of Market Return and Security Return	225%
Coefficient of Correlation	0.75

You are required to determine the Standard Deviation of Market Return and Security Return.

Solution: First we shall compute the β of Security X.

$$\text{Risk Free Rate} = \frac{\text{Coupon Payment}}{\text{Current Market Price}} = \frac{7}{140} = 5\%$$

Assuming equilibrium return to be equal to CAPM return then: $15\% = R_f + \beta X(R_m - R_f)$

$$15\% = 5\% + \beta X(15\% - 5\%) \text{ hence } \beta X = 1$$

(i) Standard Deviation of Market Return

$$\beta X = \frac{\text{Cov}(X, m)}{\sigma_m^2} = \frac{225\%}{\sigma_m^2} = 1 \text{ Using second formula....}$$

$$\sigma_m^2 = \frac{225\%}{1} = 225\%$$

$$\sigma_m = \sqrt{225} = 15\%$$

(ii) Standard Deviation of Security Return

$$\beta X = [\sigma_X / \sigma_m] * \text{corr}(X, m)$$

$$1 = [\sigma_X / 15] * 0.75, \text{ i.e. } \sigma_X = 20\%$$

CA Final SFM Batch II

Schedule : 21-11-2013 To 09-01-2014

Timings : 6.15 pm to 9.30 pm

Venue : S.R. Nagar

Problem: 13: Margin Computation

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	High	Low	Closing
4-2-09	3306.4	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
14-02-09	3315.00	3257.10	3309.30
17-2-09	3278.00	3249.50	3257.80
18-2-09	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

$$\text{Initial Margin} = \mu + 3\sigma$$

Where μ = Daily Absolute Change

σ = Standard Deviation

Accordingly, Initial Margin = ₹ 10,000 + ₹ 6,000 = ₹ 16,000

Maintenance margin = ₹ 16,000 × 0.75 = ₹ 12,000

Day	Changes in future Values (₹)	Margin A/c (₹)	Call Money (₹)
4/2/09	-	16000	-
5/2/09	50 × (3294.40 - 3296.50) = -105	15895	-
6/2/09	50 × (3230.40 - 3294.40) = -3200	12695	-
7/2/09	50 × (3212.30 - 3230.40) = -905	16000	4210
10/2/09	50 × (3267.50 - 3212.30) = 2760	18760	-
11/2/09	50 × (3263.80 - 3267.50) = -185	18575	-
12/2/09	50 × (3292 - 3263.80) = 1410	19985	-
14/2/09	50 × (3309.30 - 3292) = 865	20850	-
17/2/09	50 × (3257.80 - 3309.30) = -2575	18275	-
18/2/09	50 × (3102.60 - 3257.80) = -7760	16000	5485

Problem 14: Following data is related to Company X, market index and Treasury bond for the current year and last 4 years

YEAR	Company X		Market Index		Return on Treasury Bonds
	Average Share Price (P)	Dividend Per Share (D)	Average Market Index	Market Dividend Yield	
2009	₹ 139	₹ 7.00	1300	3%	7%
2010	₹ 147	₹ 8.50	1495	5%	9%
2011	₹ 163	₹ 9.00	1520	5.5%	8%
2012	₹ 179	₹ 9.50	1640	4.75%	8%
2013	₹ 203.51	₹ 10.00	1768	5.5%	8%

Estimate the beta of Company X's Share.

Solution: Expected return of X = Average Capital Gain + Average Dividend

The market price of the stock has gone up from ₹ 139 to ₹ 203.51, by trial and error method, the compounded growth rate is 10%. (139 + 10% + 10% + 10% + 10% + 10%)

Average annual dividend yield (%)

Year	Dividend/Share Price	Dividend Yield
2009	7.00/139	0.050
2010	8.50/147	0.058
2011	9.00/163	0.055
2012	9.50/179	0.053
2013	10.00/203.51	0.049

0.265

Average Yield = 0.265/5 = 0.053 i.e. 5.3%

Expected return of X = Average Annual Capital Gain + Average Annual Dividend = 10% + 5.3% = 15.3%

Market Index has gone up from 1300 to 1768. By trial and error method, the compounded growth rate is 8% (1300 + 8% + 8% + 8% + 8% + 8%)

Average annual dividend yield (%) = 3% + 5% + 5.5% + 4.75% + 5.5% = 23.75%/5 = 4.75%

Thus expected return on Market Index = 8% + 4.75% = 12.75%

Average annual risk-free rate of return = 7% + 9% + 8% + 8% + 8% = 40%/5 = 8%

Expected return as per CAPM $R_s = R_f + \beta[R_m - R_f]$

15.3% = 8% + $\beta[12.75\% - 8\%]$ = 1.54

BANGALORE BATCH: JAN 10 TO JAN 31 AT SHRADDHA ACADEMY

MUTUAL FUNDS**Problem: 1 Entry Load and Exit Load:**

The unit price of RSS scheme of a mutual fund is ₹ 10. The Public offer (POP) of the unit is ₹ 10.204 and the redemption price is ₹ 9.80. Calculate (I) Front-end load, and (II) Back end load.

Solution: Entry load-front end load

$$\frac{[10.204-10]*100}{10}=2.04\%$$

Exit load-back end load

$$(ii) \quad \frac{[10-9.8]*100}{10}=2\%$$

Problem: 2 Entry Load and Exit Load:

You purchased 1000 units of the New Fund at a price of ₹ 20 per unit at the beginning of the year. You paid a front end load of 4%. The securities in which the fund invests increase in value by 12% during the year. The fund's expense ratio is 1.2%. What is our rate of return on the fund if you sell your shares at the end of the year?

Solution: NAV = ₹ 20

Amount invested by investor ₹ 20000

(-) entry load @ 4% (800)

Amount to be invested in fund 19200

(+) 12% return 2304

21504

(-) expense ratio @ 1.2% (258)

Balance value of the fund ₹ 21246

Rate of Return = $\frac{(21246-20000)}{20000} \times 100 = 6.23\% \text{ P.a.}$

Problem: 3 Entry Load and Exit Load:

Mr. J purchased a load fund with a NAV of ₹ 50 per unit and a 3% sales load. One year later, J sold the fund with a NAV of ₹ 54 per unit with a back-end load of 3% as well. During the year, the fund paid a ₹ 25 dividend per unit and distributed ₹ 40 in capital gains per unit. If J invested ₹ 10,000 in this fund, what was J's rupee and percentage return over the year?

Solution: ₹ 50 @ 3% entry load

Amount invested in equity per unit = ₹ 51.5 /unit

Net sale price after exit load = $54 - 3\% = 52.38$ /unit

Dividend in the period = ₹ 25

Capital Gain = ₹ 40

No of units = $10000 / 51.5 = 194.17$ units

Realization amount = $194.17 \times 52.38 = 10171$

Return = $\frac{[10171-10000] + [25 \times 194.17] + [40 \times 194.17]}{10000} \times 100$

= 127.90% p.a.

Problem: 4 : Computation of return for closed ended fund :

A closed ended fund starts the year with a NAV of ₹ 12. By year end NAV equals ₹ 12.10. At the beginning of the year the fund was selling at 2% premium to the NAV and the end of the year the fund is selling at a 7% discount to NAV. The fund paid year end distributions of income and capital gains of ₹ 1.50.

a. What is the rate of return to an investor in the fund during the year?

b. What would have been the rate of return to an investor who held the same security as the fund manager during the year?

Solution: NAV0 = ₹ 12 > CMP $12 + 2\% = ₹ 12.24$ (Purchase price from Exchange)

NAV1 = ₹ 12.1 > CMP $12.1 - 7\% = ₹ 11.25$ (Sale Price of the unit in exchange)

Dividend in year 1 + Capital Gain in year 1 = ₹ 1.5

a) Return = $\frac{[11.25-12.24]+1.5}{12.24} \times 100$

= 4.16%

c) As fund manager (Assumed that Fund manager can buy directly from the fund.. As per SEBI guidelines he is not allowed to do so.)

Return = $\frac{[12.1-12]+1.5}{12} \times 100$

= 13.3%

Problem : 5: Calculate the year-end NAV of the mutual fund scheme on the basis of the information

(i) UTI launched a new fund scheme for ₹ 6,000 crore.

(ii) Underwriting commission is 1% of the fund shared equally by SBI, PNB, Syndicate Bank and UTI Bank.

(iii) The fund was launched on 1.4.2012 with face value of ₹ 1,000 per unit (As per SEBI rules Face value must be ₹ 10)

(iv) Underwriting commission was paid in full.

(v) Management expense was allowed by SEBI @ 1% of the fund raised. However during the year management expense was ₹ 45 crore only. The management decided to defer the payment of ₹ 5 crore to the next financial year.

(vi) On 1.5.2012, the total fund received was invested after deduction of underwriting commission And ₹ 100 cr to meet day to day management expenses. The investment fund received Yielded 10% interest per annum. The interest was received for 3 quarters and the interest of Last quarter is yet to receive. The interest realized in cash has been distributed to the unit holders @ 80%. The financial year runs from April to March. The quarter starts from the date of investment i.e., 1.5.2012.

Solution: Calculation of Net Asset Value of a Fund

		in crores
Total Assets:		
Investment (6,000-60-100)	5,840.00	
Add: Closing cash Balance(Refer W.N.)	147.60	
Add: Interest for two months due to be received (5,840X10%X2/12)	<u>97.33</u>	6,084.93
Less: Outstanding management expenses		<u>(5.00)</u>
Total value of a fund		<u>6,079.93</u>
No of units = 6,000 cr/1000	= 6 cr units	
NAV per unit = 6079.93 cr/6cr	= 1013.32 per unit	

Working Note:**Calculation of year end cash/bank balance of the fund**

		In crores
Cash received on sale of units		6,000
Add: Interest for 3 quarters on investment (5,840X 10% X9/12)		<u>438</u>
		6,438
Less: Underwriting commission	60	
Management expenses paid in cash	40	
Investment	5,840	
Dividend paid (438 X 80%)	<u>350.40</u>	<u>(6,290.40)</u>
Year end cash balance		<u>147.60</u>

FOREIGN EXCHANGE MARKET (Remember in FX Quote should be rounded off to 4 digits.)**Problem 1 : Interest rate parity theorem**

syntex Ltd. has to make a US \$5 million payment in three months' time. The required amount in dollars is available with Syntex Ltd. The management of the company decides to invest them for three months and following information is available in this context:

- The US \$ deposit rate is 9% per annum.
- The sterling pound deposit rate is 11% per annum.
- The spot exchange rate is \$1.82/£
- The three month forward rate is \$1.80/£

Answer the following questions —

- (i) Where should the company invest for better returns?
- (ii) Assuming that the interest rates and the spot exchange rate remain as above, what forward rate would yield an equilibrium situation?
- (iii) Assuming that the US interest rate and the spot and forward rates remain as above, where should the company invest if the sterling pound deposit rate were 15% per annum?

Solution:

- i) Option 1: Deposit in US \$

US Deposit Rate 9%

5million+(5m*9%*3/12)

Amount of \$ receivable after 3 months: 51,12,500\$

Option 2: Deposit in UK

UK deposit Rate 11%

➤ Convert To Sterling at spot Rate

Amount of GBP receivable = 5million*1/1.82=2747252.7£

Deposit GBP @ 11% in UK.

➤ Take 3M forward Cover to sell GBP

➤ Redeem Deposit including Interest for 3 months

(2747252.7+2747252.7*11%*3/12) =2822801£

➤ Reconvert into \$ at Forward Rate = 2822801*1.80=5081041.8\$

As the Amount receivable if invested in USA is higher company Should Invest in USA

- ii) Using Interest rate parity theorem, Theoretical forward

$F1 = S_0(1+R_h)/(1+R_f)$(Remember this is London Quote.)

=1.82(1+9%*3/12)/(1+11%*3/12).....(Do not forget to put 3/12, as it is 3 month fwd)

=1.86095/1.0275 = 1.8111\$/£

- iii) Actual R_f =15%

Using IRPT, Theoretical R_f

$F1 = S_0(1+R_h)/(1+R_f)$

=1.82(1+9%*3/12)/(1+Rf*3/12) = Rf=13.54

Theoretical UK interest rate is 13.54 where as Actual interest Rate is 15 hence the company should invest in London

Problem:2 :Purchasing power parity theorem

A TV costs £ 100 in the UK and \$ 150 in the US. The current exchange rate is £ 1 = \$1.50. Explain what happens if inflation, which is presently 0% in both the UK and the US, increases to 10% in the US?

Solution: If the inflation rate increases to 10% in the US:

Presently Cost of TV in the UK = £ 100

US = \$ 150

Increased cost of TV due to inflation = \$150 + 150 * 10% = \$ 165

Then exchange rate will change by \$ 165/£ 100 = 1.65\$/£

Problem:3 Purchasing power parity theorem

The exchange spot rate between £ and Aus.\$ is Aus.\$ 2.68/£. The expected rate of inflation in UK and Australia is 2% and 6% respectively. The current rate of interest in two countries are 6% and 8% respectively. If the PPP and Fisher Effect hold good, find out (i) spot rate after 1 year, and ii) Real rate of interest in UK and Australia.

Solution: Present exchange rate – spot rate-\$2.68/£

Particulars	Inflation Rate	Interest Rate
Australia	6%	8%
UK	2%	6%

Using IRPT:

Theoretical forward rate = $S_0(1+R_f)/(1+R_d)$

= AU\$ 2.68(1+0.08)/(1+0.06)

= AU\$ 2.73 / £

Using Real Rate of Interest:

Rate in UK = $(1 + \text{Interest Rate}) = (1 + \text{RDR})(1 + \text{Inflation Rate})$

$(1 + 0.06) = (1 + \text{RDR})(1 + 0.02)$

$\text{RDR} = \{(1.06/1.02) - 1\} * 100 = 3.92\%$

Australia = $(1 + 0.08) = (1 + \text{RDR})(1 + 0.06)$

$\text{RDR} = \{(1.08/1.06) - 1\} * 100 = 1.89\%$

Problem:4. Purchasing power parity theorem

Following are prices of selected commodities in two countries, A and B, for two consecutive years, Y1 and Y2.

Commodities	Country A		Country B	
	Y1	Y2	Y1	Y2
C ₁	50	60	70	84
C ₂	100	120	120	144
C ₃	80	96	105	126
C ₄	60	72	75	90
C ₅	40	48	50	60

Exchange rate A/B = 0.85 in Y1 and 0.90 in Y2. Given that all the commodities have equal weights, when the Absolute PPP and Relative PPP hold good. Also find out inflation rate in both countries

Solution: Spot Rate between country A and B = 0.85 in Y1

= 0.90 IN Y2

Actual Rate between country A and B in Y1

Total cost of commodities in country A = $C_1 + C_2 + C_3 + C_4 + C_5$

= 50+100+80+60+40 = 330

Total cost of commodities in country B = $C_1 + C_2 + C_3 + C_4 + C_5$

= 70+120+105+75+50 = 420

Actual Rate (A/B) = 330/420 = 0.79

Actual Rate between country A and B in Y2

Total cost of commodities in country A = $C_1 + C_2 + C_3 + C_4 + C_5 = 60 + 120 + 96 + 72 + 48 = 396$

Total cost of commodities in country B = $C_1 + C_2 + C_3 + C_4 + C_5 = 84 + 144 + 126 + 90 + 60 = 504$

Actual Rate (A/B) = 396/504 = 0.79

Inflation Rate in country A:

Inflation Rate = $\text{Y2 Total cost} - \text{Y1 Total cost} / \text{Y1 Total Cost}$

= $396 - 330 / 330 * 100 = 20\%$

Inflation Rate in country B:

Inflation Rate = $\text{Y2 Total cost} - \text{Y1 Total cost} / \text{Y1 Total Cost}$

= $504 - 420 / 420 * 100 = 20\%$

Recommendation: The purchasing power parity theorem is not holding good under relative terms and holding goods under absolute terms.

CA Final SFM Batch III

Schedule : 01-02-2014 To 20-03-2014

Timings : 6.15 am to 9.30 am

Venue : S.R.Nagar

Problem 5: Multi currency Netting

True view plc a group of companies controlled from United Kingdom includes subsidiaries in India, Malaysia and the United States. As per the CFO's forecast that, at the end of the June 2010 the position of inter-company indebtedness will be as follows:

- o The Indian subsidiary will be owed ` 1,44,38,100 by the Malaysian subsidiary and will to owe the US subsidiary US\$ 1,06,007.
- o The Malaysian subsidiary will be owed MYR 14,43,800 by the US subsidiary and will owe it US \$ 80,000.

Suppose you are head of central treasury department of the group and you are required to net off inter-company balances as far as possible and to issue instructions for settlement of the net balances.

For this purpose, the relevant exchange rates may be assumed in terms of £ 1 are US \$ 1.415; MYR 10.215; ` 68.10.

What are the net payments to be made in respect of the above balances?

Solution: Statement showing the inter company dues in Mutli currency and in single currency £ .

India	Malaysia	USA
14438100*1/68.10=212013	(1443810*1/68.10)=(212013)	
(106007*1/1.415)=(74916)		106007*1/1.415= 74916
	1443800*1/10.215= 141341	(1443800*1/10.215)=(141341)
	(80000*1/1.415)= (56537)	80000*1/1.415=56537
137097£	(127209)£	(9888)£

Malaysian subsidiary will pay 127209£ and USA will pay 9888 £ to Indian subsidiary

Problem 6: Mutli currency borrowing comparison

Jindal Steel Ltd. is having a need to raise ` 20,00,000 for a period of 3 months It has the option to borrow in any of the following currencies at the prevailing rates.

	US\$	UK£	DM	`
Spot exchange rate 3m	` 35.60/90	` 61.20/90	` 20.50/70	
forward	20/30	70/110	15/20	
Interest rate (p.a.) Expected	4%	9%	3%	12%
spot rate	` 35.80/36.0	` 62.00/62.80	` 20.80/21.10	

In which currency would it borrow if exchange risk is covered ? In which currency would it borrow if exchange risk is not covered?

Solution: If exchange risk is covered:

Currency	Spot Bid rate	Amount to be borrowed in Foreign currency	Rate of Interest	Amount repayable	Amount of ` required
US\$	35.60	56179\$(20L/35.60)	4%	56741\$	2037193
UK£	61.20	32679£	9%	33414£	2068694
DM	20.50	97561DM	3%	98293DM	2034654
`	1	20L	12%	20,60,000	20,60,000

If the company taking forward cover it should take loan from DM

If exchange risk is not covered:

Currency	Amount repayable	Expected spot rate	Amount of ` required
US\$	56741\$	36	2041725
UK£	33414£	62.80	20983992
DM	98293DM	21.10	2073982
`	20,60,000	1	20,60,000

If the company not take forward cover it should loan from US

Problem 7: Multi currency Invoicing

Following information relates to MIC electronics Ltd. which manufactures some parts of an electronics device which are exported to USA, Japan and Europe on 90 days credit terms.

Cost and sales information:

	Japan	USA	Europe
Variable cost per unit	` 225	` 395	` 510
Export sale price per unit	¥ 650	US\$10.23	€ 11.99
Receipts from sale (due in 90 Days)	¥ 78,00,000	US\$1,01,300	€ 95,920

Foreign exchange rate information:

	¥/`	US\$/`	€/`
Spot market	2.417-2.437	0.0214-0.0217	0.0177-0.0180
3 months forward	2.397-2.427	0.0213-0.0216	0.0176-0.0178
3 months spot	2.423-2.459	0.02144-0.02156	0.0177-0.0179

Advise MIC electronics Ltd by calculating average contribution to sales ratio whether it should hedge its foreign currency risk or not.

Solution:

Statement showing computation of number of units sold

Particulars	Japan	USA	Europe
Sales	7800000 ¥	101300\$	95920 €
Sale price/unit	650 ¥	10.23\$	11.99 €
Sales volume	12000(78L/650)	9902	8000

CA Final SFM Batch IV

Schedule : 01-02-2014 To 20-03-2014

Timings : 6.30 pm to 9.30 pm

Venue : S.R.Nagar

Statement showing contribution to sales ratio-If Hedged

Sales	7800000 ¥	101300 \$	95920 €
Relevant rate	2.437	0.0216	0.0178
Amount in `	3213844(78L/2.437)	4689815	5388764
Variable cost /unit	2700000 (12000*225)	3911290 (9902*395)	408000 (8000*510)
Contribution(s-v.c)	513844	778525	1308764

Total contribution/ total sales = 2601133/13292423 = 19.56%

Statement showing contribution to sales ratio-If not hedged.

Sales	7800000 ¥	101300 \$	95920 €
Relevant rate	2.459	0.02156	0.0179
Amount in `	3172021	4698515	5358659
Variable cost /unit	2700000 (12000*225)	3911290 (9902*395)	408000 (8000*510)
Contribution(s-v.c)	472021	787226	1278659

Total contribution/ total sales = 2537906/13229195=19.18%

It is recommended to go for Hedging as the contribution ratio is higher.

Problem 8: Computation of loss due to deferring the payments:

Target L.L.C. (US) purchased DM 1,00,000 worth of machines from a firm in Denmark. The value of the dollar in terms of the DM has been decreasing. The firm in Denmark offers 2/10, net 90 terms. The spot rate for the DM is \$.55 the 90 days forward rate is \$.56.

- Compute the \$ cost of paying the account within the 10 days.
- Compute the \$ cost of buying a forward contract to liquidate the account in 90 days.
- If the differential between part (a) and part (b) is the result of the time value of money and protection from currency value fluctuation, segregate these elements.

Solution:

Company- US-importer

Exposure 1,00,000 DM due in 3 months

Spot rate .55\$/DM

Forward rate .56 \$/DM

- If payment made at spot (eligible for 2% discount, hence payment will be made only for 98,000)
Amount in \$ = 98000 * 0.55 = 53900
- If payment made at forward (Not eligible for discount hence payment should be made for 1,00,000)
1,00,000 * 0.56 = 56,000\$
- 2100(53900-56000)

Time value(Discunt)
2000*.56=1120\$

Exchange rate difference
98000*.55= 53900
98000*.56=54880
980\$ (53900-54880)

Problem 9: Netting decision

ABC Ltd. has a payable of DM 1,00,000 which is due now and a debtor which is due after 1 month. It chooses to enter into a swap with the banker to buy spot and selling forward. Work out the implicit cost. If it has an option to delay the payment by 1 month, is it advisable to lag the payable. The following rates are quoted by a Banker :

` / DM Spot	` 20.50/70	Interest Rates
1m	15/20 points	DM : 6% p.a.
2m	25/30 points	` 10% p.a.
3 m	35/45 points	

Solution: Company is both Importer and Exporter

Payable DM 1,00,000 due now

Receivable DM DM 1,00,000 due from one month from now

Spot rate 20.50-20.72 ` / DM

One month Forward rate:

Spot 20.5000-20.7000

+ Swap points $\frac{15-20}{20.5015-20.7020}$

For online registrations log on to www.sfmpraveen.com

SFM Praveen

Cost of Buying DM 1,00,000 * 20.70 = ` 2070000

Selling DM 1,00,000 * 20.5015 = ` 2050150

Implicit cost ` 19850

If payment is delayed by one month:

Amount payable along with interest = 1,00,000 + 1,00,000 * 6% * 1/12 = ` 100500

Amount receivable = ` $\frac{100000}{500}$

Amount in ` = 500 \* 20.7020 = ` 10351

Company should lag the payment as it will minimize the losses.

Problem 10: FX settlement

A Company's international transfer of funds amounts to about \$2 million monthly. Presently the average transfer time is ten days. It has been proposed that the transfer of funds be turned over to one of the larger international banks, which can reduce the transfer time to an average of two days. A charge of one-half of 1 % of the volume of transfer has been proposed for this service. In view of the fact that the firm's opportunity cost of funds is 12 percent, should this offer be accepted?

Solution: Current Transfer time = 10 days

Proposed transfer time = 2 days

Transfer charges .5%

Benefit in saving Interest = 24 mln * 8/360 * 12/100 = 64000\$

Cost = 24 mln * .5/100 = 120000 \$

Cost of transfer is higher than the cost of benefit hence company should not go for proposed policy.

Problem 11: Deferring the payment

Management of an Indian company is contemplating to import a machine from USA at a cost of US\$15,000 at today's spot rate of \$0.0227272 per ` . Finance manager opines that in the present foreign exchange market scenario, the exchange rate may shoot up by 10% after two months and accordingly he proposes to defer import of machine. Management thinks that deferring import of machine will cause a loss of ` 50,000 to the company in the coming two months. As the Chartered Accountant, you are asked to express your views, giving reasons, as to whether the company should go in for purchase of machine right now or defer purchase for two months.

Solution:

Indian importer

Exposure 15000\$

Spot rate 0.0227272 \$/` .

Expected spot = 0.0227272 * 110% = 0.024999\$/`

Payment at spot = 15000 * 1/0.0227272 = 660000 `

Payment at expected spot = 15000 * 1/0.02499 = 600240 `

Benefit Due to postponement 59761 `

Loss due to import machine after two months 50000 `

Net benefit 9761 `

As net benefit is positive company should defer the purchase of machinery by two months.

Problem 12: Computation of return for FII's

An MNC company in USA has surplus funds to the tune of \$ 10 million for six months. The Finance Director of the company is interested in investing in DM for higher returns. There is a Double Tax Avoidance Agreement (DTAA) in force between USA and Germany. The company received the following information from Germany:

€/ \$ Spot 0.4040/41

6 months forward 67/65

Rate of interest for 6 months (p.a.) 5.95% – 6.15%

Withholding tax applicable for interest income 22%

Tax as per DTAA 10%

If the company invests in €, what is the gain for the company ?

Solution: Amount available 10 mln \$ for 6 months

Spot rate 0.4040-0.4041 €/ \$

Forward rate

Spot rate 0.4040-0.4041

Swap 67- 65

0.3973 - 0.3976

Amount of € receivable after converting at Spot.

Deposit amount in European bank (10 mln * 0.4040) = 4040000€

Interest (@5.95%) = 120190

416019

Tax (10%) 12019

Amount of € receivable after redemption 4148171

Amount in \$ 4148171 * .3976 = 10433025

Rate of return = (10433025 - 10000000 / 10000000) * 100 * 12/6

= 8.66% p.a.

Classes will be held by CA. Praveen Kumar having 6 years of experience in Equity markets, Mumbai and Currency markets, Dubai.

Problem: 13: Transaction exposure

An Automobile company in Gujarat exports its goods to Singapore at a price of SG\$500 per unit. The company also imports components from Italy and the cost of components for each unit is Euro 200. The company CEO executed an agreement for the supply of 20000 units of January 01, 2010 and on the same date paid for the imported components. The company's variable cost of producing per unit is ` 1250 and the allocable fixed costs of the company are ` 1,00,00,000.

The exchange rates as on 1 January 2010 were as follows:

Spot	`./SG\$	33.00/33.04
	`./Euro	56.49/56.56

Mr. A the treasure manager of company is observing the movements of exchange rates on a day to day basis and has expected that the rupee would appreciate against SG\$ and would depreciate against Euro. As per his estimates the following are expected rates for 30th June 2010

Spot	`./SG\$	32.15/32.21
	`./Euro	57.27/57.32

You are required to find out :

- The change in profitability due to transaction exposure for the contract entered into.
- How many units should the company increase its sales in order to maintain the current profit level for the proposed contract in the end of June 2010.

Solution:Computation of Profit if converted at spot rate

Sales 20000*500\$*33 = ` 33,00,00,000

Less:

Raw material (20000*200€*56.56) = ` 22,62,40,000

Variable cost (20000*1250) = ` 2,50,00,000

Fixed cost = ` 1,00,00,000

Profit = ` 6,87,60,000

Computation of Profit if converted at maturity spot

Sales 20000*500\$*32.15 = ` 32,15,00,000

Less: Raw material (20000*200*56.56) = ` 22,62,40,000

Variable cost = 2,50,00,000

Fixed cost = ` 1,00,00,000

Profit = ` 6,02,60,000

Loss due to transaction exposure = 68760000 - 60260000 = 85,00,000 `

Let no. of units be "X" so that existing profit can be maintained,

Sales (x*500*32.15) = 16075x

Less : Raw material (x*200*57.32) = 11464x

Variable cost (1250*x) = 1250x

Fixed cost = 1,00,00,000

6,87,60,000

3361x = 68760000 + 10000000 = 78760000

X = 78760000 / 3361 = 23433 units

No. of units to be sold is 23433 to maintain the existing profitability.

Mission: To make young CHARTERED ACCOUNTANTS suitable for Financial markets, Investment banking, Merchant banking, Equity research and treasury management.

Problem 14: Purchasing power parity theorem

In year 2012 a watch costs \$22.84 in New York, \$69 in Singapore and 3240 Rubles in Moscow.

- If the law of one price held, what was the exchange rate between US \$ and Singapore? Between US \$ and Ruble?
- The actual exchange rates in 2012 were \$1.63=US\$ 1 and 250 Rubles=US\$1. Where would you prefer to buy your Watch?

\$/SGD = 22.84/69 = 0.3310 \$/SGD

\$/Rubles = 22.84/3240 = 0.0070\$/Ruble

Solution:

Assume You are in New York,

Cost 22.84 \$ in New York

Cost in Singapore converted to US\$ 69/1.63 = 42.33\$

Cost in Moscow (Russia) Converted to US\$ 3240/250 = 12.96 \$

It is preferable to buy watch in Moscow as the equivalent cost is lowest

Problem 15: Columbs Surgicals Inc. is based in US. Has recently imported surgical raw materials from the UK and has been invoiced for € 480000, payable in 3 months. It has also exported surgical goods to India and France. The Indian Customer has been invoiced For € 138000, payable in 3 months, and the French customer has been invoiced for € 590000, payable in 4 months. Exchange rates are as below

Spot : 0.9830-0.9850 £/US\$

Three months forward: 0.9520-0.9545 £/US\$

Spot: 1.8890-1.8920 US\$/€

Four months forward: 1.9510-1.9540 US\$/€

Current money market rates are as follows:

UK(£) 10.0 % - 12.0% p.a

France (€) 14.0 % - 16.0% p.a

USA: (\$) 11.5 % - 13.0% p.a

You as Treasury Manager are required to show how the company can hedge its foreign exchange exposure using Forward markets and Money Market hedge and suggest which the best hedging technique.

Solution: £ Exposure

Columbus has a £ receipt (£138,000) and payment of (£ 480,000) maturing at the same time i.e. 3 months, it can match them against each other leaving a net liability of £ 342,000 to be hedged.

Option 1 : Forward hedge Buy 3 months' forward contract: Amount payable after 3 months will be £ 342,000 / 0.9520 = US\$ 359,244

Option 2 : Money market hedge

Identify FX liability: liability of £ 342,000 due 3 months

Create FX asset for £ 333,658 at Int rate of 10% p.a.

Borrow in Home currency \$ US\$ 339,429, convert to £ at spot rate receive £ 333,658

Realise FX asset 333,658(1.025)= £ 342,000 and repay FX liability £ 342,000

Repay Home currency \$ liability with Interest 339,429(1.0325)= US\$ 350,460

As the amount payable under MMH is lower, company should opt for option 2

€ Receipt Amount to be hedged = € 590,000

Convert exchange rates to home currency € / US\$ Spot 0.5285 – 0.5294

4 months forward 0.5118 – 0.5126

Option 1 : Sell 4 months' forward contract amount receivable after 4 months will be (€ 590,000 / 0.5126) = US\$ 1,150,995

Option 2 : Money market hedge

Identify FX asset Receipt of € 5,90,000 due in 4 month

Create FX liability by borrowing in Foreign currency : Amount to be borrowed P.V. of FX Asset €590,000/1.0533=€560,144

Convert to home currency at spot rate and receive \$ 1058112

Deposit the \$ at 11.5 % p.a. for 4 months 1058112(1.03833)=1098669\$

As the amount receivable is higher under forward contract, company should choose option 1.

Problem:16. Foreign currency borrowing

Pepsi Co., a US-based soft drink giant, has subsidiaries in UK and USA Each subsidiary handles its exposure and financing needs. Corporate policy is to cover all exposures. At present, the situation is as follows :

(a) U.S. subsidiary needs working capital,

HQ also needs financing for which credit is readily available in the US. There are no capital or exchange controls but HQ's cost of borrowing in the US is somewhat lower than in the London market. The following rates are prevailing :

\$/ £ spot £ 2.2795 and one month forward is .75 points discount on £.

Solution: US Interest rates : 4.5% p.a.

UK Interest rates : 7.75% - 8.00% p.a.

Advice Pepsi Co.

Spot = 2.2795\$/£

One month forward rate = 2.2720 \$/£ (2.2795-.0075)

US Subsidiary needs funds

Product = \$/£ 2.272-2.2795/2.2795*100*12/1
= -3.94%

Calculation of Net Cost of funds in UK:

UK Interest rate -8%

Less: Foreign Currency app - (3.94)%

Net Cost of funds - 4.06%

As the net cost of funds borrowing in UK is cheaper (i.e. 4.06% < 4.5%). It is recommended to borrow from UK.

Problem:17. . ABN-Amro Bank Amsterdam, wants to purchase ` 15 million against US \$ for funding their Vostro Account with Canara Bank, New Delhi. Assuming the inter-bank, rates of US \$ is ` 51.3625/3700, what would be the rate Canara Bank would quote to ABN –Amro Bank ? Further, If the deal is struck, what would be the equivalent US\$ amount.

Solution:

Canara Bank is selling Rupee and buying \$, when Canarabank is buying \$ relevant rate is BID(/\$)=51.3625 `/\$

Equivalent of US\$ for ` 15 million at this rate will be= ` 15 Mln/51.3625= US\$ 2,92,041.86

EQUITY DERIVATIVES

Problem: 1 : Arbitrage opportunity

The following table provides the prices of options on equity shares X Ltd and Y Ltd. The risk free interest is 9%. You as a financial planner are required to spot any mispricing in the quotations of options premium and stock prices? Suppose, if you find any such mispricing then how you can take advantage of this pricing position.

Stock	Time to Expiry	Execution Price	Share Price	Call Price	Put Price
X Ltd	6 months	100	160	56	4
Y Ltd	3 months	80	100	26	2

Risk free rate of interest – 9%

Solution: Using Put call parity theorem,

X Ltd:

Theoretical Call Premium = Stock Price + Put Premium – Present Value of Exercise Price

160 + 4 – 100 * 1/ [1+9%*6/12]

160 + 4 – 95.69

` 68.31

Fair value of Call Premium is ` 68.31

Actual value of Call Premium is ` 56

Call is Undervalued buy @ 56

01/01/2013 create the following portfolio,

Buy 100 Call@56 -56 outflow
 Sell 100 Put@4 +04 inflow
 Sell Stock@160 +160 Inflows
 +108 Net inflow

31/06/2013 Liquidate the above portfolio

Maturity spots Assumed	180	130	80
Call- GPO	+80	+30	0
Put-GPO	0	0	-20
Buy back Stock	-180	-130	-80
Net outflow	-100	-100	-100

Hence investor has made arbitrage gain of 8`. Irrespective of settlement prices on expiry.

Y Ltd

Theoretical Call Premium = Stock Price + Put Premium – Present Value of Exercise Price
 $100 + 2 - 78.23 = ` 23.77$

Fair value of Call Premium is ` 23.77

Actual value of Call Premium is ` 26

Call is Overvalued Sell @ 26

01/01/2013 create the following portfolio,

Sell 80 Call@26 +26 inflow
 Buy 80 Put@2 -02 outflow
 Buy Stock@100 -100 outflow
 Net outflow -76

31/06/2013 Liquidate the above portfolio

Maturity spots Assumed	80	100	120
Call-GPO	0	-20	-40
Put-GPO	0	0	0
Sell Stock	80	100	120
	80	80	80

Hence investor has made arbitrage gain of 4`. Irrespective of settlement prices on expiry.

**BANGALORE BATCH: JAN 10 TO JAN 31 AT
SHRADDHA ACADEMY**

Problem: 2 Put call parity theorem

Dena Bank has both European call and Put options traded on NSE. Both options have same exercise price of ` 40 and both expire in one year. Dena Bank does not pay any dividends. The call and the put are currently selling for ` 8 & ` 2 respectively. The risk free rate of interest is 10% p.a. What should the stock price of Dena Bank trade in order to prevent arbitrage?

Solution: Exercise Price – ` 40.

No dividend is paid.

Call Premium – ` 8.

Put Premium – ` 2.

Risk free rate of Interest – 10% p.a.

Using Put call parity theorem,

Stock Price = Call Premium + Present value of Exercise Price- Put Premium.

$$\begin{aligned} \text{Theoretical Stock Price} &= 8 + 40 \times (1/1+10\%) - 2 \\ &= 8 + 36.36 - 2 = ` 42.36. \end{aligned}$$

Problem: 3: FX Option strategies for speculator

Mr. Peter Lynch currency trader from USA expects \$ will depreciate against €. The current spot rate is 1.0768 \$/€. Strike price 1.1000\$/€ 30 days.

Call on € 0.085

Put on € 0.110

What should he do to profit from his anticipation?

What is the profit or loss if the rate on settlement after 30 days is \$ 1.220 €

If he bought 30 days call option.

If he sold 30 days put option.

Solution:

Spot rate – 1.0768 \$/€.

Strike Price – 1.1000 \$/€.

Call on €- 0.085.

Put on € - 0.110.

\$ will depreciate against €. It refers to Spot rate in future will be more than 1.1000\$/€.

a. Action to be taken to profit from his anticipation

i. Buy call option at a strike price of 1.1000 \$/€ at a premium of € 0.085. As we expect option will be exercised in future.

ii. Sell Put option at a Strike price of 1.1000 \$/€ at a premium of € 0.110. As the option is expected to be lapsed we can get premium as a profit.

c. Profit or loss after 30 days if spot rate is 1.2200 \$/€.

Particulars	Call	Put
Option status	Exercise	Lapse
a. GPO	$1.220 - 1.100 = 0.12$	0
b. Premium	- 0.085	+0.110
c. NPO (a +/- b)	0.035	0.110

Problem: 4 : FX Option strategies for speculator

In March, a derivatives dealer offers you the following quotes for June British pound option contracts (expressed in U.S dollars per GBP):

Contract	Strike Price	Bid	Offer
Call	USD 1.40	0.0642	0.0647
Put	USD 1.40	0.0255	0.0260
Call	USD 1.44	0.0417	0.0422
Put	USD 1.44	0.0422	0.0427
Call	USD 1.48	0.0255	0.0260
Put	USD 1.48	0.0642	0.0647

Assuming each of these contracts specifies the delivery of £ 31,250 and expires in exactly Four months, complete a table similar to the following (expressed in dollars) for a portfolio consisting of the following positions:

Long a 1.44 call.

Short a 1.48 call.

Long a 1.40 call.

Short a 1.44 put.

Estimate the initial cost and Net pay off with the following price on maturity 1.36, 1.40, 1.44, 1.48, 1.52 \$/£.

Solution: Derivative dealer offers you the quotes.

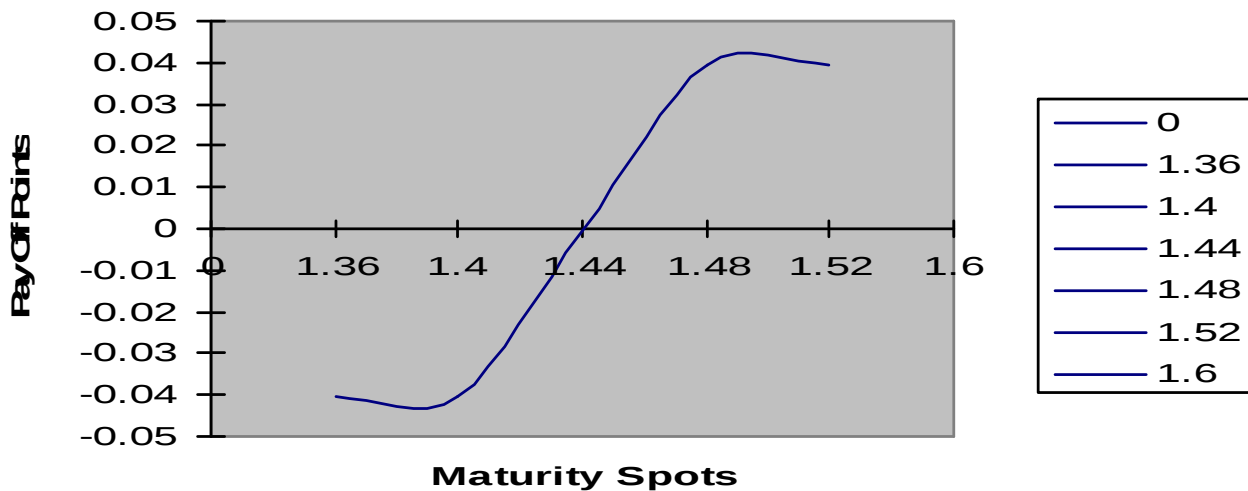
Long a 1.44 call – Buy (Payment) – 0.0422 \$/£

Short a 1.48 call – Sell (Receipt) – 0.0255 \$/£

Long a 1.40 put – Buy (Payment) – 0.0260 \$/£

Short a 1.44 put – Sell (Receipt) – 0.0422 \$/£

	Maturity Spot	1.36 \$/£	1.40 \$/£	1.44 \$/£	1.48 \$/£	1.52 \$/£
Long a 1.44 Call (BUY)	Option Status	Lapse	Lapse	Lapse	Exercise	Exercise
	GPO	0	0	0	0.0400	0.0800
	Premium	-0.0422	-0.0422	-0.0422	-0.0422	-0.0422
	A. NPO	-0.0422	-0.0422	-0.0422	-0.0022	+0.0378
Short a 1.48 Call (SELL)	Option Status	Lapse	Lapse	Lapse	Lapse	Exercise
	GPO	0	0	0	0	-0.0400
	Premium	+0.0255	+0.0255	+0.0255	+0.0255	+0.0255
	B. NPO	+0.0255	+0.0255	+0.0255	+0.0255	-0.0145
Long a 1.40 Put (BUY)	Option Status	Exercise	Lapse	Lapse	Lapse	Lapse
	GPO	+0.0400	0	0	0	0
	Premium	-0.0260	-0.0260	-0.0260	-0.0260	-0.0260
	C. NPO	+0.0140	-0.0260	-0.0260	-0.0260	-0.0260
Short a 1.44 Put (SELL)	Option Status	Exercise	Exercise	Lapse	Lapse	Lapse
	GPO	-0.0800	-0.0400	0	0	0
	Premium	+0.0422	+0.0422	+0.0422	+0.0422	+0.0422
	D. NPO	-0.0378	+0.0022	+0.0422	+0.0422	+0.0422
	Total Pay Off A+ B + C + D	-0.0405	-0.0405	-0.0005	+0.0395	+0.0395

Pay off graph**Problem: 5 Put call parity**

If in exactly one month (i.e. in April) the spot USD/GBP rate falls to 1.385 and the effective annual risk free rates in US and England are 5% and 7% respectively, calculate the equilibrium price differential that should exist between a long 1.44 call and a short 1.44 put position.

Solution: Spot rate – 1.385 \$/£
 Risk free rate of Interest USA -5%
 England – 7%

Using Put call Parity Theorem,

Call Premium - Put Premium = Stock Price - Present value of Exercise Price .

Call Premium - Put Premium = $1.385 - 1.44 (1/1+5\%*3/12)$

Equilibrium Price Between Call and Put = $1.385 - 1.4222 = -0.0372$.

Problem: 6 Option strategies for speculator

The current spot prices of shares of Surana Telecom Ltd. is ` 121 with strike price of ` 125 and ` 130 are trading at a premium of ` 3.30 and ` 1.80 respectively. Mr. X a speculator is bullish about the share price over next 6 months. However he is also of belief that share price could also go down. He approaches you for advice. You are required to:

Suggest a strategy that Mr. X can adopt which puts limit on his gain or loss.

How much is maximum possible profit?

Draw out a rough diagram of the strategy adopted.

What will be Break even price of the share?

Solution: Spot Price ` 121

Call Strike Price ` 125 and Premium ` 3.30

Call Strike Price ` 130 and Premium ` 1.80

Speculator is bullish over the stock price over next 6 months but also belief that share price could also go down.

a. Strategy to be adopted to minimize the loss or gain.

Buy a call of ` 125 at a premium of ` 3.30.

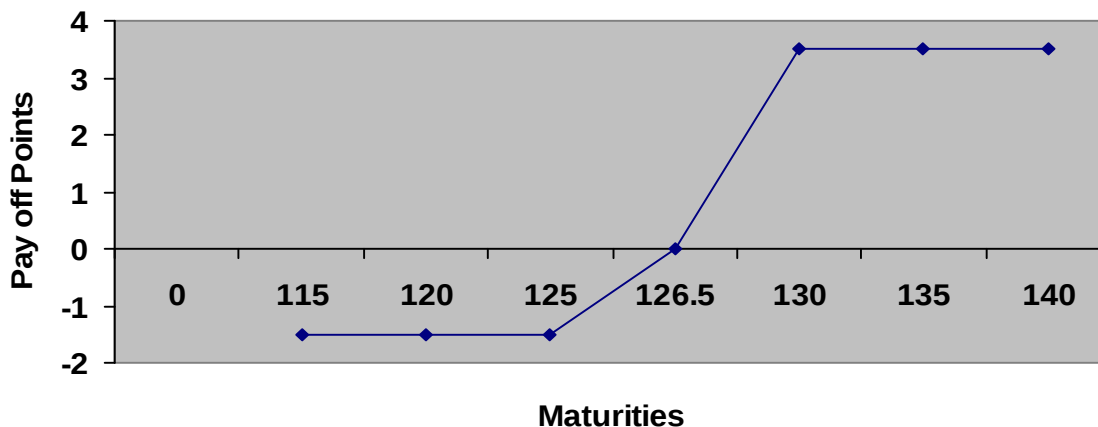
Sell a call of ` 130 at a premium of ` 1.80.

	Maturity Spots	115	120	125	130	135	140
Long Call 125 (BUY)	Status	Lapse	Lapse	Lapse	Exercise	Exercise	Exercise
	GPO	0	0	0	5	10	15
	Premium	-3.30	-3.30	-3.30	-3.30	-3.30	-3.30
	A. NPO	-3.30	-3.30	-3.30	+1.70	+6.70	+11.70
Short Call 130 (SELL)	Status	Lapse	Lapse	Lapse	Lapse	Exercise	Exercise
	GPO	0	0	0	0	-5	-10
	Premium	1.80	1.80	1.80	1.80	1.80	1.80
	B. NPO	1.80	1.80	1.80	1.80	-3.20	-8.20
	Total Pay Off A+ B	-1.50	-1.50	-1.50	3.50	3.50	3.50

b. Maximum Possible profit ` 3.50

c. Rough diagram

Pay off graph



$$\text{Break even Price} = \text{Exercise price} + \text{Net premium outflow} = 125 + 1.5 = 126.50$$

Problem: 7 Option strategies for arbitrage

Equity shares of Vinil Textiles Ltd. are currently selling at ₹ 700. In 6 months time, the share price may increase to ₹ 900 with probability of 0.7 and may decrease to ₹ 500 with probability of 0.3. A call option for 6 month period at a strike price of ₹ 800 is available.

How a perfectly hedged position in shares and options can be built?

Find out the value of option in both cases of price variation?

What is the expected value of option on maturity date?

Solution: Spot Price - ₹ 700.

Exercise Price - ₹ 800.

Probability of Increases to ₹ 900 is 0.7.

Probability of Decrease to ₹ 500 is 0.3.

i. Delta of Option = Spread in possible Maturity Spot/Spread in GPO s at that maturity spots = $\frac{900-500}{100-0} = 4$. Write 4 calls and buy 1 stock.

ii. Value of option in both cases of price variation.

	Exercise Price ₹ 900	Exercise Price ₹ 500
Write 4 calls	$-100 \times 4 = -400$	0
Buy 1 stock	900	500
	500	500

iii. Expected value of Option on Maturity

Maturity spot GPO (Exercise Price ₹ 800)

900 100

500 0

Probability	GPO	Probability*GPO
0.7	100	70
0.3	0	0
Expected Value on Maturity		70

Problem: 8 : Black Scholes model

Shares of GAIL Ltd. are being sold at ₹ 408 per share and a dividend of ₹ 10 per share is expected in two months time. Find out the value of the call option if the strike price is ₹ 380, risk free rate is 5% and the volatility of the share price is 22%. The call period is 3 months.

Solution:

Spot Price - ₹ 408

Exercise Price - ₹ 380

Dividend per share - ₹ 10

Risk free rate of interest - 5%

Time Period - 3 months = 0.25 Years

Standard deviation of stock - 22%

Value of call option ?

Call Premium = Spot price * Nd1 - Present value of exercise price * Nd2

Nd1 → Normal distribution value of d1.

Nd2 → Normal distribution value of d2.

Revised Spot Price = Spot price - Present value of Dividend

$408 - 10 \times \frac{1}{[1 + 5\% \times 2/12]} = ₹ 398.08$

Present value of exercise price = $380 \times \frac{1}{[1 + 5\% \times 3/12]} = ₹ 375.30$

Classes will be held by CA. Praveen Kumar having 6 years of experience in Equity markets, Mumbai and Currency markets, Dubai.

$$d1 = \frac{\log \text{Spot Price} / \text{Exercise Price} + [r + \frac{1}{2} \sigma^2] t}{\sigma \sqrt{t}}$$

$$= \frac{\log 398.08 / 380 + [0.05 + \frac{1}{2} (0.22)^2] 0.25}{0.22 \sqrt{0.25}}$$

$$= 0.525$$

Nd1 = Normal distribution value of d1 = 0.69847

$$d2 = d1 - \sigma \sqrt{t} = 0.525 - 0.22 \sqrt{0.25} = 0.525 - 0.11 = 0.415$$

Nd2 = Normal distribution value of d2 = 0.65910

$$\text{Call Premium} = \text{Spot price} \times Nd1 - \text{Present value of exercise price} \times Nd2 = 398.08 \times 0.69847 - 375.30 \times 0.65910$$

$$= 278.04 - 247.36 = 30.68$$

Problem: 9 Black Scholes model

You are trying to value a long term call option on the S&P 500, expiring in 2 months, with a strike price of \$ 900. The index is currently at \$930, and the annualized standard deviation in stock prices is 20% p.a. The average dividend yield on the index is 0.3% p.a. and is expected to remain unchanged over the next year. The Treasury bond rate is 8%.

Estimate the value of the long term call option.

Estimate the value of a put option, with the same parameters.

Solution:

Spot Price – 930\$

Exercise Price – 900\$

Dividend Yield – 0.3%

Risk free rate of interest – 8%

Time Period – 2 months = 0.16 Years

Standard deviation of stock – 20%

Value of call option and Put option?

$$\text{Call Premium} = \text{Spot price} \times Nd1 - \text{Present value of exercise price} \times Nd2$$

Nd1 → Normal distribution value of d1.

Nd2 → Normal distribution value of d2.

$$\text{Put Premium} = \text{Call Premium} + \text{Present value of exercise price} - \text{Spot Price}$$

$$\text{Revised rate} = \text{Treasury bond rate} - \text{Dividend yield}$$

$$= 8\% - 0.3\% = 7.7\%$$

$$\text{Present value of exercise price} = 900 \times \frac{1}{[1 + 7.7\% \times 2/12]}$$

$$= 890 \$$$

$$d1 = \frac{\log \text{Spot Price} / \text{Exercise Price} + [r + \frac{1}{2} \sigma^2] t}{\sigma \sqrt{t}}$$

$$= \frac{\log 930 / 900 + [0.077 + \frac{1}{2} (0.20)^2] 0.16}{0.20 \sqrt{0.16}}$$

$$= 0.5635$$

Nd1 = Normal distribution value of d1 = 0.71226

$$d2 = d1 - \sigma \sqrt{t} = 0.5635 - 0.20 \sqrt{0.16} = 0.5635 - 0.08 = 0.4835$$

Nd2 = Normal distribution value of d2 = 0.68439

$$\text{Call Premium} = \text{Spot price} \times Nd1 - \text{Present value of exercise price} \times Nd2$$

$$= 930 \times 0.71226 - 890 \times 0.68439 = 662.4018 - 609.1071 = 53.2947\$$$

$$\text{Put Premium} = \text{Call Premium} + \text{Present value of exercise price} - \text{Spot Price} = 53.2947 + 890 - 930 = 13.2947\$$$

Mission: To make young CHARTERED ACCOUNTANTS suitable for Financial markets, Investment banking, Merchant banking, Equity research and treasury management.

Problem: 10 Option strategies for arbitrage

PNB Ltd's share is currently trading at ` 220. It is expected that in six months some if could double or halved (equivalent to a S.D=98%). One year call option on PNB Ltd's share has an exercise price of ` 165. Assuming risk free rate of interest to be 20%, calculate.

Value of call option on PNB Ltd's share.

Option Delta for the second six month, in case stock price rises to ` 440 or falls to ` 110.

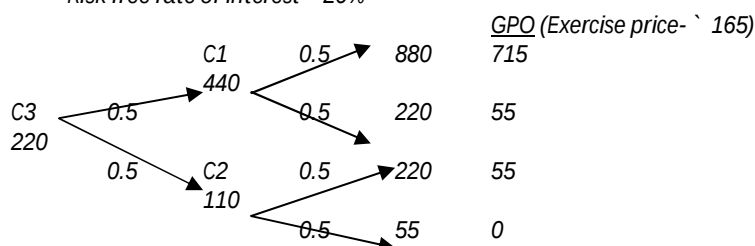
Now suppose in 6 months the share price is ` 110. How at this point we can replicate portfolio of call options and risk free lending.

Solution:

Spot Price = ` 220

Exercise Price = ` 165

Risk free rate of interest = 20%



i. Value of Call Option

	Evaluate @ C1		Evaluate @ C2		Evaluate @ C3	
Probability	0.5	0.5	0.5	0.5	0.5	0.5
GPO	715	55	55	0	385	27.5
Probability * GPO	357.5	27.5 = 385	27.5	0 = 27.5	192.5	13.75 = 206.25

Present Value @ C3 = Call Premium = $206.25 / 1 + 20\%$
 $= ₹ 171.875$

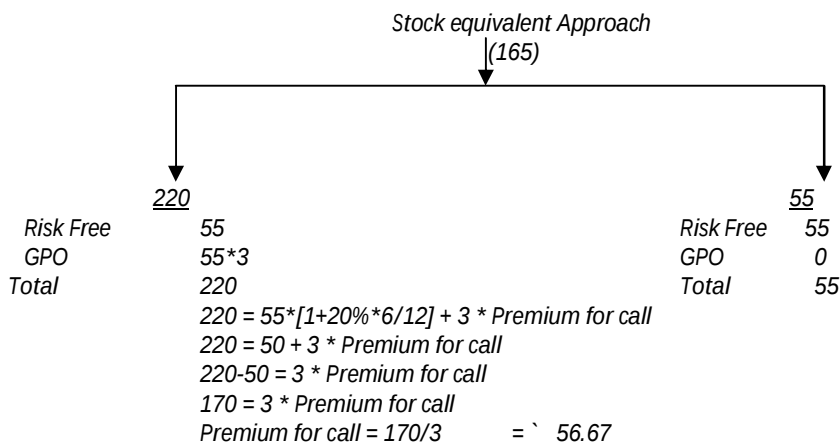
ii. Option delta for second six months

$$= \frac{\text{Spread in Maturity Spot}}{\text{Spread in GPO}}$$

$$= \frac{880 - 220}{715 - 55} = \frac{220 - 55}{55 - 0} = 1$$

iii. Using Portfolio Replication model, Stock equivalent approach,

Spot price = Present value of Lower stock price + no. of calls * Premium for call.



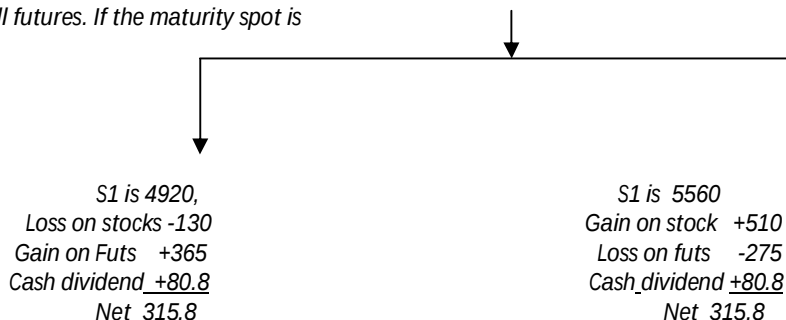
Classes will be held by CA. Praveen Kumar having 6 years of experience in Equity markets, Mumbai and Currency markets, Dubai.

Problem: 11 : Futures pay off

A stock market index currently stands at 5050. The multiple of futures contract is 100. The annualized dividend yield on the index is 4% and 40% of the stocks included in the index will pay dividends during the next six months. A six month futures contract on the index can be bought at a price of 5285. The risk free interest rate is 7% p.a. Ignore transaction costs, Margin requirement and taxes. You are required to Show how an arbitrageur can earn abnormal profit irrespective of the outcome on the expiration date (assume two levels as 4920 and 5560). Calculate implied risk free rate of return on index price.

Solution:

a. Theoretical futures price = $5050(1 + (0.07 - 0.016) * 6/12) = 5186.35$, As the actual futures price is 5285, futures is over valued and buy spot and sell futures. If the maturity spot is



Implied return p.a. = $(315.8/5050) * 2 * 100 = 12.51\%$ P.a.

Problem: 12 : convenience yield

The following information is available about standard gold.

Spot price (SP)	15600 per 10 grams.
Future price (FP)	17100 for one year future contract
Risk free interest rate	8.5%
Present value of storage cost	900 per year

From the above information you are required to calculate the present value of convenience yield of the standard gold.

Present Value of convince yield = spot rate + Present value of storage cost - present value of future price.
 $= 15600 + 900 - 15760 = ₹ 740.$

Problem: 13 Hedging with NIFTY Futures

On 1st October, Praveen is retiring from service and he will get an amount of ₹ 33,66,000 as retirement benefits. He is planning to invest this money in the following three scripts, which he considers grossly under valued stocks in the market:

Stock	No. of Shares	Price	Beta
Sowbhagya Metals Ltd.	2000	300	0.42
Tanla Solutions	3000	416	0.65
Sagar Cements	4600	330	1.72

It is September now and he plans to take hedging by using future market. How many October contracts will you be trading if the spot index is 3990 and October futures are quoted at 4062? Lot size of each NIFTY contract is 50.

Solution: No of Shares	Price	Product	Weight	Beta	Weight * Beta
2000	300	600000	0.17	0.42	0.0714
3000	416	1248000	0.37	0.65	0.2405
4600	330	1518000	0.46	1.72	0.7912
		3366000	1.00		1.1031(Approximately)

$$\begin{aligned}\text{No. of NIFTY lots to short} &= \frac{1.1031 \times 3366000}{50 \times 4062} \\ &= 18.28 \text{ lots.}\end{aligned}$$

Problem: 14: Equity Futures valuation

A future contract is available on a company that pays an annual dividend of ₹ 5 and whose stock is currently priced at ₹ 200. Each futures contract calls for delivery of 1000 shares of stock in one year, daily marketing to market, an initial margin of 10% and a maintenance margin of 5%. The corporate treasury bill rate is 8%.

Given the above information, what should the price of one futures contract be?

If the company stock price decreases by 7%, what will be the change, if any, in future price?

As a result of the company stock price decrease, will an investor that has a long position in one futures contract of this company realizes a gain or loss? Why? What will be the amount of this gain or loss?

Solution:

Dividend - ₹ 5
Spot Price - ₹ 200

i. Price of Future contract

Initial Margin and maintenance margin are irrelevant for valuation of Future Price.

Revised Spot price = Spot Price – Present value of Dividend

$$200 - 5 \times [1/1+8\%] = ₹ 195.375$$

Future Price = Revised Spot price * e^{rt}

$$195.375 \times e^{8\%}$$

$$195.375 \times 1.08329 = ₹ 211.64$$

ii. If Stock price decreases by 7% future price will also decreases by 7%.

iii. If the Stock price decreases future price will also decreases. If an investor holds long position he will suffer losses.

Problem: 15:

BSE 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

Assume that a future contract on the BSE index with four months maturity is used to hedge the value of portfolio over next three months. One future contract is for delivery of 50 times the index. Calculate: i) Price of future contract (ii) The gain on short futures position if index turns out to be 4,500 in three months (iii) Value of Portfolio using CAPM

Solution: (i) Theoretical (Assumed as Actual) future price of the index = $5000 + 5000(0.09-0.06)4/12 = 5,050$

(ii) No. of NIFTY lots to buy = $(1.5 \times 10,10,000) / 50 \times 5050 = 6 \text{ lots}$

Maturity Spot of the Index is 4500

One month Future price after three months will be = $4500 + 4500(0.09-0.06)1/12 = 4,511.25$

Therefore, Gain from the short futures position is = $6 \times (5050 - 4511.25) \times 50 = ₹ 1,61,625$

(iii) To use CAPM we require risk-free rate of return, beta of portfolio and Market Return. Since risk-free rate of return and beta of portfolio is given first we shall calculate market return as follows:

Change in Index Value = $4500 - 5000 = -500$, Return from Index (R_m) = $-500/5000 \times 100 = -10\%$ for 3 months

Dividend yield p.a. = 6% and for 3 months 1.5%.

Thus return for investment in index for 3 months = $-10\% + 1.5\% = -8.5\%$

Expected Return = $R_f + \beta(R_m - R_f) = 2.25\% + 1.50(-8.5 - 2.25\%) = -13.875\%$

The expected value of portfolio (without hedging) after 3 months will be: $10,10,000[1+(-0.13875)] = ₹ 8,69,862.25$

The expected value of portfolio with hedging after 3 months will be: = $8,69,862.25 + 1,61,625 = ₹ 10,31,487.25$

Problem: 16 Commodity Futures valuation

A wheat trader has planned to sell 440000 kgs of wheat after 6 months from now. The spot price of wheat is ₹ 19 per kg and 6 months future on same is trading at ₹ 18.50 per kg (Contract Size= 2000 kg). The price is expected to fall to as low as ₹ 17.00 per kg 6 month hence. What trader can do to mitigate its risk of reduced profit? If he decides to make use of future market what would be effective realized price for its sale when after 6 months is spot price is ₹ 17.50 per kg and future contract price for 6 months is ₹ 17.55.

In order to hedge its position trader would go short on future at current future price of ₹ 18.50 per kg. This will help the trader to realize sure ₹ 18.50 after 6 months.

Quantity of wheat to be hedged	440000 kgs
Contract Size	2000 kgs
No. of Contracts to be sold	220
Future Price	` 18.50
Exposure in Future Market (` 18.50X220X2000)	` 81,40,000

After 6 months the trader would cancel (Square up) its position in future market by buying a future contract of same quantity and will sell wheat in spot market and position shall be as follows.

Price of Future Contract	` 17.55
Amount bought	` 77,22,000
Gain/Loss on Future position...Remember Non delivery	` 4,18,000
Spot Price	` 17.50
Amount realized by selling in spot market	` 77,00,000
Effective Selling Amount	` 81,18,000
Effective Selling Price (Per Kg)	` 18.45

Bond Markets

Problem 1: Valuation of Floating rate bond

Pitti Laminations Ltd. has the following outstanding bonds.

Bond	Coupon	Maturity
Series X	8%	10 years
Series Y	Variable rate	10 years

Initially these bonds were issues at face value of ` 10,000 with yield to maturity of 8%.

Assuming that:

- After 2 years from the date of issue, interest on comparable bonds is 10%, then what should be the price of each bond?
- If after two additional years, the interest rate on comparable bond is 7%, then what should be the price of each bond?
- What conclusions you can draw from the prices of bonds, computed above.

Solution:

Bond-X

Coupon rate – 8% fixed

Period -10 years

Face value – ` 10,000

Bond-Y

Coupon rate – Variable

Period – 10 years

Face value – ` 10,000

- Present value (pv) at the beginning of 3rd year (when YTM in the market is 10%)

$$\begin{aligned} \text{PV (Bond X)} &= \text{Interest receivable p.a} \times \text{PVAF}(\text{int}\%, \text{periods}) + \text{Redemption value} \times \text{PVIF}(\text{int}\%, y) \\ &= 800 \times \text{PVAF}(10\%, 8y) + 10000 \times \text{PVIF}(10\%, 8y) \\ &= 800 \times 5.33 + 10000 \times .385 = ` 8114 \end{aligned}$$

$$\begin{aligned} \text{PV (Bond Y)} &= 1000 \times \text{PVAF}(10\%, 8y) + 10000 \times \text{PVIF}(10\%, 8y) \\ &= 1000 \times 5.33 + 10000 \times .385 = ` 10000 \end{aligned}$$

- Present value (pv) at the beginning of 5th Year (when YTM in the market is 7%)

$$\begin{aligned} \text{PV (Bond X)} &= \text{Interest receivable p.a} \times \text{PVAF}(\text{int}\%, \text{periods}) + \text{Redemption value} \times \text{PVIF}(\text{int}\%, y) \\ &= 800 \times \text{PVAF}(7\%, 6y) + 10000 \times \text{PVIF}(7\%, 6y) \\ &= 800 \times 4.766 + 10000 \times 0.666 = ` 10476 \end{aligned}$$

$$\begin{aligned} \text{PV (Bond Y)} &= 700 \times \text{PVAF}(7\%, 6y) + 10000 \times \text{PVIF}(7\%, 6y) \\ &= 700 \times 4.766 + 10000 \times .666 = ` 10000 \end{aligned}$$

- Conclusion:-

➔ When the interest rates goes up the prices of fixed coupon bonds will fall & vice versa

➔ Due to interest rates fluctuation the price of variable coupon bond will not be affected, as the coupon itself is changing.

Problem 2: Valuation of bond with special feature

Standard Chartered Plc. has outstanding , a high yield bond with following features:

Face value £ 10,000

Coupon 10%

Maturity period 6 years

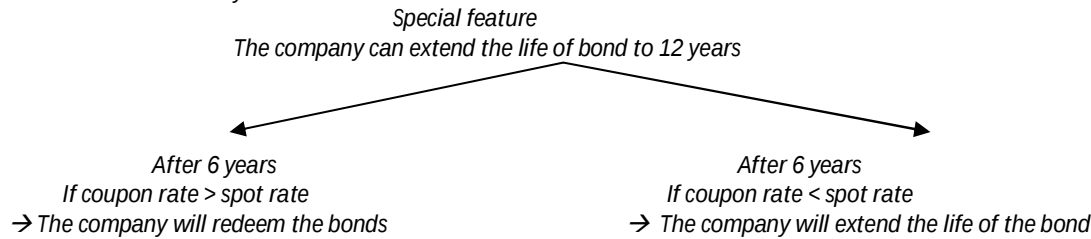
Special feature company can extend the life of bond to 12 years.

Presently the interest rate on equivalent bond is 8%.

- If an investor expects that interest will be 9%, six years from now then how much he should pay for this bond now.

Now suppose, on the basis of that expectation, he invests in the bond, but interest rates turns out to be 12%, six years from now, then what will be his potential loss/gain.

Solution: Face value – 10000 £
Coupon rate – 10%
Period 6 years



i) The investor expecting that, after 6 years the interest rates will be 9%, and the maturity period of the bond will be 6 years, invested in the bonds, pv when invested is

$$\begin{aligned}
 PV &= \text{Interest receivable } p.a * PVAf(\text{int}\%, \text{periods}) + \text{Redemption value} * PVIF(\text{int}\%, y) \\
 &= 1000 * PVAf(8\%, 6y) + 10000 * PVIF(8\%, 6y) \\
 &= 1000 * 4.622 + 10000 * 0.630 \\
 &= 10925 \text{ £}
 \end{aligned}$$

ii) But, if the interest rates has gone up to 12%, hence the company has not redeemed the bonds, pv of it at the end of 6 years

$$\begin{aligned}
 PV &= \text{Interest receivable } p.a * PVAf(\text{int}\%, \text{periods}) + \text{Redemption value} * PVIF(\text{int}\%, y) \\
 &= 1000 * PVAf(12\%, 6y) + 10000 * PVIF(12\%, 6y) = 9178 \text{ £}
 \end{aligned}$$

But, if redeemed the investor is supposed to get a cash inflow of 10000 £ at the end of the 6th year
Potential loss = £10000 - £9178 = £822.

Problem 3: Duration – Volatility

On 1 June 2003 the financial manager of Edelweiss Corporation's Pension Fund Trust is reviewing strategy regarding the fund. Over 60% of the fund is invested in fixed rate long-term bonds. Interest rates are expected to be quite volatile for the next few years. Among the pension fund's current investments are two AAA rated bonds:

1) Zero coupon June 2018 2) 12% Gilt June 2018 (interest is payable semi-annually)

Solution:

The current annual redemption yield (yield to maturity) on both bonds is 6%. The semi-annual yield may be assumed to be 3%. Both bonds have a par value and redemption value of \$100.

Estimate the market price of each of the bonds if interest rates (yields):

(i) increase by 1%;

(ii) decrease by 1%.

Zero coupon bond

Yield to maturity – 6%

Face value – \$100

Redemption value - \$100

i) YTM – 7% (6+1% increase)

$$PV = 100 * PVIF(7\%, 6y)$$

$$= 100 * 0.666$$

$$= \$66.63$$

YTM – 5% (6-1% decrease)

$$PV = 100 * PVIF(5\%, 6y)$$

$$= 100 * 0.783$$

$$= \$78.3$$

12% Gilt bond (payable once in 6 months)

Yield to maturity – 6%

Face value - \$100

Redemption value – \$100

YTM – 7%

$$PV = \text{Int} * PVAf(\text{int}\%, \text{periods}) + RV * PVIF(\text{int}\%, \text{years})$$

$$= 6 * PVAf(3.5\%, 12y) + 100 * PVIF(7\%, 6y)$$

$$= 6 * 9.66 + 100 * 0.666 = \$124.61$$

YTM – 7%

$$PV = \text{Int} * PVAf(\text{int}\%, \text{periods}) + RV * PVIF(\text{int}\%, \text{years})$$

$$= 6 * PVAf(2.5\%, 12y) + 100 * PVIF(5\%, 6y)$$

$$= 6 * 10.25 + 100 * 0.783 = \$139.84$$

FIXED INCOME DERIVATIVES

Problem 1: Interest rate Swaps

Soni Ltd. and Toni Ltd. face the following interest rate :

	Soni Ltd.	Toni Ltd.
US Dollar		
(Floating rate)	LIBOR + 0.25%	LIBOR + 2.25%
Japanese Yen		
(Fixed rate)	1.75%	2%

Toni Ltd. wants to borrow US Dollars at a floating rate of interest and Soni Ltd. wants to borrow Japanese Yen at a fixed rate of interest. A financial institution is planning to arrange a swap and requires a 100 basis point spread. If the swap is equally attractive to Soni Ltd. and Toni Ltd., what rate of interest will they end up paying ?

Solution: Lets Assume LIBOR = M

	Floating	Fixed	Conversion from
Soni Ltd	M + 0.25%	1.75%	Floating to Fixed
Toni Ltd	M + 2.25%	2%	Fixed to Floating
Difference	2%	> 0.25%	

Conversion from Floating to Fixed Possible – In the angle of stronger company i.e Soni Ltd

Brokerage = 1%

Swap Benefit = 2% – 0.25% – 1% = 0.75%

Swap is equally attractive to Soni Ltd and Toni Ltd. (i.e 0.75/2 = 0.375)

Soni Ltd

1. Pay to Bank - $(M + 0.25) \%$
2. Receive above + Swap from Toni + $[(M+0.25) + 0.375] \%$
3. Pay to Toni - 1.75%
4. Net rate - 1.375%

Toni Ltd

1. Pay to Bank - 2%
2. Pay to Soni - $[(M+0.25) + 0.375] \%$
3. Receive from Soni + 1.75%
4. Net rate - $(M + 1.875) \%$

Problem 2: Currency swap

Integrated (India) Ltd. of India and Upper Class Ltd. of USA want to raise funds. However, the latter has a better credit rating and has an advantage in raising funds in both countries. Following are the rates of interest at which the funds can be raised by these companies in different markets :

	India `	USA \$
Integrated (India) Ltd.	19%	9%
Upper Class Ltd	18%	6%

Integrated (India) Ltd. wants dollar funds while Upper Class Ltd. wants rupee funds. Design a currency swap given that both companies require funds of ` 45 crores (or \$ 1,00,00,000)

Solution:	India `	USA \$	Conversion from
Integrated Ltd	19%	9%	` to \$
Upper Class Ltd	18%	6%	\$ to `
Difference	1%	3%	

Conversion from \$ to ` Possible – In the angle of stronger company i.e Upper Class Ltd

Swap = $3\% - 1\% = 2\%$

Swap is equally attractive to Upper Class Ltd and Integrated Ltd. (i.e $2/2 = 1$)

Upper Class Ltd

1. Pay to Bank - $6\% \text{ ----- } 6,00,000\$ \text{ ----- } 6,00,000 \times 45 = (2,70,00,000)$
2. Receive above + Swap from Integrated Ltd + $6+1\% \text{ ----- } 7,00,000\$ \text{ ----- } 7,00,000 \times 45 = 3,15,00,000$
3. Pay to Integrated Ltd - $18\% \text{ ----- } = 45,00,000 \times 18\% = (8,10,00,000)$
4. Net rate - $17\% \text{ ----- } \text{ --- } 76500000 \text{ `}$

Net Amount

76500000 `.

Integrated India Ltd

1. Pay to Bank - $19\% \text{ ----- } 8,55,00,000 \text{ `} \text{ ----- } (19,00,000\$)$
2. Pay to Upper Class Ltd - $(6+1)\% \text{ ----- } (7,00,000\$)$
3. Receive from Upper Class Ltd + $18\% \text{ ----- } = (8,10,00,000) \text{ ----- } 1800000\$$
4. Net rate - $8\% \text{ ----- } \text{ ----- } 8,00,000\$$

Net Amount

$\$10000000 \times 8\% = \$800000/-$

Problem: 3: FX swap

McDonald Company of US wishes to lend \$5,00,000 to its Japanese subsidiary. At the same time, Toyota of Japan is interested in making a medium-term loan approximately the same amount to its US subsidiary. The two parties are brought together by an investment bank. McDonald will lend \$5,00,000 to the U.S. subsidiary of Toyota for 4 years at 13 per cent. Principal and interest are payable only at the end of the fourth year with interest compounding annually. Toyota will lend the Japanese subsidiary of McDonald 70 million yen for 4 years at 10%. Again, the principal and interest (annual compounding) are payable at the end. The current exchange rate is 140 yen to the \$. However, the dollar is expected decline by 5 yen to the dollar per year over the next 4 year`

- (a) If these expectations prove to be correct, what will be the dollar equivalent principal and interest to Toyota at the end of 4 years ?
- (b) What dollars will McDonald receive at the end of 4 years from the payment of principal and interest by the U.S. subsidiary of Toyota ?
- (c) Which party is better off with the parallel loan agreement ? What would happen if the yen did not change in value ?

Solution:

a. Toyota will lend the Japanese subsidiary of McDonald 70 million yen for 4 years at 10%

$$= 70 \text{ million} \times (1+10\%)^4$$

$$70 \text{ million} \times 1.1^4 = 102.487 \text{ million Yen}$$

\$ Equivalent = If rate is 120 ¥/\$

$$102.487/120$$

$$0.8541 \text{ million\$}$$

$$854100 \$$$

If rate is 140 ¥/\$

$$102.487/140$$

$$0.73205 \text{ million\$}$$

$$732050 \$$$

b. McDonald will lend the USA subsidiary of Toyota of \$500000 for 4 years at 13%

$$= 500000 \times (1+13\%)^4 = 500000 \times 1.13^4 = 815236\$$$

c. If the expectation that 120 ¥/\$ proved to be correct US subsidiary of Toyota motors is getting benefited because of swap.

If Yen rate remains same after four years company i.e Subsidiary of McDonald is benefited.

Problem: 4: Interest rate Swaps

LIC Housing Finance Limited lends money to individuals @ 12% p.a. and accepts deposits from investors at FR + 1% (where FR is floating rate). As the interest payment to investors is floating, it wants to hedge its risk, and has approached a swap dealer. Another company IDBI Suvidha Ltd. has also approached the swap dealer. IDBI Suvidha Ltd. has to pay 12% to the depositors but charges FR + 2.25% from its borrowers. You are required to devise a swap so that LIC Ltd. IDBI Suvidha Ltd. and the dealer, all the three participants are benefited.

Solution:

	Fixed	Floating
LIC Housing Finance Ltd	12% (Interest receipt)	FR + 1% (Interest Payment)
IDBI Suvidha Ltd	12% (Interest Payment)	FR + 2.25% (Interest receipt)
Difference	0%	1.25%

Conversion from Floating to Fixed Possible – In the angle of stronger company i.e LIC Housing Finance Ltd

Swap to be adopted

LIC Housing Finance Ltd

1. Receive Float + Swap from IDBI + [(FR+1) + 0.625] %
2. Pay to IDBI Bank - 12%

IDBI Suvidha Ltd

1. Receive from LIC Housing Finance - 12%
2. Pay to Float + Swap to LIC Housing Finance – [(FR+1) + 0.625] %

Problem 5: Theoretical forward rates

Assume that the current rate on a one year security is 7%. You believe that the yield on a 1 year security will be 9% one year from now and 10% 2 years from now. According to expectations hypothesis, what should be yield on a 3 year security?

Solution:

Current Rate on one year security – 7%

Yield on one year security i.e 12/24 – 9%

Yield on two year security i.e 24/36 – 10%

Yield on three year security = $(1+7\%) (1+9\%) (1+10\%) = (1+x/100)^3$

$$1.07 * 1.09 * 1.10 = (1+x/100)^3$$

$$1.28293 = (1+x/100)^3$$

$$1.28293^{1/3} = 1+x/100$$

$$X = 8.8\%$$

Problem 6: Computation of cost of funds under forward rate agreement

A treasury manager after five months will need to borrow ` 300,000 for 3 months. The current rates are as follows:

Duration	Borrowing rates	Lending rates
3-months	9.5%	10.0%
6-months	9.8%	10.2%
8-months	10.0%	10.5%
9-months	10.2%	10.8%

The manager wants to ensure the rate that he would have to pay on his borrowings. What should he do and what is the rate he can lock in?

Solution: Treasury manager needs to borrow ` 300000 for 3 months after 5 months

5/8 months Forward rate is required

Since he needed money after 5 months for a period of 3 months. The manager needs to borrow money for a period 8 months and lend the same for first 5 months. So that the rate of interest is locked and no risk for him.

Borrow for 8 months @ 10.5% $300000 * 10.5\% * 8/12 = (21000)$

Lend for 5 months @ 9.8% $300000 * 9.8\% * 5/12 = 12250$

Net interest cost to Treasury manager (8750)

Problem 7: Computation of Bond return

Consider a bond portfolio comprising of a zero coupon bond, 8 % coupon bond and 10% coupon bond (with 10 years to maturity). All have a face value of ` 1000. The current prices of these bonds are ` 463.19, ` 1000 and ` 1134.20 respectively. If the yield over the next 1 year period is likely to stay at 8% what is the current value of the portfolio and what will be the portfolio value at the end of next year? What is the individual return earned on each bond?

Solution:

Bond	Maturity	Face value	Interest	Y1 value of Bond
Zero coupon	10 years	1000	0	$1000 * PVIF(9yrs, 8\%) = 500$
8% coupon	10 years	1000	80 (1000*8%)	$80 * PVA(9yrs, 8\%) + 1000 * PVIF(9yrs, 8\%) = 1000$
10% coupon	10 years	1000	100 (1000*10%)	$100 * PVA(9yrs, 8\%) + 1000 * PVIF(9yrs, 8\%) = 1125$

$$\text{Return} = \frac{(Y1 - Y0) + \text{Interest}}{Y0}$$

$$\text{Zero Coupon return} = \frac{(500 - 463.19) + 0}{463.19}$$

$$= 8.00\%$$

$$\text{8% Coupon return} = \frac{(1000 - 1000) + 80}{1000}$$

$$= 8.00\%$$

$$10\% \text{ Coupon return} = \frac{(1125 - 1134.2) + 100}{1134.2} = 8.00\%$$

Problem 8: Immunization

Consider a company having liabilities of ` 1 million, ` 2 million, and ` 1 million over the next 1, 2 and 3 years respectively. If the yield is expected to remain at 10 % and we have only 10 % perpetuity and 1 year zero coupon bonds available, how the treasury manager would immunize his liability using these bonds.

Solution:

Year	Cash Flow(A)	DF@10%(B)	DCF(A*B)	Weight	Weight * Year
1	1 million	0.909	909000	0.36(909000/2486000)	0.36 (0.36*1)
2	1 million	0.826	826000	0.33(826000/2486000)	0.66 (0.33*2)
3	1 million	0.751	751000	0.31(751000/2486000)	0.93 (0.31*3)
			2486000	1	1.95 Years

	Duration	Weight	Duration*Weight
10% Perpetuity	$11 \frac{(1 + \text{yield})}{\text{yield}}$	x	11x
1 year Zero coupon	1	1 - x	$\frac{1(1-x)}{1.95 \text{ years}}$

Computing the value of "X"

$$11x + 1(1-x) = 1.95 \quad X = 0.95/10 = 0.095$$

Amount to be invested in perpetuity bond = $2486000 * 0.095 = ` 236170$

Amount to be invested in zero coupon bond = $2486000 * (1 - 0.095) = ` 2249830$

Problem 9: Immunization

Consider a firm is expected to have a liability of ` 1 million in 7 years. Assume that the treasury manager of the company has decided to immunize his obligation by investing in 10 years zero coupon bonds and 5 years 10 % coupon bonds Face Value ` 100. What value of investment would be made in the zero coupon bonds (zeros), if the expected yield is 8 %?

Solution:

Year	Cash Flow(A)	DF@8%(B)	DCF(A*B)	Weight	Weight * Year
1	10	0.925	9.25	0.08 (9.25/107.9)	0.08 (0.08*1)
2	10	0.857	8.57	0.07 (8.57/107.9)	0.14 (0.07*2)
3	10	0.793	7.93	0.07 (7.93/107.9)	0.21 (0.07*3)
4	10	0.735	7.35	0.06 (0.06/107.9)	0.24 (0.06*4)
5	110(100 + 10)	0.680	74.8	0.72 (0.72/107.9)	3.60 (0.72*5)
			107.9	1	4.27 Years

	Duration	Weight	Duration*Weight
Zero Coupon bond	10	x	10x
10% Coupon bond	4.27	1 - x	$\frac{4.27(1-x)}{7 \text{ years}}$

Computing the value of "X"

$$10x + 4.27(1-x) = 7$$

$$X = 2.73/5.73 = 0.47$$

Amount now to be invested = $1000000 * 1/(1+r)^n = 1000000 * 1/(1+0.08)^7 = 1000000 * 0.5837 = 583700`$

Amount to be invested in Zero Coupon bond = $583700 * 0.47 = 274339`$

Amount to be invested in 10% Coupon bond = $583700 * 0.53 = 309361`$

Problem:10 Currency swap

Drill Dip Inc, a US based company has won a contract in India for drilling oil field. The project will require an Initial investment of ` 500 Cr. The oil field along with equipments will be sold to Indian government for ` 740 Cr after one year. Since the Indian Government will pay for the amount in Indian Rupees the company is worried about exposure due to exchange rate volatility.

You are required to :

- Construct a swap that will help the Drilldip to reduce the exchange rate risk .
- Assuming that Indian government offers a swap at spot rate which is 50 ` / \$ in one year then should the company opt for . The spot after one year is expected to be 54 ` / \$. Further you may also assume that Drilldip can also take a USD loan at 8% p.a.

Solution: With swap:

Step 1: borrow USD loan of \$10 cr @ 8% p.a.

Step 2: exchange these \$ with ` with any Indian Company.

Step 3: Receive 740 Cr ` . From Indian Govt and swap back ` 500 cr with Indian company and receive \$ 10 Cr back. Balance left out is ` 240 Cr convert to \$ at one year spot rate. Receive \$ 4.444 Cr. Now Drill dip has \$14.44 Cr.

Step 4: Repay the \$ loan along with Interest , \$ 10.8, balance \$ gain is 3.6 cr.

Without swap:

Step 1: borrow USD loan of \$10 cr @ 8% p.a.

Step 2: Convert these \$ with ` at spot rate 50 ` / \$ and receive 500 Cr.

Step 3: Receive ` 740 Cr. And convert @ 1 year spot rate @ 54 ` / \$. Receive, ` . 13.70Cr

Step 4: Repay the \$ loan along with Interest , \$ 10.8, balance \$ gain is 2.904 cr

As the net amount receivable at swap is higher, the company should go for swap arrangement