CA FINAL

AIR1CA CAREER INSTITUTE

ADVANCED FINANCIAL MANAGEMENT (AFM)

Question Bank

With Solutions as per ICAI

For MAY & NOV 2024 Exams

CA AJAY AGARWAL (AIR 1)

Best Wishes... Radhe Radhe!!

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ADVANCED FINANCIAL MANAGEMENT

MAY & NOV 2024 EXAMS

Question Bank

Coverage of All Questions with Solutions as per ICAI

- ☑ Study Material
- ☑ Revision Test Papers (RTP)
- ☑ Past Exam Papers
- ☑ Mock Test Papers (MTP)

Advanced Financial Management

Edition: 2024

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About the Question Bank

नमस्कार दोस्तों, राधे राधे !!

This Question Bank is prepared by **CA Ajay Agarwal (AIR 1).** He got **Ever Highest Marks (653 out of 800)** in the history of ICAI in CA Final. He is also a **Gold Medalist** in Financial Reporting and Advanced Financial Management. This Question Bank contains **500+ Questions** which are **bifurcated topic wise** in each chapter.

Questions in each chapter are divided into 2 sections. **Section A** contains **Practical Questions** and **Section B** contains **Theory Questions.**

Key words and **Key adjustments** as per ICAI are **Highlighted** in the answers of all chapters. **Source** for each question has been **provided** in detail after Index of the Question Bank.

All questions of this Question Bank has been **solved in the lectures** in detail. It is recommended to practice all questions of this Question Bank after referring the concept book and revision videos. This will help you to develop a strong grasp over the subject and be well-prepared for the exams.

Best wishes
CA Ajay Agarwal

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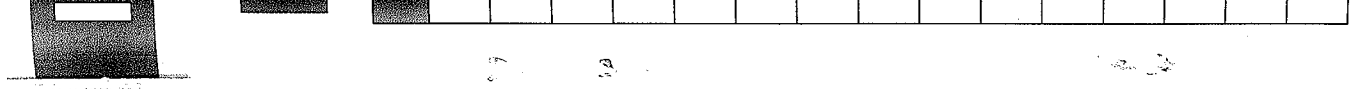

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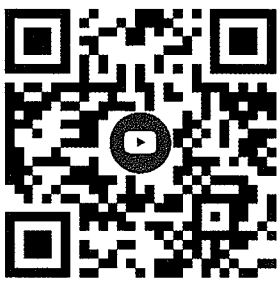

SOURCE OF QUESTIONS

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SOURCE OF QUESTIONS

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ADVANCED FINANCIAL MANAGEMENT

SECTION B – Theory Questions				
Chapter	**Study Material**	**Past Papers**	**RTP**	**MTP**
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Section B – Theory Questions

Question 1

Discuss briefly the key decisions which fall within the scope of financial strategy.

OR

As a financial strategist you will depend on certain key financial decisions. Discuss.

Answer

The key decisions falling within the scope of financial strategy include the following:

(i) **Financing decisions:** These decisions deal with the mode of financing or mix of equity capital and debt capital.

(ii) **Investment decisions:** These decisions involve the profitable utilization of firm's funds especially in long-term projects (capital projects). Since the future benefits associated with such projects are not known with certainty, investment decisions necessarily involve risk. The projects are therefore evaluated in relation to their expected return and risk.

(iii) **Dividend decisions:** These decisions determine the division of earnings between payments to shareholders and reinvestment in the company.

(iv) **Portfolio decisions:** These decisions involve evaluation of investments based on their contribution to the aggregate performance of the entire corporation rather than on the isolated characteristics of the investments themselves.

Question 2

State the strategy at different hierarchy levels.

OR

Explain the term Corporate Level Strategy and what are the three basic questions it answers?

Answer

Strategies at different levels are the outcomes of different planning needs.

Three levels of Strategy – Corporate level; Business unit level; and Functional or departmental level.

(i) **Corporate Level Strategy:** Corporate level strategy fundamentally is concerned with selection of businesses in which a company should compete and with the development and coordination of that portfolio of businesses.

Corporate level strategy should be able to answer three basic questions:

- **Suitability:** Whether the strategy would work for the accomplishment of common objective of the company.
- **Feasibility:** Determines the kind and number of resources required to formulate and implement the strategy.

- **Acceptability:** It is concerned with the stakeholders' satisfaction and can be financial and non-financial.

(ii) **Business Unit Level Strategy:** Strategic business unit (SBO) may be any profit centre that can be planned independently from the other business units of a corporation. At the business unit level, the strategic issues are about practical coordination of operating units and developing and sustaining a competitive advantage for the products and services that are produced.

(iii) **Functional Level Strategy:** The functional level is the level of the operating divisions and departments. The strategic issues at this level are related to functional business processes and value chain. Functional level strategies in R&D, operations, manufacturing, marketing, finance, and human resources involve the development and coordination of resources through which business unit level strategies can be executed effectively and efficiently. Functional units of an organization are involved in higher level strategies by providing input to the business unit level and corporate level strategy, such as providing information on customer feedback or on resources and capabilities on which the higher level strategies can be based. Once the higher level strategy is developed, the functional units translate them into discrete action plans that each department or division must accomplish for the strategy to succeed.

Question 3

Explain the outcomes of Financial Planning.

OR

Financial Resources, Financial Tools and Financial Goals are outcomes of Financial Planning. Do you agree with this statement?

Answer

Financial planning is a systematic approach whereby the financial planner helps the customer to maximize his existing financial resources by utilizing financial tools to achieve his financial goals. **Financial Resources, Financial Tools and Financial Goals are not the outcomes of Financial Planning rather these are components of Financial Planning.**

Outcomes of the financial planning are as follows:

(i) **Financial Objectives:** Financial objectives are to be decided at the very outset so that rest of the decisions can be taken accordingly. The objectives need to be consistent with the corporate mission and corporate objectives.

(ii) **Financial Decision Making:** Financial decision making helps in analyzing the financial problems that are being faced by corporate and accordingly deciding the course of action to be taken by it.

(iii) **Financial Measures:** The financial measures like ratio analysis, analysis of cash flow statement etc. are used to evaluate the performance of the Company. The selection of these measures again depends upon the corporate objective.

Question 4

Explain the interface of Financial Policy and Strategic Management.

Answer

The interface of strategic management and financial policy will be clearly understood if we appreciate the fact that starting point of organization is money and end point of that organization is also money.

Sources of finance and capital structure are the most important dimensions of a strategic plan. The need for fund mobilization to support the expansion activity of firm is very vital for any organization. The generation of funds may arise out of ownership capital and or borrowed capital.

Another important dimension of strategic management and financial policy interface is the **investment and fund allocation decisions.**

Dividend policy is another area for making financial policy decisions affecting the strategic performance of company. Dividend policy decision deals with the extent of earnings to be distributed as dividend and the extent of earnings to be retained for future expansion scheme of the organization.

It may be noted from the above discussions that **financial policy of a company cannot be worked out in isolation of other functional policies.** It has a wider appeal and closer link with the overall organizational performance and direction of growth. As a result preference and patronage for the company depends significantly on the financial policy framework. Hence, attention of the corporate planners must be drawn while framing the financial policies not at a later stage but during the stage of corporate planning itself.

Question 5

Write a short note on Balancing Financial Goals vis-a-vis Sustainable Growth.

OR

How financial goals can be balanced vis-a-vis sustainable growth?

OR

"Often, a conflict can arise if growth objectives are not consistent with the value of the organization's sustainable growth". Explain.

OR

"Sustainable growth is important to enterprise long-term development". Explain this statement in context of planning healthy corporate growth.

Answer

The concept of **sustainable growth can be helpful for planning healthy corporate growth.** This concept forces managers to consider the financial consequences of sales increases and to **set sales growth goals that are consistent with the operating and financial policies** of the firm. Often, a **conflict can arise if growth objectives are not consistent with** the value of the **organization's sustainable growth.** Question concerning right distribution of resources may take a difficult shape if we take into consideration the rightness not for the current stakeholders but for the future stakeholders also. To take an illustration, let us refer to fuel industry where resources are limited in quantity and a judicial use of resources is needed to cater to the need of the future customers along with the need of the present customers. One may have noticed the save fuel campaign, a demarketing campaign that deviates from the usual approach of sales growth strategy and preaches for conservation of fuel for their use across generation. This is an example of stable growth strategy adopted by the oil

industry as a whole under resource constraints and the long run objective of survival over years. Incremental growth strategy, profit strategy and pause strategy are other variants of stable growth strategy.

Sustainable growth is important to enterprise long-term development. Too fast or too slow growth will go against enterprise growth and development, so financial should play important role in enterprise development, **adopt suitable financial policy** initiative **to make** sure **enterprise growth speed close to sustainable growth** ratio and have sustainable healthy development.

Question 6

What is sustainable growth rate?

Answer

Sustainable growth rate (SGR) is the **maximum rate of growth in sales that can be achieved, given the firm's profitability**, asset utilization, and desired dividend payout and debt ratios. The sustainable growth rate is a measure of **how much a firm can grow without borrowing more money**. After the firm has passed this rate, it must borrow funds from another source to facilitate growth.

SGR = ROE x (1 – Dividend payment ratio)

Sustainable growth models assume that the business wants to:

- **maintain a target capital structure** without issuing new equity;
- **maintain a target dividend payment ratio**; and
- **increase sales** as rapidly as market conditions allow.

Question 7

What makes an organization financially sustainable? Discuss.

OR

Explain the traits that an organisation should have to make itself financially sustainable.

Answer

To be financially sustainable, an organization must have following traits:

- have **more than one source** of income.
- have **more than one way of generating income.**
- do strategic, action and financial planning regularly.
- have **adequate financial systems.**
- have a **good public image.**
- be clear about its values (value clarity); and
- have **financial autonomy.**

Question 8

What makes an organisation sustainable?

OR

Explain the various requirements that makes an organisation sustainable.

Answer

In order to be sustainable, an organisation must:

- have a **clear strategic direction**;
- be able to scan its environment or context to identify opportunities for its work;
- be able to **attract, manage and retain competent staff**;
- have an **adequate administrative and financial infrastructure**;
- be able to demonstrate its effectiveness and impact in order to leverage further resources; and
- **get community support** for, and involvement in its work.

CHAPTER - 2
Risk Management

Section A – Practical Questions

Standard Normal Distribution Table

Question 1

ABC Ltd. is considering a project X, which is normally distributed and has mean return of ₹ 2 crore with Standard Deviation of ₹ 1.60 crore.

In case ABC Ltd. loses on any project more than ₹ 1.00 crore there will be financial difficulties. Determine the probability the company will be in financial difficulty.

Given: Standard Normal Distribution Table (Z-Score) providing area between Mean and Z score

Z Score	Area
1.85	0.4678
1.86	0.4686
1.87	0.4693
1.88	0.4699
1.89	0.4706

Answer

For calculating probability of financial difficulty, we shall calculate the area under Normal Curve corresponding to the Z Score obtained from the following equation (how many SD is away from Mean Value of financial difficulty):

$$z = \frac{x - \mu}{\sigma}$$

$$= \frac{-1.00 \text{ crore} - 2.00 \text{ crore}}{1.60 \text{ crore}}$$

$$= -1.875 \text{ say } 1.875$$

Corresponding area from Z Score Table by using interpolation shall be found as follows:

Z Score	Area under Normal Curve
1.87	0.4693
1.88	0.4699
0.01	0.0006

The corresponding value of 0.005 Z score = $0.005 \times \frac{0.0006}{0.01} = 0.0003$

Thus the Value of 1.875 shall be = 0.4693 + 0.0003 = 0.4696

Thus the probability the company shall be in financial difficulty is 3.04% (50% – 46.96%).

Value At Risk (VAR)

Question 2

Suppose you hold worth ₹ 2 crore shares of X Ltd. whose market price standard deviation is 2% per day. Assuming 252 trading days a year, determine maximum loss level over the period of 1 trading day and 10 trading days with 99% confidence level. Assuming share prices are normally for level of 99%, the equivalent Z score from Normal table of Cumulative Area shall be 2.33.

Note: Calculations may be rounded off to 2 decimals in lakhs.

Answer

Volatility in terms of rupees shall be: 2% of ₹ 2 Crore = ₹ 4 lakh

The maximum loss for 1 day at 99% Confidence Level shall be: ₹ 4 lakh x 2.33 = ₹ 9.32 lakh,

and expected maximum loss for 10 trading days shall be: $\sqrt{10}$ x ₹ 9.32 lakh = ₹ 29.47 lakhs

Question 3

Consider a portfolio consisting of a ₹ 2,00,00,000 investment in share XYZ and a ₹ 2,00,00,000 investment in share ABC. The daily standard deviation of both shares is 1% and that the coefficient of correlation between them is 0.3. You are required to determine the 10-day 99% value at risk for the portfolio? Given: The Z score from the Normal Table at 99% confidence level is 2.33.

Note: Calculate amount in lakhs upto 2 decimals and Standard Deviation % upto 5 decimals.

Answer

The daily variance of the portfolio can be computed as follows:

$= (1)^2(0.50)^2 + (1)^2(0.50)^2 + 2(1)(1)(0.3)(0.50)(0.50)$

$= 0.25 + 0.25 + 0.15 = 0.65\%$

σ (Standard Deviation) = $\sqrt{0.65} = 0.80623\%$

σ (Standard Deviation) in Amount = 400 lakhs x 0.80623% = ₹ 3.22 lakhs

Accordingly, the standard deviation of the 10-day change is ₹ 3.22 lakhs x $\sqrt{10}$ = ₹ 10.18 lakh

From the Normal Table we see that z score for 1% is 2.33. This means that 1% of a normal distribution lies more than 2.33 standard deviations below the mean.

The 10-day 99 percent value at risk is therefore 2.33 × ₹ 10.18 lakh = ₹ 23.72 lakh

Question 4

On Tuesday morning (before opening of the capital market) an investor, while going through his bank statement, has observed that an amount of ₹ 7 lakhs is lying in his bank account. This amount is available for use from Tuesday till Friday. The Bank requires a minimum balance of ₹ 1,000 all the time. The investor desires to make a maximum possible investment where Value at Risk (VaR) should not exceed the balance lying in his bank account. The standard deviation of market price of the security is 1.5 percent per day. The required confidence level is 99 percent.

Given:

Standard Normal Probabilities										
z	**.00**	**.01**	**.02**	**.03**	**.04**	**.05**	**.06**	**.07**	**.08**	**.09**
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9998	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9923	.9925	.9929	.9931	.9932	.9934	.9936

You are required to determine the maximum possible investment.

Answer

Particulars	**Amount (₹)**
Amount available in bank account	7,00,000
Minimum balance to be kept	1,000
Available amount which can be used for potential investment for 4 days	6,99,000
Maximum Loss for 4 days at 99% level	6,99,000
Maximum Loss for 1 day at 99 % level (Maximum Loss for 4 days/√No. of days) = 6,99,000/√4	3,49,500
Z Score at 99% Level	2.33
Volatility in terms of Rupees (Maximum Loss/Z Score at 99% level) = 3,49,500/2.33	1,50,000
Maximum Possible Investment (Volatility in Rupees/Std Deviation) = 1,50,000/.015	1,00,00,000

Section B – Theory Questions

Question 1

Briefly explain:

(a) Compliance risk

(b) Operational risk

Answer

(a) Compliance Risk: Every **business needs to comply with rules and regulations.** For example, with the advent of Companies Act, 2013, and continuous updating of SEBI guidelines, each business organization has to comply with plethora of rules, regulations and guidelines. **Non-compliance leads to penalties** in the form of fine and imprisonment.

However, when a company ventures into a new business line or a new geographical area, the real problem then occurs. For example, a company pursuing cement business likely to venture into sugar business in a different state but laws applicable to the sugar mills in that state are different. So, that poses a compliance risk. If the company fails to comply with laws related to a new area or industry or sector, it will pose a serious threat to its survival.

(b) Operational Risk: This type of risk relates to **internal risk.** It also **relates to failure on the part of the company to cope with day-to-day operational problems. Operational risk relates to 'people' as well as 'process'.** We will take an example to illustrate this.

For example, employee paying out ₹ 1,00,000 from account of the company instead of ₹ 10,000.

This is a people as well as a process risk. An organization can employ another person to check the work of that person who has mistakenly paid ₹ 1,00,000 or it can install an electronic system that can flag off an unusual amount.

Question 2

What is Financial Risk? How it can be evaluated from point of views.

OR

The Financial Risk can be viewed from different perspective. Explain.

OR

How different stakeholders view the financial risk?

OR

Explain Financial Risk from the point of view of Stakeholder, Company and the Government.

Answer

Financial Risk is referred as the **unexpected changes in financial conditions such as prices, exchange rate, credit rating, and interest rate etc.** Though political risk is not a financial risk in direct sense but same can be included as any unexpected political change in any foreign country may lead to country risk which may ultimately result in financial loss.

The financial risk can be viewed by different stakeholders as follows:

(a) **From stakeholder's point of view**: Major stakeholders of a business are equity shareholders and they view financial gearing i.e. ratio of debt in capital structure of company as risk since in the event of winding up of a company they will be least be given priority.

Even for a lender, existing gearing is also a risk since company having high gearing faces more risk in default of payment of interest and principal repayment.

(b) **From Company's point of view**: From company's point of view if a company borrows excessively or lend to someone who defaults, then it can be forced to go into liquidation.

(c) **From Government's point of view:** From Government's point of view, the financial risk can be viewed as failure of any bank (like Lehman Brothers) or down grading of any financial institution leading to spread of distrust among society at large. Even this risk also includes willful defaulters. This can also be extended to sovereign debt crisis.

Question 3

What do you mean by term Counter Party Risk? Explain various hints that may provide an indicator of the same risk and the various techniques to manage this risk.

OR

Which type of risk covers the default by the counter party? List out the ways to manage this type of risk.

Answer

This risk occurs due to **non-honoring of obligations by the counter party** which can be failure to deliver the goods for the payment already made or vice-versa or repayment of borrowings and interest etc. Thus, this risk also covers the **credit risk** i.e. default by the counter party.

The various **hints that may provide counter party risk are** as follows:

(a) **Failure to obtain necessary resources** to complete the project or transaction undertaken.

(b) Any **regulatory restrictions from** the Government.

(c) **Hostile action** of foreign government.

(d) Let down by third party.

(e) Have **become insolvent**.

The various **techniques to manage this type of risk are** as follows:

(i) **Carrying out Due Diligence** before dealing with any third party.

(ii) **Do not over commit to a single entity** or group or connected entities.

(iii) **Know your exposure limits**.

(iv) **Review the limits** and procedure for credit approval regularly.

(v) Rapid action in the event of any likelihood of defaults.

(vi) Use of performance guarantee, insurance or other instruments.

Question 4

Explain the main risk that can be faced by an overseas investor.

Answer

Mainly **Political Risk is faced by an overseas investor, as the adverse action by the government of host country** may lead to huge loses. This can be on any of the following form:

- **Confiscation** or destruction **of overseas properties.**
- Rationing of remittance to home country.
- **Restriction on conversion of local currency** of host country into foreign currency.
- **Restriction as to borrowings.**
- Invalidation of Patents.
- **Price control of products.**

Question 5

Explain how an organization interested in making investment in foreign country can assess Country Risk and mitigate this risk.

Answer

Organisation can assess country risk

(a) **By referring political ranking** published by different business magazines.

(b) By **evaluating country's macro-economic conditions.**

(c) By **analyzing the popularity of current government** and assess their stability.

(d) By **taking advises from the embassies** of the home country in the host countries.

Further, following **techniques can be used to mitigate this risk**

(i) **Local sourcing of raw materials** and labour.

(ii) **Entering into joint ventures.**

(iii) **Local financing.**

(iv) **Prior negotiations.**

Question 6

Explain the parameters to identify the currency risk.

OR

Describe the various parameters to identify the currency risk.

Answer

Some of the parameters to identify the currency risk are as follows:

(i) Government Action: The Government action of any country has visual impact in its currency. For example, the UK Govt. decision to divorce from European Union i.e. Brexit brought the pound to its lowest since 1980's.

(ii) Nominal Interest Rate: As per interest rate parity (IRP) the currency exchange rate depends on

the nominal interest of that country.

(iii) **Inflation Rate:** Purchasing power parity theory impact the value of currency.

(iv) **Natural Calamities:** Any natural calamity can have negative impact.

(v) **War, Coup, Rebellion etc.:** All these actions can have far reaching impact on currency's exchange rates.

(vi) **Change of Government:** The change of government and its attitude towards foreign investment also helps to identify the currency risk.

Question 7

TRC Cables Ltd. (an Indian Company) is in the business of manufacturing Electrical Cables and Data Cables including Fiber Optics cables. While mainly it exports the manufactured cables to other countries it has also established its production facilities at some African countries' due availability of raw material and cheap labour there. Some of the major raw material such as copper, aluminum and other non-ferrous metals are also imported from foreign countries. Hence, overall TRC has frequent receipts and expenditure items denominated in Non-INR currencies.

Though TRC make use of Long-Term Debts and Equity to meet its long-term fund requirements but to finance its operations it make use of short-term financial instruments such as Commercial Papers, Bank Credit and Term Loans from the banks etc. If any surplus cash is left with TRC it is invested in interest yielding securities. Recently due to stiff competition from its competitors TRC has relaxed its policy for granting credit and to manage receivables it has formed a separate credit division.

Evaluate the major risks to which TRC Ltd. is exposed to.

Answer

TRC is exposed to following financial risks:

(a) **Currency Risk:** Since most of the Receipts and Payments of TRC are denominated in Non-INR currencies it is exposed to Currency Risk.

(b) **Interest Rate Risk:** As TRC borrows and invest money in short-term instruments it is exposed to Interest Rate Risk.

(c) **Counter Party Risk:** Due to relaxation of norms for granting credits certainly the receivable amount must have increased resulting in increased in Credit Risk.

(d) **Liquidity Risk:** Since for short-term funding requirements TRC is using Commercial Papers etc. they are exposed to Liquidity Risk as in time of need if funds are not available from these sources, then securities shall be sold at discounted price.

(e) **Political Risk:** As TRC is operating in various countries, it is also exposed to Political Risks such as restriction on conversion of local earnings into foreign currency, restrictions on remittance etc.

Question 8

What is Value at Risk? Identify its main features.

OR

Describe the main features of Value at Risk (VAR).

Answer

VAR is a **measure of risk of investment**. Given the normal market condition in a set of period, say, one day **it estimates how much an investment might lose**. This investment can be a portfolio, capital investment or foreign exchange etc.

Following are main features of VAR

(i) **Components of Calculations:** VAR calculation is based on following three components:

(a) Time Period

(b) Confidence Level – Generally 95% and 99%

(c) Loss in percentage or in amount

(ii) **Statistical Method:** It is a type of statistical tool based on Standard Deviation.

(iii) **Time Horizon:** VAR can be applied for different time horizons say one day, one week, one month and so on.

(iv) **Probability:** Assuming the values are normally attributed, probability of maximum loss can be predicted.

(v) **Control Risk:** Risk can be controlled by selling limits for maximum loss.

(vi) **Z Score:** Z Score indicates how many standard Deviations is away from Mean value of a population. When it is multiplied with Standard Deviation it provides VAR.

Question 9

Explain the significance of VAR.

OR

What are the applications of Value at Risk (VAR)?

Answer

VAR can be applied

(a) to **measure the maximum possible loss** on any portfolio or a trading position.

(b) as a **benchmark for performance measurement** of any operation or trading.

(c) to **fix limits for individuals dealing** in front office of a treasury department.

(d) to enable the management to **decide the trading strategies**.

(e) as a **tool for Asset and Liability Management** especially in banks.

CHAPTER - 3
Advanced Capital Budgeting Decisions

Section A – Practical Questions

Impact of Inflation on Capital Budgeting Decisions

Question 1

A firm has projected the following cash flows from a project under evaluation:

Year	₹ lakhs
0	(70)
1	30
2	40
3	30

The above cash flows have been made at expected prices after recognizing inflation. The firm's cost of capital is 10% (without inflation). The expected annual rate of inflation is 5%.

Show how the viability of the project is to be evaluated.

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

Answer

Nominal cost of capital = (1.10) (1.05) – 1 = 0.155 = 15.50%

Year	Nominal Cash Flows (₹ in lakhs)	PVF @ 15.50%	PV of Cash Flows (₹ in lakhs)
1	30	0.866	25.98
2	40	0.749	30.00
3	30	0.649	19.47
Cash Inflow			75.45
Less: Cash Outflow			(70.00)
Net Present Value			**5.45**

Advise: With positive NPV, the project is financially viable.

Question 2

Shashi Co. Ltd has projected the following cash flows from a project under evaluation:

Year	0	1	2	3
₹ (in lakhs)	(72)	30	40	30

The above cash flows have been made at expected prices after recognizing inflation. The firm's cost of capital is 10% (without inflation). The expected annual rate of inflation is 5%.

Show how the viability of the project is to be evaluated.

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

Answer

Nominal cost of capital = (1.10) (1.05) – 1 = 0.155 = 15.50%

Year	Nominal Cash Flows (₹ in lakhs)	PVF @ 15.50%	PV of Cash Flows (₹ in lakhs)
1	30	0.866	25.98
2	40	0.749	30.00
3	30	0.649	19.47
Cash Inflow			75.45
Less: Cash Outflow			(72.00)
Net Present Value			**3.45**

Advise: With positive NPV, the project is financially viable.

Question 3

Determine NPV of the project with the following information:

Initial Outlay of project	₹ 40,000
Annual revenues (without inflation)	₹ 30,000
Annual costs excluding depreciation (without inflation)	₹ 10,000
Useful life	4 years
Salvage value	Nil
Tax Rate	50%
Cost of Capital (including inflation premium of 10%)	12%

PVF @ 12% for 4 years is 0.893, 0.797, 0.712, 0.635 and show amount to nearest rupee in calculations.

Answer

Calculation of Annual Cash Flows

Particulars	Year 1	Year 2	Year 3	Year 4
Annual Revenue	33,000	36,300	39,930	43,923
Less: Annual Cost	11,000	12,100	13,310	14,641
Less: Depreciation	10,000	10,000	10,000	10,000
PBT	12,000	14,200	16,620	19,282
Less: Tax @ 50%	6,000	7,100	8,310	9,641
PAT	6,000	7,100	8,310	9,641
Add: Depreciation	10,000	10,000	10,000	10,000
Cash Inflows	16,000	17,100	18,310	19,641

Computation of NPV of the Project

Particulars	Period	Cash Flow (₹)	PVF	PV (₹)
Annual Cash Inflows	1	16,000	0.893	14,288
Annual Cash Inflows	2	17,100	0.797	13,629
Annual Cash Inflows	3	18,310	0.712	13,037
Annual Cash Inflows	4	19,641	0.635	12,472
Cash Inflow				53,426
Less: Cash Outflow				(40,000)
Net Present Value				**13,426**

Question 4

XYZ Ltd. requires ₹ 8,00,000 for an unit. Useful life of project is 4 years. Salvage value is Nil. Depreciation charge is ₹ 2,00,000 p.a.

Expected revenues & costs (excluding depreciation) ignoring inflation:

Year	1	2	3	4
Revenues	₹ 6,00,000	₹ 7,00,000	₹ 8,00,000	₹ 8,00,000
Costs	₹ 3,00,000	₹ 4,00,000	₹ 4,00,000	₹ 4,00,000

Tax rate is 60%. Cost of capital is 10% (including inflation premium).

Calculate NPV of the project, if inflation rates for revenues & costs are as follows:

Year	Revenues	Costs
1	10%	12%
2	9%	10%
3	8%	9%
4	7%	8%

Note: Show amount to the nearest rupee in calculations.

Answer

Computation of Annual Cash Flow

(i) Inflation adjusted Revenues

Year	Revenues (₹)	Revenues (Inflation Adjusted) (₹)
1	6,00,000	6,00,000 (1.10) = 6,60,000
2	7,00,000	7,00,000 (1.10) (1.09) = 8,39,300
3	8,00,000	8,00,000 (1.10) (1.09) (1.08) = 10,35,936
4	8,00,000	8,00,000 (1.10) (1.09) (1.08) (1.07) = 11,08,452

(ii) Inflation adjusted Costs

Year	Revenues (₹)	Revenues (Inflation Adjusted) (₹)
1	3,00,000	3,00,000 (1.12) = 3,36,000
2	4,00,000	4,00,000 (1.12) (1.10) = 4,92,800
3	4,00,000	4,00,000 (1.12) (1.10) (1.09) = 5,37,172
4	4,00,000	4,00,000 (1.12) (1.10) (1.09) (1.08) = 5,80,124

(iii) Tax Benefit on Depreciation = ₹ 2,00,000 x 0.60 = ₹ 1,20,000

(iv) Net Profit after Tax

Year	Revenues (Inflation Adjusted) (1)	Costs (Inflation Adjusted) (2)	Net Profit (3) = (1) – (2)	Tax (4) = 60% of (3)	Net Profit after Tax (3) – (4)
1	6,60,000	3,36,000	3,24,000	1,94,400	1,29,600
2	8,39,300	4,92,800	3,46,500	2,07,900	1,38,600
3	10,35,936	5,37,172	4,98,764	2,99,258	1,99,506
4	11,08,452	5,80,124	5,28,328	3,16,997	2,11,331

(v) Present Value of Cash Inflows

Year	Net Profit after Tax (₹)	Tax Benefit on Depreciation (₹)	Cash Inflow (₹)	PVF @ 10%	PV (₹)
1	1,29,600	1,20,000	2,49,600	0.909	2,26,886
2	1,38,600	1,20,000	2,58,600	0.826	2,13,604
3	1,99,506	1,20,000	3,19,506	0.751	2,39,949
4	2,11,331	1,20,000	3,31,331	0.683	2,26,299
					9,06,738

NPV = ₹ 9,06,738 – ₹ 8,00,000 = ₹ 1,06,738

Question 5

KLM Ltd. requires ₹ 15,00,000 for a new project. Useful life of project is 3 years. Salvage value is NIL. Depreciation is ₹ 5,00,000 p.a.

Given below are projected revenues and costs (excluding depreciation) ignoring inflation:

Year	1	2	3
Revenues in ₹	10,00,000	13,00,000	14,00,000
Costs in ₹	5,00,000	6,00,000	6,50,000

Applicable tax rate is 35%. Assume cost of capital to be 14%. The inflation rates for revenues and costs are as under:

Year	Revenues %	Costs %
1	9	10
2	8	9
3	6	7

You are required to calculate net present value of the project.

Note: Show amount to the nearest rupee in calculations.

Answer

(i) Inflation adjusted Revenues

Year	Revenues (₹)	Revenues (Inflation Adjusted) (₹)
1	10,00,000	10,00,000 (1.09) = 10,90,000
2	13,00,000	13,00,000 (1.09) (1.08) = 15,30,360
3	14,00,000	14,00,000 (1.09) (1.08) (1.06) = 17,46,965

(ii) Inflation adjusted Costs

Year	Costs (₹)	Costs (Inflation Adjusted) (₹)
1	5,00,000	5,00,000 (1.10) = 5,50,000
2	6,00,000	6,00,000 (1.10) (1.09) = 7,19,400
3	6,50,000	6,50,000 (1.10) (1.09) (1.07) = 8,33,905

(iii) Tax Benefit on Depreciation = ₹ 5,00,000 x 0.35 = ₹ 1,75,000

(iv) Net Profit after Tax

Year	Revenues (Inflation Adjusted) (₹) (1)	Costs (Inflation Adjusted) (₹) (2)	Net Profit (₹) (3) = (1) – (2)	Tax (₹) (4) = 35% of (3)	Profit after Tax (₹) (3) – (4)
1	10,90,000	5,50,000	5,40,000	1,89,000	3,51,000
2	15,30,360	7,19,400	8,10,960	2,83,836	5,27,124
3	17,46,965	8,33,905	9,13,060	3,19,571	5,93,489

(v) Present Value of Cash Inflows

Year	Net Profit after tax (₹)	Tax Benefit on Depreciation (₹)	Cash Inflow (₹)	PVF @ 14%	PV (₹)
1	3,51,000	1,75,000	5,26,000	0.877	4,61,302
2	5,27,124	1,75,000	7,02,124	0.769	5,39,933
3	5,93,489	1,75,000	7,68,489	0.675	5,18,730
					15,19,965

NPV = ₹ 15,19,965 – ₹ 15,00,000 = ₹ 19,965

Conventional Techniques of Risk Analysis in Capital Budgeting

Question 6

An enterprise is investing ₹ 100 lakhs in a project. The risk-free rate of return is 7%. Risk premium expected by the Management is 7%. The life of the project is 5 years. Following are the cash flows that are estimated over the life of the project:

Year	Cash flows (₹ in lakhs)
1	25
2	60
3	75
4	80
5	65

Calculate Net Present Value of the project based on Risk free rate and also on the basis of Risks adjusted discount rate.

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

Answer

The Present Value of Cash Flows for all years by discounting the cash flow at 7% is calculated as below:

Year	Cash flows (₹ in lakhs)	PVF @ 7%	Present Value of Cash Flows (₹ in lakhs)
1	25	0.935	23.38
2	60	0.873	52.38
3	75	0.816	61.20
4	80	0.763	61.04
5	65	0.713	46.35
Total of Present value of Cash flows			244.34
Less: Initial investment			(100.00)
Net Present Value (NPV)			**144.34**

Now, when the risk-free rate is 7% and the risk premium expected by the Management is 7%, then risk adjusted discount rate is 7% + 7% = 14%

Discounting the above cash flows using the Risk Adjusted Discount Rate would be as below:

Year	Cash flows (₹ in lakhs)	PVF @ 14%	Present Value of Cash Flows (₹ in lakhs)
1	25	0.877	21.93
2	60	0.769	46.14
3	75	0.675	50.63
4	80	0.592	47.36
5	65	0.519	33.74

Total of Present value of Cash flows	199.79
Less: Initial investment	(100.00)
Net Present Value (NPV)	**99.79**

Question 7

Determine the risk adjusted net present value of the following projects:

	X	Y	Z
Net cash outlays (₹)	2,10,000	1,20,000	1,00,000
Project life	5 years	5 years	5 years
Annual Cash inflow (₹)	70,000	42,000	30,000
Coefficient of variation	1.2	0.8	0.4

The Company selects the risk adjusted rate of discount on the basis of the coefficient of variation:

Coefficient of Variation	Risk Adjusted Rate of Return	PV Factor 1 to 5 years at RADR
0.0	10%	3.791
0.4	12%	3.605
0.8	14%	3.433
1.2	16%	3.274
1.6	18%	3.127
2.0	22%	2.864
More than 2.0	25%	2.689

Answer

Statement showing the determination of the risk adjusted net present value

Projects	Net cash outlays	Coefficient of variation	RADR	Annual cash inflow	PV factor 1-5 years	Discounted cash inflow (₹)	Net present value (₹)
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii) = (v) x (vi)	(viii) = (vii) – (ii)
X	2,10,000	1.20	16%	70,000	3.274	2,29,180	19,180
Y	1,20,000	0.80	14%	42,000	3.433	1,44,186	24,186
Z	1,00,000	0.40	12%	30,000	3.605	1,08,150	8,150

Question 8

New Projects Ltd. is evaluating 3 projects, P-I, P-II, P-III. Following information is available in respect of these projects:

	P-I	P-II	P-III

Cost	₹ 15,00,000	₹ 11,00,000	₹ 19,00,000
Inflows: Year 1	6,00,000	6,00,000	4,00,000
Year 2	6,00,000	4,00,000	6,00,000
Year 3	6,00,000	5,00,000	8,00,000
Year 4	6,00,000	2,00,000	12,00,000
Risk Index	1.80	1.00	0.60

Minimum required rate of return of the firm is 15% and applicable tax rate is 40%. The risk free interest rate is 10%.

Required:

(i) Find out the risk-adjusted discount rate (RADR) for these projects.

(ii) Which project is the best?

Answer

(i) The risk free rate of interest and risk factor for each of the projects are given. The risk adjusted discount rate (RADR) for different projects can be found on the basis of CAPM as follows:

Required Rate of Return = I_{Rf} + (k_o – I_{Rf}) x Risk Factor

For P-I: RADR = 0.10 + (0.15 – 0.10) x 1.80 = 19%

For P-II: RADR = 0.10 + (0.15 – 0.10) x 1.00 = 15%

For P-III: RADR = 0.10 + (0.15 – 0.10) x 0.60 = 13%

(ii) The three projects can now be evaluated at 19%, 15% and 13% discount rate as follows:

Project P-I

Annual Inflows	₹ 6,00,000
PVAF (19%, 4)	2.639
PV of Inflows (₹ 6,00,000 x 2.639)	₹ 15,83,400
Less: Cost of Investment	(₹ 15,00,000)
Net Present Value	**₹ 83,400**

Project P-II

Year	Cash Inflow (₹)	PVF @ 15%	PV (₹)
1	6,00,000	0.870	5,22,000
2	4,00,000	0.756	3,02,400
3	5,00,000	0.658	3,29,000
4	2,00,000	0.572	1,14,400
Total Present Value			12,67,800
Less: Cost of Investment			(11,00,000)
Net Present Value			**1,67,800**

Project P-III

Year	Cash Inflow (₹)	PVF @ 13%	PV (₹)
1	4,00,000	0.885	3,54,000
2	6,00,000	0.783	4,69,800
3	8,00,000	0.693	5,54,400
4	12,00,000	0.613	7,35,600
Total Present Value			21,13,800
Less: Cost of Investment			(19,00,000)
Net Present Value			**2,13,800**

Project P-III has highest NPV. So, it should be accepted by the firm.

Question 9

If Investment proposal costs ₹ 45,00,000 and risk free rate is 5%, calculate net present value under certainty equivalent technique.

Year	Expected cash flow (₹)	Certainty Equivalent coefficient
1	10,00,000	0.90
2	15,00,000	0.85
3	20,00,000	0.82
4	25,00,000	0.78

Note: PVF @ 5% for four years is 0.9524, 0.9070, 0.8638, 0.8227

Answer

$$NPV = \frac{10,00,000 \times (0.90)}{(1.05)^1} + \frac{15,00,000 \times (0.85)}{(1.05)^2} + \frac{20,00,000 \times (0.82)}{(1.05)^3} + \frac{25,00,000 \times (0.78)}{(1.05)^4} - 45,00,000$$

= ₹ 5,34,482

Question 10

The Textile Manufacturing Company Ltd., is considering one of two mutually exclusive proposals, Projects M and N, which require cash outlays of ₹ 8,50,000 and ₹ 8,25,000 respectively. The certainty-equivalent (C.E) approach is used in incorporating risk in capital budgeting decisions. The current yield on government bonds is 6% and this is used as the risk free rate. The expected net cash flows and their certainty equivalents are as follows:

Project M			Project N	
Year-end	**Cash Flow (₹)**	**C.E.**	**Cash Flow (₹)**	**C.E.**
1	4,50,000	0.8	4,50,000	0.9
2	5,00,000	0.7	4,50,000	0.8
3	5,00,000	0.5	5,00,000	0.7

Required:

(i) Which project should be accepted?

(ii) If risk adjusted discount rate method is used, which project would be appraised with a higher rate and why?

Answer

(i) Statement Showing the Net Present Value of Project M

Year end (a)	Cash Flow (₹) (b)	C.E. (c)	Adjusted Cash flow (₹) (d) = (b) x (c)	PVF @ 6% (e)	Present value (₹) (f) = (d) x (e)
1	4,50,000	0.8	3,60,000	0.943	3,39,480
2	5,00,000	0.7	3,50,000	0.890	3,11,500
3	5,00,000	0.5	2,50,000	0.840	2,10,000
					8,60,980
Less: Initial Investment					(8,50,000)
Net Present Value					10,980

Statement Showing the Net Present Value of Project N

Year end (a)	Cash Flow (₹) (b)	C.E. (c)	Adjusted Cash flow (₹) (d) = (b) x (c)	PVF @ 6% (e)	Present value (₹) (f) = (d) x (e)
1	4,50,000	0.9	4,05,000	0.943	3,81,915
2	4,50,000	0.8	3,60,000	0.890	3,20,400
3	5,00,000	0.7	3,50,000	0.840	2,94,000
					9,96,315
Less: Initial Investment					(8,25,000)
Net Present Value					1,71,315

Decision: Since the net present value of Project N is higher, so the project N should be accepted.

(ii) Certainty Equivalent (C.E.) Co-efficient of Project M (2.0) is lower than Project N (2.4). This means Project M is riskier than Project N as "higher the riskiness of a cash flow, the lower will be the CE factor". If risk adjusted discount rate (RADR) method is used, Project M would be analysed with a higher rate.

RADR is based on the premise that riskiness of a proposal may be taken care of, by adjusting the discount rate. The cash flows from a more risky proposal should be discounted at a relatively higher discount rate as compared to other proposals whose cash flows are less risky. Any investor is basically risk averse. However, he may be ready to take risk provided he is rewarded for undertaking risk by higher returns. So, more risky the investment is, the greater would be the expected return. The expected return is expressed in terms of discount rate which is also the minimum required rate of return generated by a proposal if it is to be accepted. Therefore, there is a positive correlation between risk of a proposal and the discount rate.

Question 11

Jumble Consultancy Group has determined relative utilities of cash flows of two forthcoming projects of its client company as follows:

Cash Flow in ₹	-15,000	-10,000	-4,000	0	15,000	10,000	5,000	1,000
Utilities	-100	-60	-3	0	40	30	20	10

The distribution of cash flows of project A and Project B are as follows:

Project A

Cash Flow (₹)	-15,000	-10,000	15,000	10,000	5,000
Probability	0.10	0.20	0.40	0.20	0.10

Project B

Cash Flow (₹)	-10,000	-4,000	15,000	5,000	10,000
Probability	0.10	0.15	0.40	0.25	0.10

Which project should be selected and why?

Answer

Evaluation of project utilizes of Project A and Project B

Project A

Cash flow (in ₹)	Probability	Utility	Utility value
-15,000	0.10	-100	-10
-10,000	0.20	-60	-12
15,000	0.40	40	16
10,000	0.20	30	6
5,000	0.10	20	2
			2

Project B

Cash flow (in ₹)	Probability	Utility	Utility value
-10,000	0.10	-60	-6
-4,000	0.15	-3	-0.45
15,000	0.40	40	16
5,000	0.25	20	5
10,000	0.10	30	3
			17.55

Project B should be selected as its expected utility is more.

Sensitivity Analysis Technique of Risk Analysis in Capital Budgeting

Question 12

From the following details relating to a project, analyse the sensitivity of the project to changes in initial project cost, annual cash inflow and cost of capital considering a 10% adverse variance in each variable:

Initial Project Cost (₹)	1,20,000
Annual Cash Inflow (₹)	45,000
Project Life (Years)	4
Cost of Capital	10%

To which of the three factors, the project is most sensitive?

Note: Cumulative annuity factor for 4 years @ 10% is 3.169 and @ 11% is 3.103

Answer

Calculation of NPV

PV of cash inflows (₹ 45,000 x 3.169)	₹ 1,42,605
Less: Initial Project Cost	(₹ 1,20,000)
NPV	₹ 22,605

If initial project cost is varied adversely by 10%

NPV (Revised) = ₹ 1,42,605 – ₹ 1,32,000 = ₹ 10,605

$$\text{Change in NPV} = \frac{₹\ 22,605 - ₹\ 10,605}{₹\ 22,605} = 53.08\%$$

If annual cash inflow is varied adversely by 10%

Revised annual inflow = ₹ 40,500

NPV (Revised) = (₹ 40,500 x 3.169) – ₹ 1,20,000 = ₹ 8,345

$$\text{Change in NPV} = \frac{₹\ 22,605 - ₹\ 8,345}{₹\ 22,605} = 63.08\%$$

If cost of capital is varied adversely by 10%

NPV (Revised) = (₹ 45,000 x 3.103) – ₹ 1,20,000 = ₹ 19,635

$$\text{Change in NPV} = \frac{₹\ 22,605 - ₹\ 19,635}{₹\ 22,605} = 13.14\%$$

Conclusion: Project is most sensitive to 'annual cash inflow'.

Question 13

X Ltd. is considering its new project with the following details:

Particulars	
Initial capital cost	₹ 400 Cr.
Annual unit sales	5 Cr.

Selling price per unit	₹ 100
Variable cost per unit	₹ 50
Fixed costs per year	₹ 50 Cr.
Discount Rate	6%

Consider Life of the project as 3 years.

Required:

(i) Calculate the NPV of the project.

(ii) Compute the impact on the project's NPV considering a 2.5% adverse variance in each variable. Which variable is having maximum effect?

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

Answer

(i) Calculation of Net Cash Inflow per year

	Particulars		Amount (₹)
A	Selling price per unit		100
B	Variable cost per unit		50
C	Contribution per unit	(A – B)	50
D	Number of units sold per year		5 Cr.
E	Total Contribution	(C x D)	₹ 250 Cr.
F	Fixed cost per year		₹ 50 Cr.
G	Net cash inflow per year	(E – F)	₹ 200 Cr.

Calculation of Net Present Value (NPV) of the Project

Year	Year Cash Flow (₹ in Cr.)	PV factor @ 6%	Present Value (PV) (₹ in Cr.)
0	(400.00)	1.000	(400.00)
1	200.00	0.943	188.60
2	200.00	0.890	178.00
3	200.00	0.840	168.00
Net Present Value			134.60

(ii) Sensitivity Analysis considering 2.5 % Adverse Variance in each variable

Particulars	Base	Initial capital cost increased to ₹ 410 crore	Selling Price per unit reduced to ₹ 97.5	Variable Cost per unit increased to ₹ 51.25	Fixed Cost per unit increased to ₹ 51.25	Units sold per year reduced to 4.875 crore
Selling price p.u. (A)	100	100	97.5	100	100	100

Variable cost p.u. (B)	50	50	50	51.25	50	50
Contribution p.u. (C) = (A) – (B)	50	50	47.5	48.75	50	50
Number of units sold (units in Crores) (D)	5	5	5	5	5	4.875
	(₹ in Cr.)	(₹ in Cr.)	(₹ in Cr.)	(₹ in Cr.)	(₹ in Cr.)	(₹ in Cr.)
Total Contribution (E) = (C) x (D)	250	250	237.5	243.75	250	243.75
Fixed cost (F)	50	50	50	50	51.25	50
Net Cash Inflow (G) = (E) – (F)	200	200	187.5	193.75	198.75	193.75
PV (H) = (G) x 2.673	534.60	534.60	501.19	517.89	531.26	517.89
Initial capital cost (I)	400	410	400	400	400	400
NPV (J) = (H) – (I)	134.60	124.60	101.19	117.89	131.26	117.89
% Change in NPV (K)	–	–7.43%	–24.82%	–12.41%	–2.48%	–12.41%

Thus, the change in selling price has the maximum effect on the NPV by 24.82%.

Question 14

Red Ltd. is considering a project with the following Cash flows:

Years	Cost of Plant	Recurring Cost	Savings
0	10,000		
1		4,000	12,000
2		5,000	14,000

The cost of capital is 9%. Measure the sensitivity of the project to changes in the levels of plant value, running cost and savings considering a 10% adverse variance in each variable.

Which factor is the most sensitive to affect the acceptability of the project?

Answer

PV of Cash Flows

Year 1	Running Cost	₹ 4,000 x 0.917	(₹ 3,668)
	Savings	₹ 12,000 x 0.917	₹ 11,004
Year 2	Running Cost	₹ 5,000 x 0.842	(₹ 4,210)
	Savings	₹ 14,000 x 0.842	₹ 11,788
			₹ 14,914
Year 0	Less: PV of Cash Outflow	₹ 10,000 x 1	(₹ 10,000)
NPV			₹ 4,914

Sensitivity Analysis

(i) If the initial project cost is varied adversely by say 10%

NPV (Revised) = ₹ 4,914 – ₹ 1,000 = ₹ 3,914

$$\text{Change in NPV} = \frac{₹\ 4,914 - ₹\ 3,914}{₹\ 4,914} = 20.35\%$$

(ii) If Annual Running Cost is varied by say 10%

NPV (Revised) = ₹ 4,914 – (₹ 400 x 0.917) – (₹ 500 x 0.843)

= ₹ 4,914 – ₹ 367 – ₹ 421 = ₹ 4,126

$$\text{Change in NPV} = \frac{₹\ 4,914 - ₹\ 4,126}{₹\ 4,914} = 16.04\%$$

(iii) If Saving is varied by say 10%

NPV (Revised) = ₹ 4,914 – (₹ 1,200 x 0.917) – (₹ 1,400 x 0.843)

= ₹ 4,914 – ₹ 1,100 – ₹ 1,180 = ₹ 2,634

$$\text{Change in NPV} = \frac{₹\ 4,914 - ₹\ 2,634}{₹\ 4,914} = 46.40\%$$

Hence, savings factor is the most sensitive to affect the acceptability of the project.

Question 15

XYZ Ltd. is considering a project for which the following estimates are available:

	₹
Initial Cost of the project	10,00,000
Sales price per unit	60
Cost per unit	40
Sales volumes	
Year 1	20,000 units
Year 2	30,000 units
Year 3	30,000 units

Discount rate is 10% p.a.

You are required to measure the sensitivity of the project in relation to each of the following parameters such that the NPV becomes zero:

(a) Sales Price per unit

(b) Unit cost

(c) Sales volume

(d) Initial outlay

(e) Project lifetime

Answer

Calculation of NPV

$$NPV = -10,00,000 + \frac{20,000 \times 20}{(1+0.10)^1} + \frac{30,000 \times 20}{(1+0.10)^2} + \frac{30,000 \times 20}{(1+0.10)^3}$$

$= -10,00,000 + 3,63,636 + 4,95,868 + 4,50,789$

$= 13,10,293 - 10,00,000 = ₹\ 3,10,293$

Measurement of sensitivity is as follows:

(a) Sales Price:

Let the sale price per unit be S so that the project would break even with 0 NPV.

$$\therefore 10,00,000 = \frac{20,000 \times (S-40)}{(1+0.10)^1} + \frac{30,000 \times (S-40)}{(1+0.10)^2} + \frac{30,000 \times (S-40)}{(1+0.10)^3}$$

$$S - 40 = \frac{10,00,000}{65,514}$$

$S - 40 = ₹\ 15.26$

$S = ₹\ 55.26$ which represents a fall of [(60 – 55.26)/60] or 0.079 or 7.9%.

(b) Unit Cost:

If sales price = ₹ 60 the cost price required to give a margin of ₹ 15.26 is (₹ 60 – ₹ 15.26) or ₹ 44.74 which would represent a rise of 11.85% i.e., [(44.74 – 40)/40].

(c) Sales Volume:

The requisite percentage fall is: $\frac{3,10,293}{13,10,293} \times 100 = 23.68\%$

(d) Since PV of inflows remains at ₹ 13,10,293 the initial outlay must also be the same.

$$\therefore \text{Percentage rise} = \frac{3,10,293}{10,00,000} \times 100 = 31.03\%$$

(e) Present value for 1st two years

$= -10,00,000 + 4,00,000 \times 0.909 + 6,00,000 \times 0.826$

$= -10,00,000 + 3,63,600 + 4,95,600$

$= -10,00,000 + 8,59,200 = -1,40,800$

So, project needs to run for some part of third year so that present value of return is ₹ 1,40,800. It can be computed as follows:

(i) 30,000 units x ₹ 20 x 0.751 = ₹ 4,50,600

(ii) Per day Production in (₹) assuming a year of 360 days

$$= \frac{₹\ 4,50,600}{360} = ₹\ 1,252$$

(iii) Days needed to recover ₹ 1,40,800

$$= \frac{₹\ 1,40,800}{₹\ 1,252} = 112$$

Thus, if the project runs for 2 years and 112 days then break-even would be achieved representing a fall of 22.97% i.e., [(3 – 2.311)/3].

Question 16

Unnat Ltd. is considering investing ₹ 50,00,000 in a new machine. The expected life of machine is five years and has no scrap value. It is expected that 2,00,000 units will be produced and sold each year at a selling price of ₹ 30.00 per unit. It is expected that the variable costs to be ₹ 16.50 per unit and fixed costs to be ₹ 10,00,000 per year. Cost of capital of Unnat Ltd. is 12% and acceptable level of risk is 20%.

You are required to measure the sensitivity of the project's net present value to a change in the following project variables such that the NPV becomes zero.:

(a) sale price

(b) sales volume

(c) variable cost

(d) On further investigation, it is found that there is a significant chance that the expected sales volume of 2,00,000 units per year will not be achieved. The sales manager of Unnat Ltd. suggests that sales volumes could depend on expected economic states which could be assigned the following probabilities:

State of Economy	Annual Sales (in Units)	Probability
Poor	1,75,000	0.30
Normal	2,00,000	0.60
Good	2,25,000	0.10

Calculate expected net present value of the project and give your decision whether company should accept the project or not.

Answer

Calculation of NPV

= –₹ 50,00,000 + [2,00,000 x (₹ 30 – ₹ 16.50) – ₹ 10,00,000] x PVIAF (12%, 5)

= –₹ 50,00,000 + [2,00,000 x ₹ 13.50 – ₹ 10,00,000] x 3.605

= –₹ 50,00,000 + [₹ 27,00,000 – ₹ 10,00,000] x 3.605

= –₹ 50,00,000 + ₹ 61,28,500

= ₹ 11,28,500

Measurement of Sensitivity Analysis:

(a) Sales Price:

Let the sale price per unit be S so that the project would break even with 0 NPV.

∴ ₹ 50,00,000 = [2,00,000 x (S – ₹ 16.50) – ₹ 10,00,000] x PVIAF (12%, 5)

₹ 50,00,000 = [2,00,000S – ₹ 33,00,000 – ₹ 10,00,000] x 3.605

₹ 50,00,000 = [2,00,000S – ₹ 43,00,000] x 3.605

₹ 13,86,963 = 2,00,000S – ₹ 43,00,000

₹ 56,86,963 = 2,00,000S

S = ₹ 28.43 which represents a fall of [(30 – 28.43)/30] or 0.0523 or 5.23%.

(b) Sales Volume:

Let V be the sale volume so that the project would break even with 0 NPV.

∴ ₹ 50,00,000 = [V x (₹ 30 – ₹ 16.50) – ₹ 10,00,000] x PVIAF (12%, 5)

₹ 50,00,000 = [V x ₹ 13.50 – ₹ 10,00,000] x PVIAF (12%, 5)

₹ 50,00,000 = [₹ 13.50V – ₹ 10,00,000] x 3.605

₹ 13,86,963 = ₹ 13.50V – ₹ 10,00,000

₹ 23,86,963 = ₹ 13.50V

V = 1,76,812 which represents a fall of [(2,00,000 – 1,76,812)/2,00,000] or 0.1159 or 11.59%.

(c) Variable Cost:

Let the variable cost be V so that the project would break even with 0 NPV.

∴ ₹ 50,00,000 = [2,00,000 x (₹ 30 – V) – ₹ 10,00,000] x PVIAF (12%, 5)

₹ 50,00,000 = [₹ 60,00,000 – 2,00,000V – ₹ 10,00,000] x 3.605

₹ 50,00,000 = [₹ 50,00,000 – 2,00,000V] x 3.605

₹ 13,86,963 = ₹ 50,00,000 – 2,00,000V

₹ 36,13,037 = 2,00,000V

V = ₹ 18.07 which represents a fall of [(18.07 – 16.50)/16.50] or 0.0951 or 9.51%.

(d) Expected Net Present Value

(1,75,000 x 0.30) + (2,00,000 x 0.60) + (2,25,000 x 0.10) = 1,95,000

NPV = [1,95,000 x ₹ 13.50 – ₹ 10,00,000] x 3.605 – ₹ 50,00,000 = ₹ 8,85,163

Further NPV in worst and best cases will be as follows:

Worst Case:

[1,75,000 x ₹ 13.50 – ₹ 10,00,000] x 3.605 – ₹ 50,00,000 = –₹ 88,188

Best Case:

[2,25,000 x ₹ 13.50 – ₹ 10,00,000] x 3.605 – ₹ 50,00,000 = ₹ 23,45,188

Thus, there are 30% chances that the rise will be a negative NPV and 70% chances of positive NPV. Since acceptable level of risk of Unnat Ltd. is 20% and there are 30% chances of negative NPV hence project should not be accepted.

Question 17

The Easygoing Company Limited is considering a new project with initial investment, for a product "Survival". It is estimated that IRR of the project is 16% having an estimated life of 5 years.

Financial Manager has studied that project with sensitivity analysis of NPV becoming zero and informed that annual fixed cost sensitivity is 7.8416%, whereas cost of capital (discount rate) sensitivity is 60%.

Other information available are:

Profit Volume Ratio (P/V) is 70%

Variable cost is ₹ 60 per unit

Annual Cash Flow is ₹ 57,500

Ignore Depreciation on initial investment and impact of taxation.

Calculate:

(i) Initial Investment of the Project

(ii) Net Present Value of the Project

(iii) Annual Fixed Cost

(iv) Estimated annual unit of sales

(v) Break Even Units

Cumulative discounting factor for 5 years

8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%
3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127

Answer

(i) Initial Investment

IRR = 16% (Given)

At IRR, NPV shall be zero, therefore

Initial Cost of Investment = PVAF (16%, 5) x Cash Flow (Annual)

= 3.274 x ₹ 57,500

= ₹ 1,88,255

(ii) Net Present Value (NPV)

Let Cost of Capital be X, then

$$\frac{16 - X}{X} = 60\%$$

X = 10%

Thus NPV of the project

= Annual Cash Flow x PVAF (10%, 5) – Initial Investment

= ₹ 57,500 x 3.791 – ₹ 1,88,255

= ₹ 2,17,982.50 – ₹ 1,88,255 = ₹ 29,727.50

(iii) Annual Fixed Cost

Let change in the Fixed Cost which makes NPV zero is X. Then,

₹ 29,727.50 – 3.791X = 0

X = ₹ 7,841.60

Let original Fixed Cost be Y then,

Y x 7.8416% = ₹ 7,841.60

Y = ₹ 1,00,000

Thus Fixed Cost is equal to ₹ 1,00,000

(iv) Estimated Annual Units of Sales

$$\text{Selling Price per unit} = \frac{₹\ 60}{100\% - 70\%} = ₹\ 200$$

$$\frac{\text{Annual Cash Flow + Fixed Cost}}{\text{P/V Ratio}} = \text{Sales Value}$$

$$\frac{₹\ 57,500 + ₹\ 1,00,000}{0.70} = ₹\ 2,25,000$$

$$\text{Sales in Units} = \frac{₹\ 2,25,000}{₹\ 200} = 1,125 \text{ units}$$

(v) Break Even Units

$$\frac{\text{Fixed Cost}}{\text{Contribution Per Unit}} = \frac{₹\ 1,00,000}{₹\ 140} = 714.285 \text{ units}$$

Statistical Techniques of Risk Analysis in Capital Budgeting

Question 18

Calculate Variance and Standard Deviation of Project A and Project B on basis of following information:

Project A		Project B	
NPV (₹)	**Probability**	**NPV (₹)**	**Probability**
8,000	0.10	24,000	0.10
10,000	0.20	20,000	0.15
12,000	0.40	16,000	0.50
14,000	0.20	12,000	0.15
16,000	0.10	8,000	0.10

Answer

Calculation of Expected Value for Project A and Project B

Project A			Project B		
NPV	**Probability**	**Expected Value**	**NPV**	**Probability**	**Expected Value**
8,000	0.10	800	24,000	0.10	2,400
10,000	0.20	2,000	20,000	0.15	3,000
12,000	0.40	4,800	16,000	0.50	8,000
14,000	0.20	2,800	12,000	0.15	1,800
16,000	0.10	1,600	8,000	0.10	800
ENPV		**12,000**			**16,000**

Project A:

Variance (σ^2) = $(8,000 - 12,000)^2 \times (0.1) + (10,000 - 12,000)^2 \times (0.2) + (12,000 - 12,000)^2 \times (0.4) + (14,000 - 12,000)^2 \times (0.2) + (16,000 - 12,000)^2 \times (0.1)$

= 16,00,000 + 8,00,000 + 0 + 8,00,000 + 16,00,000 = 48,00,000

Standard Deviation (σ) = $\sqrt{\text{Variance } (\sigma^2)}$ = $\sqrt{48,00,000}$ = 2,190.90

Project B:

Variance (σ^2) = (24,000 – 16,000)^2 x (0.1) + (20,000 – 16,000)^2 x (0.15) + (16,000 – 16,000)^2 x (0.5) + (12,000 – 16,000)^2 x (0.15) + (8,000 – 16,000)^2 x (0.1)

= 64,00,000 + 24,00,000 + 0 + 24,00,000 + 64,00,000 = 1,76,00,000

Standard Deviation (σ) = $\sqrt{\text{Variance } (\sigma^2)}$ = $\sqrt{1,76,00,000}$ = 4,195.23

Question 19

Calculate Coefficient of Variation of Project A and Project B based on the following information:

Project A		Project B	
NPV (₹)	**Probability**	**NPV (₹)**	**Probability**
10,000	0.10	26,000	0.10
12,000	0.20	22,000	0.15
14,000	0.40	18,000	0.50
16,000	0.20	14,000	0.15
18,000	0.10	10,000	0.10

Answer

Calculation of Expected Value for Project A and Project B

Project A			Project B		
NPV	**Probability**	**Expected Value**	**NPV**	**Probability**	**Expected Value**
10,000	0.10	1,000	26,000	0.10	2,600
12,000	0.20	2,400	22,000	0.15	3,300
14,000	0.40	5,600	18,000	0.50	9,000
16,000	0.20	3,200	14,000	0.15	2,100
18,000	0.10	1,800	10,000	0.10	1,000
ENPV		**14,000**			**18,000**

Project A:

Variance (σ^2) = (10,000 – 14,000)^2 x (0.1) + (12,000 – 14,000)^2 x (0.2) + (14,000 – 14,000)^2 x (0.4) + (16,000 – 14,000)^2 x (0.2) + (18,000 – 14,000)^2 x (0.1)

= 16,00,000 + 8,00,000 + 0 + 8,00,000 + 16,00,000 = 48,00,000

Standard Deviation (σ) = $\sqrt{\text{Variance } (\sigma^2)}$ = $\sqrt{48,00,000}$ = 2,190.90

Project B:

Variance (σ^2) = (26,000 – 18,000)^2 x (0.1) + (22,000 – 18,000)^2 x (0.15) + (18,000 – 18,000)^2 x (0.5) + (14,000 – 18,000)^2 x (0.15) + (10,000 – 18,000)^2 x (0.1)

$= 64,00,000 + 24,00,000 + 0 + 24,00,000 + 64,00,000 = 1,76,00,000$

Standard Deviation (σ) = $\sqrt{\text{Variance } (\sigma^2)} = \sqrt{1,76,00,000} = 4,195.23$

Projects	Coefficient of variation	Risk	Expected Value
A	2,190.90/14,000 = 0.16	Less	Less
B	4,195.23/18,000 = 0.23	More	More

In project A, risk per rupee of return is ₹ 0.16 while in project B, it is ₹ 0.23. Therefore, Project A is better than Project B.

Question 20

KLM Ltd., is considering taking up one of the two projects, Project K and Project S. Both the projects having same life require equal investment of ₹ 80 lakhs each. Both are estimated to have almost the same yield. As the company is new to this type of business, the cash flow arising from the projects cannot be estimated with certainty. An attempt was therefore, made to use probability to analyse the pattern of cash flow from other projects during the first year of operations. This pattern is likely to continue during the life of these projects. The results of the analysis are as follows:

Project K		Project S	
NPV (₹ in lakhs)	Probability	NPV (₹ in lakhs)	Probability
11	0.1	9	0.1
13	0.2	13	0.25
15	0.4	17	0.3
17	0.2	21	0.25
19	0.1	25	0.1

Required:

(i) Calculate variance, standard deviation and co-efficient of variance for both the projects.

(ii) Which of the two projects is riskier?

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

Answer

(i) Calculation of Variance and Standard Deviation

Project K

Expected NPV $= (0.10 \times 11) + (0.20 \times 13) + (0.40 \times 15) + (0.20 \times 17) + (0.10 \times 19)$

$= 1.1 + 2.6 + 6 + 3.4 + 1.9 = 15$

$\sigma^2 = 0.10 (11 - 15)^2 + 0.20 (13 - 15)^2 + 0.40 (15 - 15)^2 + 0.20 (17 - 15)^2 + 0.10 (19 - 15)^2$

$= 1.6 + 0.8 + 0 + 0.8 + 1.6 = 4.8$

$\sigma = \sqrt{4.8} = 2.19$

Project S

Expected NPV = (0.10 x 9) + (0.25 x 13) + (0.30 x 17) + (0.25 x 21) + (0.10 x 25)

= 0.9 + 3.25 + 5.1 + 5.25 + 2.5 = 17

$\sigma^2 = 0.1 (9 - 17)^2 + 0.25 (13 - 17)^2 + 0.30 (17 - 17)^2 + 0.25 (21 - 17)^2 + 0.10 (25 - 17)^2$

$= 6.4 + 4 + 0 + 4 + 6.4 = 20.8$

$\sigma = \sqrt{20.8} = 4.56$

Calculation of Coefficient of Variation

$$\text{Coefficient of Variation} = \frac{\text{Standard Deviation}}{\text{Mean}}$$

$$\text{Project K} = \frac{2.19}{15} = 0.15$$

$$\text{Project S} = \frac{4.56}{17} = 0.27$$

(ii) Project S is riskier as it has higher Coefficient of Variation.

Question 21

Shivam Ltd. is considering two mutually exclusive projects A and B. Project A costs ₹ 36,000 and project B costs ₹ 30,000. You have been given below the net present value probability distribution for each project.

Project A		Project B	
NPV (₹)	**Probability**	**NPV (₹)**	**Probability**
15,000	0.2	15,000	0.1
12,000	0.3	12,000	0.4
6,000	0.3	6,000	0.4
3,000	0.2	3,000	0.1

(i) Compute the expected net present values of projects A and B.

(ii) Compute the risk attached to each project i.e. standard deviation of each probability distribution.

(iii) Compute the profitability index of each project.

(iv) Which project do you recommend? State with reasons.

Answer

(i) Statement showing computation of expected net present value of Projects A and B:

Project A			Project B		
NPV (₹)	**Probability**	**Expected Value (₹)**	**NPV (₹)**	**Probability**	**Expected Value (₹)**
15,000	0.2	3,000	15,000	0.1	1,500
12,000	0.3	3,600	12,000	0.4	4,800
6,000	0.3	1,800	6,000	0.4	2,400

3,000	0.2	600	3,000	0.1	300
		9,000			9,000

(ii) Computation of Standard deviation of each project

Project A

P	X	(X – EV)	P (X – EV)²
0.2	15,000	6,000	72,00,000
0.3	12,000	3,000	27,00,000
0.3	6,000	–3,000	27,00,000
0.2	3,000	–6,000	72,00,000
Variance			1,98,00,000

Standard Deviation of Project A = $\sqrt{1,98,00,000}$ = 4,450

Project B

P	X	(X – EV)	P (X – EV)²
0.1	15,000	6,000	36,00,000
0.4	12,000	3,000	36,00,000
0.4	6,000	–3,000	36,00,000
0.1	3,000	–6,000	36,00,000
Variance			1,44,00,000

Standard Deviation of Project B = $\sqrt{1,44,00,000}$ = 3,795

(iii) Computation of profitability index of each project

$$\text{Profitability index} = \frac{\text{Discount cash inflow}}{\text{Initial outlay}}$$

$$\text{In case of Project A: PI} = \frac{9,000 + 36,000}{36,000} = \frac{45,000}{36,000} = 1.25$$

$$\text{In case of Project B: PI} = \frac{9,000 + 30,000}{30,000} = \frac{39,000}{30,000} = 1.30$$

(iv) Measurement of risk is made by the possible variation of outcomes around the expected value and decision will be taken in view of variation in expected value where two projects have same expected value, the decision will be project which has smaller variation in expected value. In the selection of one of the two projects A and B, Project B is preferable because possible profit which may occur is subject to less variation (or dispersion). Much higher risk is lying with project A.

Question 22

A company is considering Projects X and Y with following information:

Project	Expected NPV (₹)	Standard deviation

X	1,22,000	90,000
Y	2,25,000	1,20,000

(i) Which project will you recommend based on the standard deviation?

(ii) Explain whether your opinion will change, if you use coefficient of variation as a measure of risk.

(iii) Which measure is more appropriate in this situation and why?

Answer

(i) On the basis of standard deviation, project X be chosen because it is less risky than Project Y having higher standard deviation.

(ii) $CV_x = \frac{SD}{ENPV} = \frac{90,000}{1,22,000} = 0.74$

$CV_y = \frac{SD}{ENPV} = \frac{1,20,000}{2,25,000} = 0.53$

On the basis of Co-efficient of Variation (C.V.), Project X appears to be riskier and hence Y should be accepted.

(iii) However, the NPV method in such conflicting situation is best because the NPV method is in compatibility of the objective of wealth maximisation in terms of time value.

Question 23

Possible net cash flows of Projects A and B at the end of first year and their probabilities are given below. Discount rate is 10%. For both the projects, initial investment is ₹ 10,000. Calculate the expected net present value for each project. State which project is preferable?

Project A		Project B	
Cash Flow (₹)	**Probability**	**Cash Flow (₹)**	**Probability**
8,000	0.10	24,000	0.10
10,000	0.20	20,000	0.15
12,000	0.40	16,000	0.50
14,000	0.20	12,000	0.15
16,000	0.10	8,000	0.10

Answer

Calculation of Expected Value for Project A and Project B

Project A			Project B		
Cash Flow	**Probability**	**Expected Value**	**Cash Flow**	**Probability**	**Expected Value**
8,000	0.10	800	24,000	0.10	2,400
10,000	0.20	2,000	20,000	0.15	3,000
12,000	0.40	4,800	16,000	0.50	8,000

14,000	0.20	2,800	12,000	0.15	1,800
16,000	0.10	1,600	8,000	0.10	800
ENCF		12,000			16,000

The Net Present Value for Project A = 0.909 x ₹ 12,000 – ₹ 10,000 = ₹ 908

The Net Present Value for Project B is = 0.909 x ₹ 16,000 – ₹ 10,000 = ₹ 4,544

Since the net present value of Project B is higher, so the Project B is preferable.

Question 24

Probabilities for net cash flows for 3 years of a project are as follows:

Year 1		Year 2		Year 3	
Cash Flow (₹)	**Probability**	**Cash Flow (₹)**	**Probability**	**Cash Flow (₹)**	**Probability**
2,000	0.1	2,000	0.2	2,000	0.3
4,000	0.2	4,000	0.3	4,000	0.4
6,000	0.3	6,000	0.4	6,000	0.2
8,000	0.4	8,000	0.1	8,000	0.1

Calculate the expected net present value of the project using 10% discount rate, if the Initial Investment of the project is ₹ 10,000.

Answer

Calculation of Expected Value for the project

Year 1			Year 2			Year 3		
Cash Flow (₹)	**Prob.**	**Expected Value (₹)**	**Cash Flow (₹)**	**Prob.**	**Expected Value (₹)**	**Cash Flow (₹)**	**Prob.**	**Expected Value (₹)**
2,000	0.1	200	2,000	0.2	400	2,000	0.3	600
4,000	0.2	800	4,000	0.3	1200	4,000	0.4	1,600
6,000	0.3	1,800	6,000	0.4	2400	6,000	0.2	1,200
8,000	0.4	3,200	8,000	0.1	800	8,000	0.1	800
ENCF		6,000			4,800			4,200

The present value of expected value of cash flow at 10% discount rate has been determined as follows:

$$\text{Present Value of cash flow} = \frac{ENCF_1}{(1+k)^1} + \frac{ENCF_2}{(1+k)^2} + \frac{ENCF_3}{(1+k)^3}$$

$$= \frac{6,000}{(1.10)^1} + \frac{4,800}{(1.10)^2} + \frac{4,200}{(1.10)^3}$$

$$= (6,000 \times 0.909) + (4,800 \times 0.826) + (4,200 \times 0.751) = ₹\ 12,573$$

Expected Net Present value = Present Value of cash flow – Initial Investment

= ₹ 12,573 – ₹ 10,000 = ₹ 2,573

Question 25

Skylark Airways is planning to acquire a light commercial aircraft for flying class clients at an investment of ₹ 50,00,000. The expected cash flow after tax for the next three years is as follows:

Year 1		Year 2		Year 3	
CFAT	**Probability**	**CFAT**	**Probability**	**CFAT**	**Probability**
14,00,000	0.1	15,00,000	0.1	18,00,000	0.2
18,00,000	0.2	20,00,000	0.3	25,00,000	0.5
25,00,000	0.4	32,00,000	0.4	35,00,000	0.2
40,00,000	0.3	45,00,000	0.2	48,00,000	0.1

The Company wishes to take into consideration all possible risk factors relating to airline operations. The company wants to know:

(i) The expected NPV of this venture assuming independent probability distribution with 6% risk free rate of interest.

(ii) The possible deviation in the expected value.

(iii) How would standard deviation of present value distribution help in Capital Budgeting decisions?

Note: Make calculations in ₹ lakh and upto 3 decimal points.

Answer

(i) Expected NPV

₹ in lakhs

Year I			Year II			Year III		
CFAT	**P**	**CF x P**	**CFAT**	**P**	**CF x P**	**CFAT**	**P**	**CF x P**
14	0.1	1.4	15	0.1	1.5	18	0.2	3.6
18	0.2	3.6	20	0.3	6.0	25	0.5	12.5
25	0.4	10.0	32	0.4	12.8	35	0.2	7.0
40	0.3	12.0	45	0.2	9	48	0.1	4.8
	$\bar{x}$ or $\overline{CF}$	27.0		$\bar{x}$ or $\overline{CF}$	29.3		$\bar{x}$ or $\overline{CF}$	27.9

NPV	PV factor @ 6%	Total PV
27	0.943	25.461
29.3	0.890	26.077
27.9	0.840	23.436
PV of cash inflow		74.974
Less: Cash outflow		(50.000)
NPV		24.974

(ii) Possible deviation in the expected value

Year 1

$X - \bar{X}$	$(X - \bar{X})^2$	P_1	$(X - \bar{X})^2 \times P_1$
14 – 27 = –13	169	0.1	16.9
18 – 27 = –9	81	0.2	16.2
25 – 27 = –2	4	0.4	1.6
40 – 27 = 13	169	0.3	50.7
			85.4

$\sigma_1 = \sqrt{85.4} = 9.241$

Year 2			
$X - \bar{X}$	$(X - \bar{X})^2$	P_1	$(X - \bar{X})^2 \times P_1$
15 – 29.3 = –14.3	204.49	0.1	20.449
20 – 29.3 = –9.3	86.49	0.3	25.947
32 – 29.3 = 2.7	7.29	0.4	2.916
45 – 29.3 = 15.7	246.49	0.2	49.298
			98.610

$\sigma_2 = \sqrt{98.61} = 9.930$

Year 3			
$X - \bar{X}$	$(X - \bar{X})^2$	P_1	$(X - \bar{X})^2 \times P_1$
18 – 27.9 = –9.9	98.01	0.2	19.602
25 – 27.9 = –2.9	8.41	0.5	4.205
35 – 27.9 = 7.1	50.41	0.2	10.082
48 – 27.9 = 20.1	404.01	0.1	40.401
			74.290

$\sigma_3 = \sqrt{74.29} = 8.619$

Standard deviation about the expected value:

$$\sigma = \sqrt{\frac{85.4}{(1.06)^2} + \frac{98.61}{(1.06)^4} + \frac{74.29}{(1.06)^6}} = 14.370$$

(iii) Standard deviation is a statistical measure of dispersion; it measures the deviation from a central number i.e. the mean.

In the context of capital budgeting decisions especially where we take up two or more projects giving somewhat similar mean cash flows, by calculating standard deviation in such cases, we can measure in each case the extent of variation. It can then be used to identify which of the projects is least risky in terms of variability of cash flows. A project, which has a lower coefficient of variation will be preferred if sizes are heterogeneous.

Besides this, if we assume that probability distribution is approximately normal, we are able to calculate the probability of a capital budgeting project generating a net present value less than or more than a specified amount.

Question 26

Project X and Project Y are under the evaluation of XY Co. The estimated cash flows and their probabilities are as below:

Project X: Investment (year 0) = ₹ 70 lakhs

Probability weights	0.3	0.4	0.3
Years	₹ lakhs	₹ lakhs	₹ lakhs
1	30	50	65
2	30	40	55
3	30	40	45

Project Y: Investment (year 0) = ₹ 80 lakhs

Probability weighted	Annual cash flows through life (₹ lakhs)
0.2	40
0.5	45
0.3	50

(a) Which project is better based on NPV criterion with a discount rate of 10%?

(b) Compute the standard deviation of the present value distribution and analyse the inherent risk of the projects.

The PV factors are given below:

Years	1	2	3
PVIF @ 10%	0.893	0.797	0.712

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

Answer

(a) Calculation of NPV of XY Co.:

Project X

Year	Cash Flow	PVF	PV
1	(30 x 0.3) + (50 x 0.4) + (65 x 0.3) = 48.5	0.909	44.09
2	(30 x 0.3) + (40 x 0.4) + (55 x 0.3) = 41.5	0.826	34.28
3	(30 x 0.3) + (40 x 0.4) + (45 x 0.3) = 38.5	0.751	28.91
PV of cash inflow			107.28
Less: Initial Investment			(70.00)
NPV			37.28

Project Y

Year	Cash Flow	PVF	PV

1-3	(40 x 0.2) + (45 x 0.5) + (50 x 0.3) = 45.5	2.486	113.11
PV of cash inflow			113.11
Less: Initial Investment			(80.00)
NPV			33.11

Since NPV of Project X is higher, so Project X is better.

(b) Calculation of Standard deviation (σ)

As per Hiller's model

$$M = \sum_{i=0}^{n} (1+r)^{-1} M_i$$

$$\sigma^2 = \sum_{i=0}^{n} (1+r)^{-2i} \sigma_i^2$$

Project X

Year 1 = $\sqrt{(30-48.5)^2\ 0.30 + (50-48.5)^2\ 0.40 + (65-48.5)^2\ 0.30} = \sqrt{185.25} = 13.61$

Year 2 = $\sqrt{(30-41.5)^2\ 0.30 + (40-41.5)^2\ 0.40 + (55-41.5)^2\ 0.30} = \sqrt{95.25} = 9.76$

Year 3 = $\sqrt{(30-38.5)^2\ 0.30 + (40-38.5)^2\ 0.40 + (45-38.5)^2\ 0.30} = \sqrt{35.25} = 5.94$

Standard Deviation about the expected value

$$\sigma = \sqrt{\frac{185.25}{(1.10)^2} + \frac{95.25}{(1.10)^4} + \frac{35.25}{(1.10)^6}}$$

$$= \sqrt{\frac{185.25}{1.21} + \frac{95.25}{1.4641} + \frac{35.25}{1.7716}}$$

$$= \sqrt{153.10 + 65.06 + 19.90} = \sqrt{238.06} = 15.43$$

Project Y

For 1-3 Years = $\sqrt{(40-45.5)^2\ 0.20 + (45-45.5)^2\ 0.50 + (50-45.5)^2\ 0.30} = \sqrt{12.25} = 3.50$

Standard Deviation about the expected value

$$\sigma = \sqrt{\frac{12.25}{(1.10)^2} + \frac{12.25}{(1.10)^4} + \frac{12.25}{(1.10)^6}}$$

$$= \sqrt{\frac{12.25}{1.21} + \frac{12.25}{1.4641} + \frac{12.25}{1.7716}}$$

$$= \sqrt{10.12 + 8.37 + 6.91} = \sqrt{25.4} = 5.03$$

Analysis: Project Y is less risky as its Standard Deviation is less than Project X.

Question 27

Cyber Company is considering two mutually exclusive projects. Investment outlay of both the projects is ₹ 5,00,000 and each is expected to have a life of 5 years. Under three possible situations their annual cash flows and probabilities are as under:

Probabilities	Project A Cash Flow (₹)	Project B Cash Flow (₹)
0.3	6,00,000	5,00,000
0.4	4,00,000	4,00,000
0.3	2,00,000	3,00,000

The cost of capital is 7%, which project should be accepted? Explain with workings.

The PV factors are given below:

Years	1	2	3	4	5	6	7	8	9	10
PVIF @ 7%	0.935	0.873	0.816	0.763	0.713	0.666	0.623	0.582	0.544	0.508

Answer

Project A

Expected Net Cash flow (ENCF) = 0.3 (6,00,000) + 0.4 (4,00,000) + 0.3 (2,00,000) = 4,00,000

Present Value of Expected Cash Inflows = 4,00,000 x 4.100 = 16,40,000

NPV = 16,40,000 – 5,00,000 = 11,40,000

Standard deviation in cash inflows of each year

$\sigma^2 = 0.3\ (6,00,000 - 4,00,000)^2 + 0.4\ (4,00,000 - 4,00,000)^2 + 0.3\ (2,00,000 - 4,00,000)^2$

$\sigma = \sqrt{24,00,00,00,000} = 1,54,919.33$

Standard deviation about the expected value:

$$\sigma = \sqrt{\frac{24,00,00,00,000}{(1.07)^2} + \frac{24,00,00,00,000}{(1.07)^4} + \frac{24,00,00,00,000}{(1.07)^6} + \frac{24,00,00,00,000}{(1.07)^8} + \frac{24,00,00,00,000}{(1.07)^{10}}} = 2,85,320.87$$

Project B

Expected Net Cash flow (ENCF) = 0.3 (5,00,000) + 0.4 (4,00,000) + 0.3 (3,00,000) = 4,00,000

Present Value of Expected Cash Inflows = 4,00,000 x 4.100 = 16,40,000

NPV = 16,40,000 – 5,00,000 = 11,40,000

Standard deviation in cash inflows of each year

$\sigma^2 = 0.3\ (5,00,000 - 4,00,000)^2 + 0.4\ (4,00,000 - 4,00,000)^2 + 0.3\ (3,00,000 - 4,00,000)^2$

$\sigma = \sqrt{6,00,00,00,000} = 77,459.66$

Standard deviation about the expected value:

$$\sigma = \sqrt{\frac{6,00,00,00,000}{(1.07)^2} + \frac{6,00,00,00,000}{(1.07)^4} + \frac{6,00,00,00,000}{(1.07)^6} + \frac{6,00,00,00,000}{(1.07)^8} + \frac{6,00,00,00,000}{(1.07)^{10}}} = 1,42,660.44$$

Decision: NPV in both projects being the same, the project should be decided on the basis of standard deviation and hence project 'B' should be accepted having lower standard deviation, means less risky.

Question 28

XYZ Ltd. is considering a project "A" with an initial outlay of ₹ 14,00,000 and the possible three cash inflow attached with the project as follows: (₹ '000)

Particulars	Year 1	Year 2	Year 3
Worst case	450	400	700
Most likely	550	450	800
Best case	650	500	900

Assuming the cost of capital as 9%, determine NPV in each scenario. If XYZ Ltd is certain about the most likely result in first two years but uncertain about the third year's cash flow, analyze what will be the NPV expecting worst scenario in the third year.

Note: Make calculations in ₹ '000 and upto 2 decimal points.

Answer

The possible outcomes will be as follows: (₹ '000)

Year	PVF @ 9%	Worst Case		Most likely		Best case	
		Cash Flow	PV	Cash Flow	PV	Cash Flow	PV
0	1	(1,400)	(1,400)	(1,400)	(1,400)	(1,400)	(1,400)
1	0.917	450	412.65	550	504.35	650	596.05
2	0.842	400	336.80	450	378.90	500	421.00
3	0.772	700	540.40	800	617.60	900	694.80
NPV			-110.15		100.85		311.85

If XYZ Ltd. is certain about the most likely result in first two years but uncertain about the third year's cash flow, then NPV expecting worst case scenario is expected in the third year will be as follows:

Year	Cash Flow	PVF @ 9%	PV
0	(1,400)	1	(1,400)
1	550	0.917	504.35
2	450	0.842	378.90
3	700	0.772	540.40
			23.65

Question 29

XY Ltd. has under its consideration a project with an initial investment of ₹ 1,00,000. Three probable cash inflow scenarios with their probabilities of occurrence have been estimated as below:

Annual cash inflow (₹)	20,000	30,000	40,000
Probability	0.1	0.7	0.2

The project life is 5 years and the desired rate of return is 20%. The estimated terminal values for the project assets under the three probability alternatives, respectively, are ₹ 0, 20,000 and 30,000.

You are required to:

(i) Find the probable NPV.

(ii) Find the worst case NPV and the best case NPV.

(iii) State the probability occurrence of the worst case, if the cash flows are perfectly positively correlated over time.

The PV factors are given below:

Years	1	2	3	4	5
PVIF @ 20%	0.8333	0.6944	0.5787	0.4822	0.4019

Answer

The expected cash flows of the project are as follows:

Year	Probability = 0.1	Probability = 0.7	Probability = 0.2	Total
	₹	₹	₹	₹
0	–10,000	–70,000	–20,000	–1,00,000
1	2,000	21,000	8,000	31,000
2	2,000	21,000	8,000	31,000
3	2,000	21,000	8,000	31,000
4	2,000	21,000	8,000	31,000
5	2,000	21,000	8,000	31,000
5	0	14,000	6,000	20,000

(i) NPV based on expected cash flows would be as follows:

$$= -₹\,1,00,000 + \frac{₹\,31,000}{(1+0.20)^1} + \frac{₹\,31,000}{(1+0.20)^2} + \frac{₹\,31,000}{(1+0.20)^3} + \frac{₹\,31,000}{(1+0.20)^4} + \frac{₹\,31,000}{(1+0.20)^5} + \frac{₹\,20,000}{(1+0.20)^5}$$

$= -₹\,1,00,000 + ₹\,25,832.30 + ₹\,21,526.40 + ₹\,17,939.70 + ₹\,14,948.20 + ₹\,12,458.90 + ₹\,8,038$

$= ₹\,743.50$

(ii) For the worst case, the cash flows from the cash flow column farthest on the left are used to calculate NPV

$$= -₹\,1,00,000 + \frac{₹\,20,000}{(1+0.20)^1} + \frac{₹\,20,000}{(1+0.20)^2} + \frac{₹\,20,000}{(1+0.20)^3} + \frac{₹\,20,000}{(1+0.20)^4} + \frac{₹\,20,000}{(1+0.20)^5}$$

$= -₹\,1,00,000 + ₹\,16,666 + ₹\,13,888 + ₹\,11,574 + ₹\,9,644 + ₹\,8,038 = -₹\,40,190$

For the best case, the cash flows from the cash flow column farthest on the right are used to calculate NPV

$$= -₹\,1,00,000 + \frac{₹\,40,000}{(1+0.20)^1} + \frac{₹\,40,000}{(1+0.20)^2} + \frac{₹\,40,000}{(1+0.20)^3} + \frac{₹\,40,000}{(1+0.20)^4} + \frac{₹\,40,000}{(1+0.20)^5} + \frac{₹\,30,000}{(1+0.20)^5}$$

$= -₹\,1,00,000 + ₹\,33,332 + ₹\,27,776 + ₹\,23,148 + ₹\,19,288 + ₹\,16,076 + ₹\,12,057 = ₹\,31,677$

(iii) If the cash flows are perfectly dependent, then the low cash flow in the first year will mean a low cash flow in every year. Thus, the possibility of the worst case occurring is the probability of getting ₹ 20,000 net cash flow in year 1 is 10%.

Question 30

Following are the estimates of the net cash flows and probability of a new project of M/s X Ltd.:

	Year	P = 0.3	P = 0.5	P = 0.2
Initial investment	0	4,00,000	4,00,000	4,00,000
Estimated net after tax cash inflows per year	1 to 5	1,00,000	1,10,000	1,20,000
Estimated salvage value (after tax)	5	20,000	50,000	60,000

Required rate of return from the project is 10%. Find:

(i) The expected NPV of the project.

(ii) The best case and the worst case NPVs.

(iii) The probability of occurrence of the worst case if cash flows are perfectly dependent overtime.

(iv) Standard deviation and coefficient of variation assuming that there are only three streams of cash flow, which are represented by each column of the table with the given probabilities.

(v) Coefficient of variation of X Ltd. on its average project which is in the range of 0.95 to 1.0. If the coefficient of variation of the project is found to be less risky than average, 100 basis points are deducted from the Company's cost of Capital. Should the project be accepted by X Ltd?

The PV factors are given below:

Years	1	2	3	4	5
PVIF @ 10%	0.909	0.826	0.751	0.683	0.621

Answer

(i) Expected cash flows:

Year	Net cash flows	P.V.	PV @ 10%
0	4,00,000 x 1 = -4,00,000	1.000	-4,00,000
1 to 4	1,00,000 x 0.3 + 1,10,000 x 0.5 + 1,20,000 x 0.2 = 1,09,000	3.169	3,45,421
5	1,09,000 + (20,000 x 0.3 + 50,000 x 0.5 + 60,000 x 0.2) = 1,52,000	0.621	94,392
NPV			39,813

(ii) NPV of the worst case

NPV = -4,00,000 + 1,00,000 x 3.790 + 20,000 x 0.621 = -₹ 8,580

NPV of the best case

NPV = -4,00,000 + 1,20,000 x 3.790 + 60,000 x 0.621 = ₹ 92,060

(iii) Probability of occurrence of the worst case if flows are perfectly dependent overtime = 0.3

(iv) NPV of the most likely case = -4,00,000 + (1,10,000 x 3.790) + (50,000 x 0.621) = ₹ 47,950

ENPV = 0.30 x -8,580 + 0.5 x 47,950 + 92,060 x 0.20 = ₹ 39,813

$\sigma_{NPV} = \sqrt{0.3\,(-8,580 - 39,813)^2 + 0.5\,(47,950 - 39,813)^2 + 0.2\,(92,060 - 39,813)^2}$ = ₹ 35,800

Therefore, CV = 35,800/39,813 = 0.90

(v) Risk adjusted out of cost of capital of X Ltd. = 10% – 1% = 9%

Year	Expected net cash flow	PV @ 9%	PV
0	–4,00,000	1.000	–4,00,000
1 to 4	1,09,000	3.240	3,53,160
5	1,52,000	0.650	98,800
ENPV			51,960

Therefore, the project should be accepted.

Question 31

A firm has an investment proposal, requiring an outlay of ₹ 80,000. The investment proposal is expected to have two years economic life with no salvage value. In year 1, there is a 0.4 probability that cash inflow after tax will be ₹ 50,000 and 0.6 probability that cash inflow after tax will be ₹ 60,000. The probability assigned to cash inflow after tax for the year 2 is as follows:

The cash inflow year 1	₹ 50,000		₹ 60,000	
The cash inflow year 2		Probability		Probability
	₹ 24,000	0.2	₹ 40,000	0.4
	₹ 32,000	0.3	₹ 50,000	0.5
	₹ 44,000	0.5	₹ 60,000	0.1

The firm uses a 10% discount rate for this type of investment.

Required:

(i) Construct a decision tree for the proposed investment project and calculate the expected net present value (NPV).

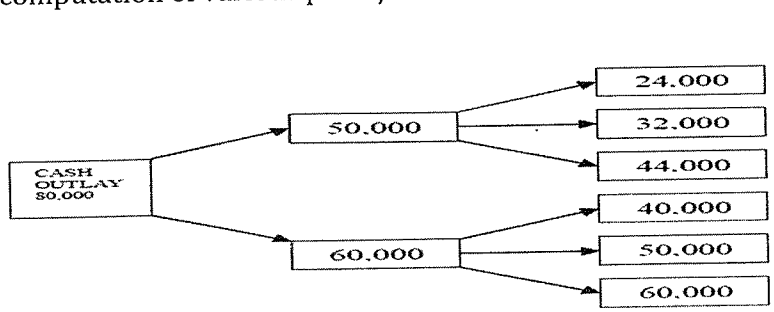
(ii) What net present value will the project yield, if worst outcome is realized? What is the probability of occurrence of this NPV?

(iii) What will be the best outcome and the probability of that occurrence?

(iv) Will the project be accepted?

Answer

(i) The decision tree diagram is presented in the chart, identifying various paths and outcomes, and computation of various paths/outcomes and NPV of each path are presented in following tables:



Path No.	Joint probability Year 1 x year 2
1	.08
2	0.12
3	0.20
4	0.24
5	0.30
6	0.06
	1.00

The Net Present Value (NPV) of each path at 10% discount rate is given below:

Path	Year 1 Cash Flows (₹)	Year 2 Cash Flows (₹)	Total Cash Inflows (PV) (₹)	Cash Inflows NPV (₹)	
1	50,000 x 0.909 = 45,450	24,000 x 0.826 = 19,824	65,274	80,000	-14,726
2	50,000 x 0.909 = 45,450	32,000 x 0.826 = 26,432	71,882	80,000	-8,118
3	50,000 x 0.909 = 45,450	44,000 x 0.826 = 36,344	81,794	80,000	1,794
4	60,000 x 0.909 = 54,540	40,000 x 0.826 = 33,040	87,580	80,000	7,580
5	60,000 x 0.909 = 54,540	50,000 x 0.826 = 41,300	95,840	80,000	15,840
6	60,000 x 0.909 = 54,540	60,000 x 0.826 = 49,560	1,04,100	80,000	24,100

Statement showing Expected Net Present Value

z	NPV (₹)	Joint Probability	Expected NPV
1	-14,726	0.08	-1,178.08
2	-8,118	0.12	-974.16
3	1,794	0.20	358.80
4	7,580	0.24	1,819.20
5	15,840	0.30	4,752.00
6	24,100	0.06	1,446.00
ENPV			6,223.76

(ii) If the worst outcome is realized the project will yield NPV of -₹ 14,726. The probability of occurrence of this NPV is 8% and a loss of ₹ 1,178 (path 1).

(iii) The best outcome will be path 6 when the NPV is at ₹ 24,100. The probability of occurrence of this NPV is 6% and a expected profit of ₹ 1,446.

(iv) The project should be accepted because the expected NPV is positive at ₹ 6,223.76 based on joint probability.

Decision Tree Technique of Risk Analysis in Capital Budgeting

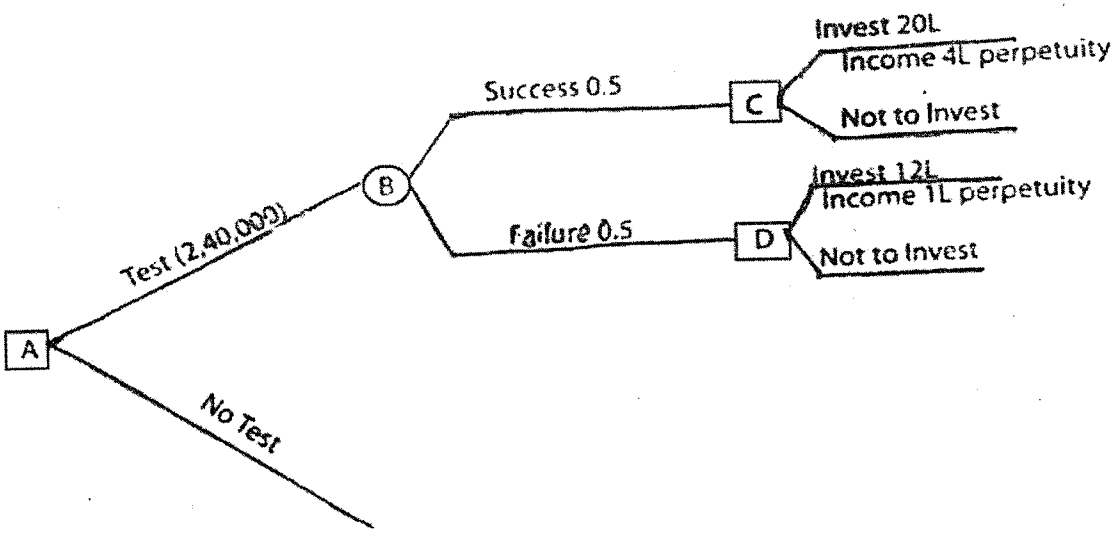
Question 32

L & R Limited wishes to develop new virus-cleaner software. The cost of the pilot project would be ₹ 2,40,000. Presently, the chances of the product being successfully launched on a commercial scale are rated at 50%. In case it does succeed. L&R can invest a sum of ₹ 20 lacs to market the product. Such an effort can generate perpetually, an annual net after tax cash income of ₹ 4 lacs. Even if the commercial launch fails, they can make investment of smaller amount of ₹ 12 lacs with hope of gaining perpetually a sum of ₹ 1 lac. Evaluate the proposal, adopting decision tree approach. The discount rate is 10%.

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

Answer

Decision tree diagram is given below:



Evaluation

At Decision Point C: The choice is between investing ₹ 20 lacs for a perpetual benefit of ₹ 4 lacs and not to invest. The preferred choice is to invest, since the capitalized value of benefit of ₹ 4 lacs (at 10%) adjusted for the investment of ₹ 20 lacs, yields a net benefit of ₹ 20 lacs.

At Decision Point D: The choice is between investing ₹ 12 lacs, for a similar perpetual benefit of ₹ 1 lac. and not to invest. Here the invested amount is greater than capitalized value of benefit at ₹ 10 lacs. There is a negative benefit of ₹ 2 lacs. Therefore, it would not be prudent to invest.

At Outcome Point B: Evaluation of EMV is as under (₹ in lacs)

Outcome	Amount (₹)	Probability	Result (₹)
Success	20.00	0.50	10.00
Failure	0.00	0.50	00.00
Net result			10.00

EMV at B is, therefore, ₹ 10 lacs.

At A: Decision is to be taken based on preferences between two alternatives. The first is to test, by investing ₹ 2,40,000 and reap a benefit of ₹ 10 lacs. The second is not to test, and thereby losing the opportunity of a possible gain.

The preferred choice is, therefore, investing a sum of ₹ 2,40,000 and undertaking the test.

Replacement Decisions

Question 33

A Company named Roby's cube decided to replace the existing Computer system of their organisation. Original cost of old system was ₹ 25,000 and it was installed 5 years ago. Current market value of old system is ₹ 5,000. Depreciation of the old system was charged with life of 10 years with Estimated

Salvage value as Nil. Depreciation of the new system will be charged with life over 5 years. Present cost of the new system is ₹ 50,000. Estimated Salvage value of the new system is ₹ 1,000. Estimated cost savings with new system is ₹ 5,000 per year. Increase in sales with new system is assumed at 10% per year based on original total sales of ₹ 10,00,00. Company follows straight line method of depreciation. Cost of capital of the company is 10% whereas tax rate is 30%.

Answer

Step I Net cash outflow (assumed at current time) [Present values of cost]:

a. Tax payable/savings from sale

= (Book value of old system – market value of old system) x Tax Rate

= [{₹ 25,000 – (5 x ₹ 2,500)} – ₹ 5,000] x 0.30 = ₹ 7,500 x 0.30

= ₹ 2,250

b. Net cash outflow

= Cost of new system – [Tax payable/savings from sale + Market value of old system]

= ₹ 50,000 – [₹ 2,250 + ₹ 5,000]

= ₹ 42,750

Step II Estimated change in cash flows per year if replacement decision is implemented:

Change in cash flow = (Change in sales ± Change in operating costs – Change in depreciation) (1 – tax rate) + Change in depreciation

= [(₹ 1,00,000 x 0.1) + ₹ 5,000 – {(₹ 49,000/5) – (₹ 25,000/10)}] (1 – 0.30) + [(₹ 49,000/5) – (₹ 25,000/10)]

= ₹ 12,690

Step III Present value of benefits = Present value of yearly cash flows + Present value of estimated salvage of new system

= ₹ 12,690 x PVIFA (10%, 5) + ₹ 1,000 x PVIF (10%, 5)

= ₹ 48,723

Step IV Net present value = Present value of benefits – Present value of costs

= ₹ 48,723 – ₹ 42,750

= ₹ 5,973

Step V Decision rule: Since NPV is positive we should accept the proposal to replace the machine.

Question 34

A company has an old machine having book value zero, which can be sold for ₹ 50,000. The company is thinking to choose one from following two alternatives:

(i) To incur additional cost of ₹ 10,00,000 to upgrade the old existing machine.

(ii) To replace old machine with a new machine costing ₹ 20,00,000 plus installation cost ₹ 50,000.

Both above proposals envisage useful life to be five years with salvage value to be nil.

The expected after tax profits for the above three alternatives are as under:

Year	Old existing Machine (₹)	Upgraded Machine (₹)	New Machine (₹)
1	5,00,000	5,50,000	6,00,000
2	5,40,000	5,90,000	6,40,000
3	5,80,000	6,10,000	6,90,000
4	6,20,000	6,50,000	7,40,000
5	6,60,000	7,00,000	8,00,000

The tax rate is 40%. The company follows straight line method of depreciation. Assume cost of capital to be 15%.

You are required to advise the company as to which alternative is to be adopted.

Note: PVF @ 15% for 5 years = 0.870, 0.756, 0.658, 0.572, 0.497

Answer

(A) Cash Outflow

₹

(i)	In case machine is upgraded:	
	Upgradation Cost	10,00,000
(ii)	In case new machine installed:	
	Cost	20,00,000
	Add: Installation cost	50,000
	Total Cost	20,50,000
	Less: Disposal of old machine [₹ 50,000 – 40% tax]	(30,000)
	Total Cash Outflow	20,20,000

Working Note:

(i) Depreciation (in case machine is upgraded) = ₹ 10,00,000 ÷ 5 = ₹ 2,00,000

(ii) Depreciation (in case new machine is installed) = ₹ 20,50,000 ÷ 5 = ₹ 4,10,000

(iii) Old existing machine (Book Value is zero). So, no depreciation.

(B) Cash Inflows after Taxes (CFAT)

Year	Old Existing Machine	Upgraded Machine			
	EAT [CFAT] (i)	EAT (ii)	DEP (iii)	CFAT (iv) = (ii) + (iii)	Incremental CFAT (v) = (iv) – (i)
1	5,00,000	5,50,000	2,00,000	7,50,000	2,50,000
2	5,40,000	5,90,000	2,00,000	7,90,000	2,50,000
3	5,80,000	6,10,000	2,00,000	8,10,000	2,30,000
4	6,20,000	6,50,000	2,00,000	8,50,000	2,30,000
5	6,60,000	7,00,000	2,00,000	9,00,000	2,40,000

Cash Inflow after Taxes (CFAT)

Year	New Machine			
	EAT (vi)	DEP (vii)	CFAT (viii) = (vi) + (vii)	Incremental CFAT (ix) = (viii) – (i)
1	6,00,000	4,10,000	10,10,000	5,10,000
2	6,40,000	4,10,000	10,50,000	5,10,000
3	6,90,000	4,10,000	11,00,000	5,20,000
4	7,40,000	4,10,000	11,50,000	5,30,000
5	8,00,000	4,10,000	12,10,000	5,50,000

PV @ 15% for 5 Years on Incremental CFAT

Year	Upgraded Machine			New Machine		
	Incremental CFAT	PVF	Total PV	Incremental CFAT	PVF	Total PV
1	2,50,000	0.870	2,17,500	5,10,000	0.870	4,43,700
2	2,50,000	0.756	1,89,000	5,10,000	0.756	3,85,560
3	2,30,000	0.658	1,51,340	5,20,000	0.658	3,42,160
4	2,30,000	0.572	1,31,560	5,30,000	0.572	3,03,160
5	2,40,000	0.497	1,19,280	5,50,000	0.497	2,73,350
Total PV of CFAT			8,08,680			17,47,930
Less: Cash Outflows			(10,00,000)			(20,20,000*)
NPV			–1,91,320			–2,72,070

*Acquisition Cost (including installation cost)	₹ 20,50,000
Less: Salvage Value of existing machine net of Tax	(₹ 30,000)
	₹ 20,20,000

As the NPV in both the new (alternative) proposals is negative, the company should continue with the existing old Machine.

Question 35

Company X is forced to choose between two machines A and B. The two machines are designed differently but have identical capacity and do exactly the same job. Machine A costs ₹ 1,50,000 and will last for 3 years. It costs ₹ 40,000 per year to run. Machine B is an 'economy' model costing only ₹ 1,00,000, but will last only for 2 years, and costs ₹ 60,000 per year to run. These are real cash flows. The costs are forecasted in rupees of constant purchasing power. Ignore tax. Opportunity cost of capital is 10%. Which machine company X should buy?

Note: Cumulative annuity factor @ 10% for 2 years is 1.735 and for 3 years is 2.486

Answer

Statement showing the evaluation of two machines

Machines		A	B
Purchase cost (₹)	(i)	1,50,000	1,00,000
Life of machines (years)		3	2
Running cost of machine per year (₹)	(ii)	40,000	60,000
Cumulative present value factor for 1-3 years @ 10%	(iii)	2.486	–
Cumulative present value factor for 1-2 years @ 10%	(iv)	–	1.735
Present value of running cost of machines (₹)	(v)	99,440 [(ii) x (iii)]	1,04,100 [(ii) x (iv)]
Cash outflow of machines (₹)	(vi) = (i) + (v)	2,49,440	2,04,100
Equivalent present value of annual cash outflow		1,00,338 [(vi) ÷ (iii)]	1,17,637 [(vi) ÷ (iv)]

Decision: Company X should buy machine A since its equivalent cash outflow is less than machine B.

Question 36

Company Y is operating an elderly machine that is expected to produce a net cash inflow of ₹ 40,000 in the coming year and ₹ 40,000 next year. Current salvage value is ₹ 80,000 and next year's value is ₹ 70,000. The machine can be replaced now with a new machine, which costs ₹ 1,50,000, but is much more efficient and will provide a cash inflow of ₹ 80,000 a year for 3 years. Company Y wants to know whether it should replace the equipment now or wait a year with the clear understanding that the new machine is the best of the available alternatives and that it in turn be replaced at the optimal point. Ignore tax. Take opportunity cost of capital as 10%. Advise with reasons.

Note: Cumulative annuity factor @ 10% for 3 years is 2.486; PV factor @ 10% for year 1 is 0.90909

Answer

Statement showing present value of cash inflow of new machine when it replaces elderly machine now

NPV of New Machine

PV of Cash Inflow (80,000 x 2.486)	₹ 1,98,880
Less: Purchase Cost of New Machine	(₹ 1,50,000)
	₹ 48,880

Since NPV of New Machine is positive, it should be purchased.

Timing Decision

(i)	Replace Now	
	Current Realizable Value	₹ 80,000
	NPV of New Machine	₹ 48,880
	Total NPV	₹ 1,28,880
(ii)	Replace after 1 Year	
	Cash Inflow for Year 1	₹ 40,000

Realisable Value of Old Machine	₹ 70,000
NPV of New Machine	₹ 48,880
Total NPV after 1 Year	₹ 1,58,880
PV of Total NPV (1,58,880/1.1)	₹ 1,44,436

Advise: Since total NPV is higher in case of Replacement after one year. Hence, machine should be replaced after 1 year.

Question 37

X Ltd. is a taxi operator. Each taxi cost to company ₹ 4,00,000 and has a useful life of 3 years. The taxi's operating cost for each of 3 years and salvage value at the end of year is as follows:

	Year 1	Year 2	Year 3
Operating Cost	₹ 1,80,000	₹ 2,10,000	₹ 2,38,000
Resale Value	₹ 2,80,000	₹ 2,30,000	₹ 1,68,000

You are required to determine the optimal replacement period of taxi if cost of capital of X Ltd. is 10%.

Note: Show amount to the nearest rupee in calculations.

Answer

NPV if taxi is kept for 1 Year

= – ₹ 4,00,000 – ₹ 1,80,000 (0.909) + ₹ 2,80,000 (0.909) = –₹ 3,09,100

NPV if taxi is kept for 2 Year

= – ₹ 4,00,000 – ₹ 1,80,000 x 0.909 + ₹ 20,000 x 0.826 = –₹ 5,47,100

NPV if taxi is kept for 3 Year

= – ₹ 4,00,000 – ₹ 1,80,000 x 0.909 – ₹ 2,10,000 x 0.826 – ₹ 70,000 x 0.751 = –₹ 7,89,650

Since above NPV figures relate to different periods, there are not comparable. to make them comparable we shall use concept of EAC as follows:

EAC of 1 year

$$= \frac{3,09,100}{0.909} = ₹\ 3,40,044$$

EAC of 2 year

$$= \frac{5,47,100}{1.735} = ₹\ 3,15,331$$

EAC of 3 year

$$= \frac{7,89,650}{2.486} = ₹\ 3,17,639$$

Since lowest EAC incur if taxi for 2 year; Hence, the optimum replacement cycle to replace taxi is 2 years.

Question 38

A & Co. is contemplating whether to replace an existing machine or to spend money on overhauling it. A & Co. currently pays no taxes. The replacement machine costs ₹ 90,000 now and requires maintenance of ₹ 10,000 at the end of every year for eight years. At the end of eight years it would have a salvage value of ₹ 20,000 and would be sold. The existing machine requires increasing amounts of maintenance each year and its salvage value falls each year as follows:

Year	Maintenance (₹)	Salvage (₹)
Present	0	40,000
1	10,000	25,000
2	20,000	15,000
3	30,000	10,000
4	40,000	0

The opportunity cost of capital for A & Co. is 15%.

When should the company replace the machine?

Note: Present value of an annuity of ₹ 1 per period for 8 years at interest rate of 15%: 4.4873; present value of ₹ 1 to be received after 8 years at interest rate of 15%: 0.3269

Answer

Equivalent cost of (EAC) of new machine

		₹
(i)	Cost of new machine now	90,000
	Add: PV of annual repairs @ ₹ 10,000 per annum for 8 years [₹ 10,000 x 4.4873]	44,873
		1,34,873
	Less: PV of salvage value at the end of 8 years [₹ 20,000 x 0.3269]	6,538
		1,28,335
	Equivalent annual cost (EAC) [₹ 1,28,335/4.4873]	28,600

PV of cost of replacing the old machine in each of 4 years with new machine

Scenario	Year	Cash Flow (₹)	PV @ 15%	PV (₹)
Replace Immediately	0	(28,600)	1.00	(28,600)
		40,000	1.00	40,000
				11,400
Replace in one year	1	(28,600)	0.870	(24,882)
	1	(10,000)	0.870	(8,700)
	1	25,000	0.870	21,750
				(11,832)
Replace in two years	1	(10,000)	0.870	(8,700)

	2	(28,600)	0.756	(21,622)
	2	(20,000)	0.756	(15,120)
	2	15,000	0.756	11,340
				(34,102)
Replace in three years	1	(10,000)	0.870	(8,700)
	2	(20,000)	0.756	(15,120)
	3	(28,600)	0.658	(18,819)
	3	(30,000)	0.658	(19,740)
	3	10,000	0.658	6,580
				(55,799)
Replace in four years	1	(10,000)	0.870	(8,700)
	2	(20,000)	0.756	(15,120)
	3	(30,000)	0.658	(19,740)
	4	(28,600)	0.572	(16,359)
	4	(40,000)	0.572	(22,880)
				(82,799)

Advice: The company should replace the old machine immediately because the PV of cost of replacing the old machine with new machine is least.

Alternatively, optimal replacement period can also be computed using the following table:

Scenario	Year	Cash Flow (₹)	PV @ 15%	PV (₹)
Replace immediately	0	(40,000)	1	(40,000)
	1 to 4	28,600	2.855	81,652
				41,652
Replace after 1 year	1	10,000	0.870	8,696
	1	(25,000)	0.870	(21,739)
	2 to 4	28,600	1.985	56,783
				43,739
Replace after 2 years	1	10,000	0.870	8,696
	2	20,000	0.756	15,123
	2	(15,000)	0.756	(11,342)
	3 and 4	28,600	1.229	35,157
				47,633
Replace after 3 years	1	10,000	0.870	8,696
	2	20,000	0.756	15,123
	3	30,000	0.658	19,725

	3	(10,000)	0.658	(6,575)
	4	28,600	0.572	16,352
				53,321
Replace after 4 years	1	10,000	0.870	8,696
	2	20,000	0.756	15,123
	3	30,000	0.658	19,725
	4	40,000	0.572	22,870
				66,414

Question 39

A machine used on a production line must be replaced at least every four years. Costs incurred to run the machine according to its age are:

	Age of the Machine (years)				
	0	**1**	**2**	**3**	**4**
Purchase price (in ₹)	60,000				
Maintenance (in ₹)		16,000	18,000	20,000	20,000
Repair (in ₹)		0	4,000	8,000	16,000
Scrap Value (in ₹)		32,000	24,000	16,000	8,000

Future replacement will be with identical machine with same cost. Revenue is unaffected by the age of the machine. The opportunity cost of capital is 15%.

Ignoring inflation and tax, determine the optimum replacement cycle.

Note: PVF @ 15% for four years is 0.8696, 0.7561, 0.6575, 0.5718

Answer

Working Notes

First of all, we shall calculate cash flows for each replacement cycle as follows:

One Year Replacement Cycle ₹

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net Cash Flow
0	(60,000)	–	–	(60,000)
1	–	(16,000)	32,000	16,000

Two Years Replacement Cycle ₹

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net Cash Flow
0	(60,000)	–	–	(60,000)
1	–	(16,000)	–	(16,000)
2	–	(22,000)	24,000	2,000

Three Years Replacement Cycle ₹

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net Cash Flow
0	(60,000)	–	–	(60,000)
1	–	(16,000)	–	(16,000)
2	–	(22,000)	–	(22,000)
3	–	(28,000)	16,000	(12,000)

Four Years Replacement Cycle ₹

Year	Replacement Cost	Maintenance & Repair	Residual Value	Net Cash Flow
0	(60,000)	–	–	(60,000)
1	–	(16,000)	–	(16,000)
2	–	(22,000)	–	(22,000)
3	–	(28,000)	–	(28,000)
4	–	(36,000)	8,000	(28,000)

Now we shall calculate NPV for each replacement cycles

		1 Year		2 Years		3 Years		4 Years	
Year	PVF @ 15%	Cash Flows	PV	Cash Flows	PV	Cash Flows	PV	Cash Flows	PV
0	1	–60,000	–60,000	–60,000	–60,000	–60,000	–60,000	–60,000	–60,000
1	0.8696	16,000	13,914	–16,000	–13,914	–16,000	–13,914	–16,000	–13,914
2	0.7561	–	–	2,000	1,512	–22,000	–16,634	–22,000	–16,634
3	0.6575	–	–	–	–	–12,000	–7,890	–28,000	–18,410
4	0.5718	–	–	–	–	–	–	–28,000	–16,010
			–46,086		–72,402		–98,438		–1,24,968

Replacement Cycles		EAC (₹)
1 Year	46,086 ÷ 0.8696	52,997
2 Years	72,402 ÷ 1.6257	44,536
3 Years	98,438 ÷ 2.2832	43,114
4 Years	1,24,968 ÷ 2.855	43,772

Since EAC is least in case of replacement cycle of 3 years. Hence, machine should be replaced after every three years.

Question 40

Trouble Free Solutions (TFS) is an authorized service center of a reputed domestic air conditioner manufacturing company. All complaints/service related matters of Air conditioner are attended by this

service center. The service center employs a large number of mechanics, each of whom is provided with a motor bike to attend the complaints. Each mechanic travels approximately 40,000 kms per annum. TFS decides to continue its present policy of always buying a new bike for its mechanics but wonders whether the present policy of replacing the bike every three year is optimal or not. It is of believe that as new models are entering into market on yearly basis, it wishes to consider whether a replacement of either one year or two years would be better option than present three year period. The fleet of bike is due for replacement shortly in near future.

The purchase price of latest model bike is ₹ 55,000. Resale value of used bike at current prices in market is as follows:

Period	₹
1 Year old	35,000
2 Year old	21,000
3 Year old	9,000

Running and Maintenance expenses (excluding depreciation) are as follows:

Year	Road Taxes Insurance etc. (₹)	Petrol Repair Maintenance etc. (₹)
1	3,000	30,000
2	3,000	35,000
3	3,000	43,000

Using opportunity cost of capital as 10%, you are required to determine optimal replacement period of bike.

Answer

In this question the effect of increasing running cost and decreasing resale value have to be weighted upto against the purchase cost of bike. For this purpose, we shall compute Equivalent Annual Cost (EAC) of replacement in different years shall be computed and compared.

Year	Road Taxes (₹)	Petrol etc. (₹)	Total (₹)	PVF @ 10%	PV (₹)	Cumulative PV (₹)	PV of Resale Price (₹)	Net Outflow (₹)
1	3,000	30,000	33,000	0.909	29,997	29,997	31,815	(1,818)
2	3,000	35,000	38,000	0.826	31,388	61,385	17,346	44,039
3	3,000	43,000	46,000	0.751	34,546	95,931	6,759	89,172

Computation of EACs

Year*	Purchase Price of Bike (₹)	Net Outflow (₹)	Total Outflow (₹)	PVAF @ 10%	EAC# (₹)
1	55,000	(1,818)	53,182	0.909	58,506
2	55,000	44,039	99,039	1.735	57,083
3	55,000	89,172	1,44,172	2.486	57,993

Thus, from above table it is clear that EAC is least in case of 2 years, hence bike should be replaced every two years.

*Assume these periods are the periods from which bike shall be kept in use.

#EAC is used to bring Cash Flows occurring for different periods at one point of Time.

Real Options

Question 41

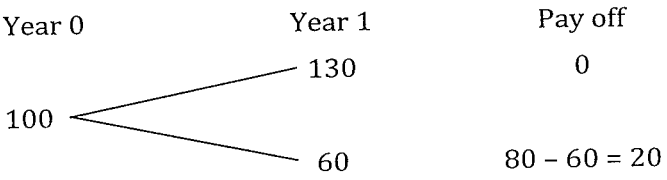
IPL already in production of Fertilizer is considering a proposal of building a new plant to produce pesticides. Suppose the PV of proposal is ₹ 100 crore without the abandonment option. However, if market conditions for pesticide turns out to be favourable the PV of proposal shall increase by 30%. On the other hand, market conditions remain sluggish the PV of the proposal shall be reduced by 40%. In case company is not interested in continuation of the project it can be disposed of for ₹ 80 crore.

If the risk-free rate of interest is 8%, then what will be value of abandonment option.

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

Answer

Decision Tree showing pay off



First of all, we shall calculate probability of high demand (P) using risk neutral method as follows:

8% = p x 30% + (1 – p) x (–40%)

0.08 = 0.30 p – 0.40 + 0.40p

$$p = \frac{0.48}{0.70} = 0.686$$

The value of abandonment option will be as follows:

Expected Payoff at Year 1

= p x 0 + [(1 – p) x 20]

= 0.686 x 0 + [0.314 x 20]

= ₹ 6.28 crore

Since expected pay off at year 1 is ₹ 6.28 crore. Present value of expected pay off will be:

$$= \frac{6.28}{1.08} = ₹ 5.81 \text{ crore}$$

This is the value of abandonment option (Put Option).

Question 42

Suppose MIS Ltd. is considering installation of solar electricity generating plant for light the staff quarters. The plant shall cost ₹ 2.50 crore and shall lead to saving in electricity expenses at the current

tariff by ₹ 21 lakh per year forever.

However, with change in Government in state, the rate of electricity is subject to change. Accordingly, the saving in electricity can be of ₹ 12 lakh or ₹ 35 lakh per year and forever.

Assuming WACC of MIS Ltd. is 10% and risk-free rate of rate of return is 8%.

Decide whether MIS Ltd. should accept the project or wait and see.

Answer

Here we shall evaluate NPV in two possible situations:

(i) As on Today

At cost of Capital of 10%, the value of saving forever = ₹ 21 lakhs/0.10 = ₹ 2.1 crore

NPV = ₹ 2.1 crore – ₹ 2.5 crore = –₹ 0.4 crore

Since NPV is negative, it does not worth to accept the project.

(ii) After one Year

After one year these are two possible situations, either rate of electricity decreases or increase.

(a) If price of electricity increases

At cost of Capital of 10%, the value of saving forever = $\frac{₹\ 35\ lakh}{0.10}$ = ₹ 3.50 crore

The position of the NPV will be as follows:

= ₹ 3.50 crore – ₹ 2.50 crore = ₹ 1 crore

And Rate of Return will be = (3.5/2.5) – 1 = 0.40 i.e. 40%

(b) If the price of electricity decreases, then value of saving forever will be

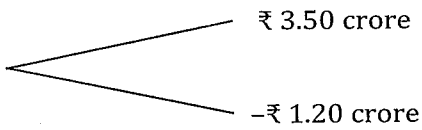
At cost of Capital of 10%, the value of saving forever = $\frac{₹\ 12\ lakh}{0.10}$ = ₹ 1.20 crore

The position of the NPV will be as follows:

= ₹ 1.20 crore – ₹ 2.5 crore = –₹ 1.3 crore

and Rate of Return will be = (1.2/2.5) – 1 = –0.52 i.e. –52.00%

Diagrammatically it can be shown below



Let prob. of price increase be p. Then using Risk Neutral Method, the risk-free rate of return will be equal to expected saving as follows:

p x 0.40 + (1 – p) (–0.52) = 0.08

0.40p – 0.52 + 0.52p = 0.08

0.92p = 0.60

p = 0.652

Hence, expected pay off = 0.652 x ₹ 1 crore + 0.348 x (–₹ 1.30 crore) = ₹ 19.96 lakh

PV of Pay off after one year = ₹ 19.96 lakh/1.08 = ₹ 18.48 lakh

Thus, it shall be advisable to wait and see as NPV may turn out to be positive after one year.

Question 43

ABC Ltd. is a pharmaceutical company possessing a patent of a drug called 'Aidrex', a medicine for aids patient. Being an approach drug ABC Ltd. holds the right of production of drugs and its marketing. The period of patent is 15 years after which any other pharmaceutical company produce the drug with same formula. It is estimated that company shall require to incur $ 12.5 million for development and market of the drug. As per a survey conducted the expected present value of cashflows from the sale of drug during the period of 15 years shall be $ 16.7 million. Cash flow from the previous similar type of drug have exhibited a variance of 26.8% of the present value of cashflows. The current yield on Treasury Bonds of similar duration (15 years) is 7.8%.

Determine the value of the patent.

Given:

ln(1.336) = 0.2897

$e^{1.0005}$ = 0.3677 and $e^{-1.17}$ = 0.3104

Note: Make calculations in $ million and upto 4 decimal points.

Answer

The given solution is like valuation of stock option wherein delay in introduction of drug 'Aidrex' shall cause the loss of cashflow which is like payment of dividend.

To value the patent, we shall use Black Scholes Model for option pricing as follows:

Value call option

$C = S\, e^{-df} - E\, e^{(-rt)}\, N(d_2)$

$$d_1 = \frac{l_n\,(S/E) + [(R - D) + \sigma^2/2]\,t}{\sigma\sqrt{t}}$$

$d_2 = d_1 - \sigma\sqrt{t}$

Where,

S (Spot Price) = The Present Value of Cashflows = $ 16.7 million

E (Exercise Price) = Cost of Development Formula = $ 12.5 million

σ^2 (Variance of Cash flow) = 26.8% i.e. 0.27

R (Risk Free Rate of Return) = 7.8%

D (Expected cost of Delays) = 1/15 = 0.0667 i.e. 6.67%

Accordingly,

$$d_1 = \frac{l_n\,(16.7/12.5) + [(0.078 - 0.0667) + (0.268/2)]\,15}{\sqrt{0.268}\,\sqrt{15}}$$

$$d_1 = \frac{0.2897 + 0.1453 \times 15}{0.5177 \times 3.8730}$$

$$d_1 = \frac{0.2897 + 2.1795}{2.005}$$

$$d_1 = \frac{2.4692}{2.005} = 1.2315$$

$d_2 = 1.2315 - 2.005$

$d_2 = -0.7735$

$N(d_1) = 0.8910$

$N(d_2) = 0.2196$

Value of Patent

$= 16.7 \times e^{-0.0667 \times 15} \times 0.8910 - 12.5 \times e^{-0.078 \times 15} \times 0.2196$

$= 16.7 \times 0.3677 \times 0.8910 - 12.5 \times 0.3104 \times 0.2196$

$= 5.4713 - 0.8520 = 4.6193$

Thus, the value of patents is $ 4.6193 million.

Section B – Theory Questions

Question 1

Explain the steps involved in Simulation Analysis.

Answer

Steps for Simulation Analysis:

1. **Modelling the project**: The model shows the relationship of NPV with parameters and exogenous variables. (Parameters are input variables specified by decision maker and held constant over all simulation runs. Exogenous variables are input variables, which are stochastic in nature and outside the control of the decision maker).
2. **Specify values of parameters and probability distributions** of exogenous variables.
3. **Select a value at random from probability distribution** of each of the exogenous variables.
4. **Determine NPV** corresponding **to the randomly generated value** of exogenous variables and pre-specified parameter variables.
5. **Repeat steps (3) & (4)** a large number of times **to get a large number of simulated NPVs**.
6. Plot probability distribution of NPVs and **compute a mean and Standard Deviation of returns** to gauge the project's level of risk.

CHAPTER - 4
Security Analysis

Section A – Practical Questions

Exponential Moving Average (EMA)

Question 1

Closing Values of NIFTY Index from 3rd to 12th day of the month of January 2023 were as follows:

Days	Date	Closing Values of NIFTY Index
1	03/01/2023	17626
2	04/01/2023	17805
3	05/01/2023	17925
4	06/01/2023	17746
5	07/01/2023	17813
6	10/01/2023	18003
7	11/01/2023	18056
8	12/01/2023	18212

The simple moving average of NIFTY Index for the month of December 2022 was 17174.

You are required to calculate

(i) The value of exponent for 15 days EMA.

(ii) The exponential moving average (EMA) of NIFTY during the above period. (Calculations to be done up to 2 decimals only)

(iii) Analyse the buy & sell signal on the basis of your calculations.

Answer

(i) Value of Exponent for 15 days EMA

$$= \frac{2}{n+1} = 0.125$$

(ii) $EMA_t = a \times P_t + (1 - a)\ (EMA_{(t-1)})$

Where, a = exponent, P_t = Price of today

Date	1 Sensex	2 EMA for Previous day ($EMA_{(t-1)}$)	3 1 – 2	4 3 x 0.125	5 EMA 2 + 4
03/01/2023	17626	17174	452	56.50	17230.50
04/01/2023	17805	17230.50	574.50	71.81	17302.31
05/01/2023	17925	17302.31	622.69	77.84	17380.15
06/01/2023	17746	17380.15	365.85	45.73	17425.88

07/01/2023	17813	17425.88	387.12	48.39	17474.27
10/01/2023	18003	17474.27	528.73	66.09	17540.36
11/01/2023	18056	17540.36	515.64	64.45	17604.82
12/01/2023	18212	17604.82	607.18	75.90	17680.71

(iii) A buy (bullish) signal is generated when actual price line (NIFTY in the give case) rises through the moving average, while a sell a (bearish) signal is generated when actual NIFTY level declines through the moving averages. In the case under consideration the price line of NIFTY never breaches the 15-day EMA line. In-fact it is hovering around the 15-day EMA line only.

Question 2

Closing values of NSE Nifty from 6th to 17th day of the month of January of year 2023 were as follows:

Days	Date	Day	Nifty
1	6	THU	14522
2	7	FRI	14925
3	8	SAT	No Trading
4	9	SUN	No Trading
5	10	MON	15222
6	11	TUE	16000
7	12	WED	16400
8	13	THU	17000
9	14	FRI	No Trading
10	15	SAT	No Trading
11	16	SUN	No Trading
12	17	MON	18000

Calculate Exponential Moving Average (EMA) of Nifty during the above period. The previous day exponential moving average of Nifty can be assumed as 15000. The value of exponent for 31 days EMA is 0.062.

Give detailed analysis on the basis of your calculations.

Note: Calculations to be done up to 3 decimals only

Answer

Date	1 Nifty	2 EMA for Previous day	3 1 – 2	4 3 x 0.062	5 EMA 2 ± 4
6	14522	15000	(478)	(29.636)	14970.364
7	14925	14970.364	(45.364)	(2.812)	14967.55

10	15222	14967.55	254.45	15.776	14983.32
11	16000	14983.32	1016.68	63.034	15046.354
12	16400	15046.354	1353.646	83.926	15130.28
13	17000	15130.28	1869.72	115.922	15246.202
17	18000	15246.202	2753.798	170.735	15416.937

Conclusion – The market is bullish. The market is likely to remain bullish for short term to medium term if other factors remain the same. On the basis of this indicator (EMA) the investors/brokers can take long position.

Run Test

Question 3

The closing value of Sensex for the month of October, 2023 is given below:

Date Closing	Index Value
1.10.23	2800
3.10.23	2780
4.10.23	2795
5.10.23	2830
8.10.23	2760
9.10.23	2790
10.10.23	2880
11.10.23	2960
12.10.23	2990
15.10.23	3200
16.10.23	3300
17.10.23	3450
19.10.23	3360
22.10.23	3290
23.10.23	3360
24.10.23	3340
25.10.23	3290
29.10.23	3240
30.10.23	3140
31.10.23	3260

You are required to test the weak form of efficient market hypothesis by applying the run test at 5% and 10% level of significance.

Following value can be used:

Value of t at 5% is 2.101 at 18 degrees of freedom

Value of t at 10% is 1.734 at 18 degrees of freedom

Note: Calculation of Limits to be done up to 3 decimals and all other calculations to be done upto 2 decimals only

Answer

Date	Closing Index	Sign of Price Change
1.10.23	2800	
3.10.23	2780	–
4.10.23	2795	+
5.10.23	2830	+
8.10.23	2760	–
9.10.23	2790	+
10.10.23	2880	+
11.10.23	2960	+
12.10.23	2990	+
15.10.23	3200	+
16.10.23	3300	+
17.10.23	3450	+
19.10.23	3360	–
22.10.23	3290	–
23.10.23	3360	+
24.10.23	3340	–
25.10.23	3290	–
29.10.23	3240	–
30.10.23	3140	–
31.10.23	3260	+

Total of sign of price changes (r) = 8

No of Positive changes = $n_1 = 11$

No. of Negative changes = $n_2 = 8$

$$\mu_t = \frac{2n_1n_2}{n_1 + n_2} + 1$$

$$\mu = \frac{2 \times 11 \times 8}{11 + 8} + 1 = \frac{176}{19} + 1 = 10.26$$

$$\hat{\sigma_r} = \sqrt{\frac{2n_1n_2\,(2n_1n_2 - n_1 - n_2)}{(n_1 + n_2)^2\,(n_1 + n_2 - 1)}}$$

$$\hat{\sigma_r} = \sqrt{\frac{(2 \times 11 \times 8)\ (2 \times 11 \times 8 - 11 - 8)}{(11+8)^2\ (11+8-1)}} = \sqrt{\frac{176 \times 157}{(19)^2\ (18)}} = \sqrt{4.252} = 2.06$$

Since too few runs in the case would indicate that the movement of prices is not random. We employ a two-tailed test the randomness of prices.

Test at 5% level of significance at 18 degrees of freedom using t-table

The lower limit

$= \mu - t \times \hat{\sigma_r} = 10.26 - 2.101 \times 2.06 = 5.932$

Upper limit

$= \mu + t \times \hat{\sigma_r} = 10.26 + 2.101 \times 2.06 = 14.588$

At 10% level of significance at 18 degrees of freedom

Lower limit

= 10.26 – 1.734 x 2.06 = 6.688

Upper limit

= 10.26 + 1.734 x 2.06 = 13.832

As seen r lies between these limits. Hence, the market exhibits weak form of efficiency.

*For a sample of size n, the t distribution will have n–1 degrees of freedom.

Auto-Correlation Test (Serial Correlation Test)

Question 4

Mr. X is of the opinion that market has recently shown the Weak Form of Market Efficiency. In order to test the validity of his impression he has collected the following data relating to the movement of the SENSEX for the last 20 days.

Days	Open	High	Low	Close
1	33470.94	33513.79	33438.03	33453.99
2	33453.64	33478.11	33427.82	33434.83
3	33414.06	33440.29	33397.65	33431.93
4	33434.94	33446.18	33377.78	33383.41
5	33372.92	33380.27	33352.12	33370.93
6	33375.85	33389.49	33331.42	33340.75
7	33340.89	33340.89	33310.95	33330.98
8	33326.84	33340.91	33306.17	33335.08
9	33307.16	33328.22	33296.43	33301.97
10	33298.64	33318.60	33254.28	33259.03
11	33260.04	33228.85	33241.66	33251.53
12	33255.92	33289.46	33249.46	33285.89

13	33288.86	33535.67	33255.98	33329.28
14	33335.00	33346.21	33276.72	33284.17
15	33293.83	33310.86	33278.54	33298.78
16	33300.02	33337.79	33300.02	33325.38
17	33323.36	33356.34	33322.44	33329.95
18	33322.81	33345.98	33317.44	33319.67
19	33317.51	33321.18	33294.19	33302.32
20	33290.86	33324.96	33279.62	33319.61

You are required to test the Weak Form of Market Efficiency using Auto-Correlation test, taking time lag of 10 days.

Note: All Calculations to be done in 6 decimals and Correlation is to be presented in 3 decimals only

Answer

Period 1					Period 2				
Day	**Closing Prices**	**Return (%)**	**Return – $\bar{X}$**	**Squared**	**Day**	**Closing Prices**	**Return (%)**	**Return – $\bar{Y}$**	**Squared**
1	33453.99				11	33251.53			
2	33434.83	–0.057273	0.007635	0.000058	12	33285.89	0.103334	0.080574	0.006492
3	33431.93	–0.008674	0.056234	0.003162	13	33329.28	0.130356	0.107596	0.011577
4	33383.41	–0.145131	–0.080223	0.006436	14	33284.17	–0.135346	–0.158106	0.024998
5	33370.93	–0.037384	0.027524	0.000758	15	33298.78	0.043895	0.021135	0.000447
6	33340.75	–0.090438	–0.025530	0.000652	16	33325.38	0.079883	0.057123	0.003263
7	33330.98	–0.029303	0.035605	0.001268	17	33329.95	0.013713	–0.009047	0.000082
8	33335.08	0.012301	0.077209	0.005961	18	33319.67	–0.030843	–0.053603	0.002873
9	33301.97	–0.099325	–0.034417	0.001185	19	33302.32	–0.052071	–0.074831	0.005600
10	33259.03	–0.128941	–0.064033	0.004100	20	33319.61	0.051918	0.029158	0.000850
		–0.584168		0.023580			0.204839		0.056182
Mean ($\bar{X}$)		–0.064908	**Variance**	0.002620	**Mean ($\bar{Y}$)**		0.022760	**Variance**	0.006242
			S.D. (σ)	0.051186				**S.D. (σ)**	0.079006

Covariance between Returns of Period 1 and Period 2		
Return – $\bar{X}$	**Return – $\bar{Y}$**	**(Return – $\bar{X}$) x (Return – $\bar{Y}$)**
0.007635	0.080574	0.000615
0.056234	0.107596	0.006051
–0.080223	–0.158106	0.012684
0.027524	0.021135	0.000582

-0.025530	0.057123	-0.00146
0.035605	-0.009047	-0.00032
0.077209	-0.053603	-0.00414
-0.034417	-0.074831	0.002575
-0.064033	0.029158	-0.00187
		0.014721
Covariance		0.001636

Calculation of Correlation Coefficient

$$r = \frac{Cov_{12}}{\sigma_1 \sigma_2} = \frac{0.001636}{0.051186 \times 0.079006} = \frac{0.001636}{0.004044} = 0.405$$

There is moderate degree of correlation between the returns of two periods hence it can be concluded that the market does not show the weak form of efficiency.

Alternative Solution:

Period 1	Closing Prices	Change	Period 2	Closing Prices	Change
1	33453.99		11	33251.53	
2	33434.83	-19.16	12	33285.89	34.36
3	33431.93	-2.90	13	33329.28	43.39
4	33383.41	-48.52	14	33284.17	-45.11
5	33370.93	-12.48	15	33298.78	14.61
6	33340.75	-30.18	16	33325.38	26.6
7	33330.98	-9.77	17	33329.95	4.57
8	33335.08	4.1	18	33319.67	-10.28
9	33301.97	-33.11	19	33302.32	-17.35
10	33259.03	-42.94	20	33319.61	17.29

X	Y	X^2	Y^2	XY
-19.16	34.36	367.11	1180.61	-658.34
-2.90	43.39	8.41	1882.69	-125.83
-48.52	-45.11	2354.19	2034.91	2188.74
-12.48	14.61	155.75	213.45	-182.33
-30.18	26.6	910.83	707.56	-802.79
-9.77	4.57	95.45	20.88	-44.65
4.1	-10.28	16.81	105.68	-42.15
-33.11	-17.35	1096.27	301.02	574.46
-42.94	17.29	1843.84	298.94	-742.43
$\sum X = -194.96$	$\sum Y = 68.08$	$\sum X^2 = 6848.66$	$\sum Y^2 = 6745.74$	$\sum XY = 164.68$

$\bar{X} = -21.66$	$\bar{Y} = 7.56$			

$$b = \frac{\sum XY - n\bar{X}\bar{Y}}{\sum X^2 - n(\bar{X})^2} = \frac{164.68 - 9(-21.66)(7.56)}{6848.66 - 9(-21.66)^2} = 0.624$$

$$a = \bar{Y} - b\bar{X} = 7.56 - 0.624(-21.66) = 21.08$$

$$r^2 = \frac{a\sum Y + b\sum XY - n(\bar{Y})^2}{\sum Y^2 - n(\bar{Y})^2} = \frac{21.08(68.08) + 0.624(164.68) - 9(7.56)^2}{6745.74 - 9(7.56)^2}$$

$r^2 = 0.164$

$r = 0.405$

There is moderate degree of correlation between the returns of two periods hence it can be concluded that the market does not show the weak form of efficiency.

Section B – Theory Questions

Question 1

Explain the factors affecting economic analysis.

Answer

Some of the factors affecting economic analysis are discussed as under:

(i) **Growth Rates of National Income and Related Measures:** For most purposes, what is important is the difference between the nominal growth rate quoted by GDP and the 'real' growth after taking inflation into account. The estimated growth rate of the economy would be a pointer to the prospects for the industrial sector, and therefore to the returns investors can expect from investment in shares.

(ii) **Growth Rates of Industrial Sector:** This can be further broken down into growth rates of various industries or groups of industries if required. The growth rates in various industries are estimated based on the estimated demand for its products.

(iii) **Inflation:** Inflation is measured in terms of either wholesale prices (the Wholesale Price Index or WPI) or retail prices (Consumer Price Index or CPI). The demand in some industries, particularly the consumer products industries, is significantly influenced by the inflation rate. Therefore, firms in these industries make continuous assessment about inflation rates likely to prevail in the near future so as to fine-tune their pricing, distribution and promotion policies to the anticipated impact of inflation on demand for their products.

(iv) **Monsoon:** Because of the strong forward and backward linkages, monsoon is of great concern to investors in the stock market too.

Question 2

Explain the various indicators that can be used to assess the performance of an economy.

OR

Discuss the various techniques used in economic analysis.

Answer

Some of the techniques used for economic analysis are:

(i) **Anticipatory Surveys:** They help investors to form an opinion about the future state of the economy. It incorporates expert opinion on construction activities, expenditure on plant and machinery, levels of inventory, all having a definite bearing on economic activities. Also future spending habits of consumers are taken into account.

(ii) **Barometer/Indicator Approach:** Various indicators are used to find out how the economy shall perform in the future. The indicators have been classified as under:

(a) Leading Indicators: They lead the economic activity in terms of their outcome. They relate to time series data of variables that reach high/low points in advance of economic activity.

(b) Roughly Coincidental Indicators: They reach their peaks and troughs at approximately the same in the economy.

(c) Lagging Indicators: They are time series data of variables that lag behind in their consequences vis-a-vis the economy. They reach their turning points after the economy has reached its own already.

All these approaches suggest direction of change in the aggregate economic activity but nothing about its magnitude.

(iii) Economic Model Building Approach: In this approach, a precise and clear relationship between dependent and independent variables is determined. GNP model building or sectoral analysis is used in practice through the use of national accounting framework.

Question 3

Describe the factors affecting Industry Analysis.

Answer

Following factors may particularly be kept in mind while assessing the factors relating to an industry:

(i) Product Life-Cycle: An industry usually exhibits high profitability in the initial and growth stages, medium but steady profitability in the maturity stage and a sharp decline in profitability in the last stage of growth.

(ii) Demand Supply Gap: Excess supply reduces the profitability of the industry because of the decline in the unit price realization, while insufficient supply tends to improve the profitability because of higher unit price realization.

(iii) Barriers to Entry: Any industry with high profitability would attract fresh investments. The potential entrants to the industry, however, face different types of barriers to entry. Some of these barriers are innate to the product and the technology of production, while other barriers are created by existing firms in the industry.

(iv) Government Attitude: The attitude of the government towards an industry is a crucial determinant of its prospects.

(v) State of Competition in the Industry: Factors to be noted are- firms with leadership capability and the nature of competition amongst them in foreign and domestic market, type of products manufactured viz. homogeneous or highly differentiated, demand prospects through classification viz customer-wise/area-wise, changes in demand patterns in the long/immediate/ short run, type of industry the firm is placed viz. growth, cyclical, defensive or decline.

(vi) Cost Conditions and Profitability: The price of a share depends on its return, which in turn depends on profitability of the firm. Profitability depends on the state of competition in the industry, cost control measures adopted by its units and growth in demand for its products.

(vii) Technology and Research: They play a vital role in the growth and survival of a particular industry. Technology is subject to change very fast leading to obsolescence. Industries which update themselves have a competitive advantage over others in terms of quality, price etc.

Question 4

Describe briefly on which principles Technical Analysis is based.

Answer

Technical analysis is based on the following three principals:

(i) **The Market Discounts Everything:** Although many experts criticize technical analysis because it only considers price movements and ignores fundamental factors but the Efficient Market Hypothesis contradicts it according to which a company's share price already reflects everything that has or could affect a company and it includes fundamental factors. So, technical analysts generally have view that share price includes everything including fundamentals of a company.

(ii) **Price Moves in Trends:** Technical analysts believe that prices move in trends. In other words, a stock price is more likely to continue a past trend than move in a different direction.

(iii) **History Tends to Repeat Itself:** Technical analysts believe that history tends to repeat itself. Technical analysis uses chart patterns to analyze market movements to understand trends. While many forms of technical analysis have been used for many years, they are still considered to be significant because they illustrate patterns in price movements that often repeat themselves.

Question 5

Explain Dow Theory.

Answer

The Dow Theory is one of the oldest and most famous technical theories. It was **originated by Charles Dow**, the founder of Dow Jones Company in late nineteenth century. It is a helpful tool **for determining the relative strength of the stock market**. It can also be **used as a barometer of business**.

The Dow Theory is **based upon the movements of two indices**, constructed by Charles Dow, Dow Jones Industrial Average (**DJIA**) and Dow Jones Transportation Average (**DJTA**). These averages reflect the aggregate impact of all kinds of information on the market. The **movements of the market are divided into three classifications**, all going at the same time; the **primary movement, the secondary movement, and the daily fluctuations**. The primary movement is the main trend of the market, which lasts from one year to 36 months or longer. This trend is commonly called bear or bull market. The secondary movement of the market is shorter in duration than the primary movement, and is opposite in direction. It lasts from two weeks to a month or more. The daily fluctuations are the narrow movements from day-to-day. These fluctuations are not part of the Dow Theory interpretation of the stock market. However, daily movements must be carefully studied, along with primary and secondary movements, as they go to make up the longer movement in the market.

Thus, the Dow Theory's purpose is to determine where the market is and where is it going, although not how far or high. The theory, in practice, states that if the cyclical swings of the stock market averages are successively higher and the successive lows are higher, then the market trend is up and a bullish market exists. Contrarily, if the successive highs and successive lows are lower, then the direction of the market is down and a bearish market exists.

Question 6

Explain the Elliot Wave Theory of technical analysis.

Answer

Inspired by the Dow Theory and by observations found throughout nature, **Ralph Elliot formulated Elliot Wave Theory** in 1934. This theory was **based on analysis of 75 years stock price movements** and charts. From his studies, he **defined price movements in terms of waves**. Accordingly, this theory was named Elliot Wave Theory. Elliot found that the markets exhibited certain repeated patterns or waves. As per this theory, **wave is a movement of the market price** from one change in the direction to the next change **in the same direction**. These waves are resulted from buying and selling impulses emerging from the demand and supply pressures on the market. Depending on the demand and supply pressures, waves are generated in the prices.

As per this theory, waves can be classified into two parts:

(a) Impulsive Patterns (Basic Waves): In this pattern there will be 3 or 5 waves in a given direction (going upward or downward). These waves shall move in the direction of the basic movement. This movement can indicate bull phase or bear phase.

(b) Corrective Patterns (Reaction Waves): These 3 waves are against the basic direction of the basic movement. Correction involves correcting the earlier rise in case of bull market and fall in case of bear market.

Question 7

Explain Random Walk Theory.

Answer

Random Walk Theory

Random Walk hypothesis **states that the behaviour of stock market prices is unpredictable** and that there is no relationship between the present prices of the shares and their future prices. Basic premises of the theory are as follows:

- Prices of shares in stock market can never be predicted. The **reason is that the price trends** are not the result of any underlying factors, but that they **represent a statistical expression of past data**.
- There may be periodical ups or downs in share prices, but no connection can be established between two successive peaks (high price of stocks) and troughs (low price of stocks).

Question 8

Explain various Market Indicators.

Answer

The various market indicators are as follows:

(i) Breadth Index: It is an index that covers all securities traded. It is computed by dividing the net advances or declines in the market by the number of issues traded. The breadth index either supports or contradicts the movement of the Dow Jones Averages. If it supports the movement of the Dow Jones Averages, this is considered sign of technical strength and if it does not support the averages, it is a sign of technical weakness. The breadth index is an addition to the Dow Theory and the movement of the Dow Jones Averages.

(ii) **Volume of Transactions:** The volume of shares traded in the market provides useful clues on how the market would behave in the near future. A rising index/price with increasing volume would signal buy behaviour because the situation reflects an unsatisfied demand in the market. Similarly, a falling market with increasing volume signals a bear market and the prices would be expected to fall further. A rising market with decreasing volume indicates a bull market while a falling market with dwindling volume indicates a bear market. Thus, the volume concept is best used with another market indicator, such as the Dow Theory.

(iii) **Confidence Index:** It is supposed to reveal how willing the investors are to take a chance in the market. It is the ratio of high-grade bond yields to low- grade bond yields. It is used by market analysts as a method of trading or timing the purchase and sale of stock, and also, as a forecasting device to determine the turning points of the market. A rising confidence index is expected to precede a rising stock market, and a fall in the index is expected to precede a drop in stock prices. A fall in the confidence index represents the fact that low-grade bond yields are rising faster or falling more slowly than high grade yields. Confidence index is usually, but not always a leading indicator of the market. Therefore, it should be used in conjunction with other market indicators.

(iv) **Relative Strength Analysis:** The relative strength concept suggests that the prices of some securities rise relatively faster in a bull market or decline more slowly in a bear market than other securities i.e. some securities exhibit relative strength. Investors will earn higher returns by investing in securities which have demonstrated relative strength in the past because the relative strength of a security tends to remain undiminished over time.

(v) **Odd-Lot Theory:** This theory is a contrary - opinion theory. It assumes that the average person is usually wrong and that a wise course of action is to pursue strategies contrary to popular opinion. The odd-lot theory is used primarily to predict tops in bull markets, but also to predict reversals in individual securities.

Question 9

Describe the concept of 'Evaluation of Technical Analysis'.

OR

"In an efficient market, technical analysis may not work perfectly. However, with imperfections, inefficiencies and irrationalities, which characterises the real world, technical analysis may be helpful". Critically analyse the statement.

Answer

Arguments for technical analysis:

(a) Under influence of crowd psychology, trend persists for some time. **Technical analysis helps in identifying** these **trends early** which is helping decision making.

(b) Shift in demand and supply is gradual rather than instantaneous. Technical analysis **helps in detecting this shift** rather **early**.

(c) Fundamental information about a company is observed and assimilated by the market over a period of time. Hence, price movements tend to more or less in same direction till the information is fully assimilated in the price of the stock.

Arguments against technical analysis:

(a) Technical analysts are **not able to offer a convincing explanation for tools employed** by them.

(b) **Empirical evidence in support of random walk hypothesis cast its shadow on it.**

(c) By the time trends are signaled by technical analysis, trends have already taken place.

Question 10

Explain the Efficient Market Theory and what are major misconceptions about this theory?

Answer

Efficient Market Theory was **developed by** University of Chicago professor **Eugen Fama** in the 1960s. **As per this theory,** at any given time, **all available price sensitive information is fully reflected in securities' prices**. Thus, this theory implies that no investor can consistently outperform the market as every stock is appropriately priced based on available information.

Stating otherwise theory **states that no one can "beat the market"**, hence making it impossible for investors to either purchase undervalued stocks or sell stocks for inflated prices as stocks are always traded at their fair value on stock exchanges. **Hence, it is impossible to outperform the overall market** through expert stock selection or market timing and that the only way an investor can possibly obtain higher returns is by purchasing riskier investments.

Misconception about Efficient Market Theory

Efficient Market Theory implies that market prices factor in all available information and as such it is **not possible for any investor to earn consistent long term returns** from market operations.

Although price tends to fluctuate, they cannot reflect fair value. This is because the future is uncertain. The market springs surprises continually and as prices reflect the surprises they fluctuate.

Inability of institutional portfolio managers to achieve superior investment performance implies that they lack competence in an efficient market. It is **not possible to achieve superior investment performance since market efficiency exists** due to portfolio managers doing this job well in a competitive setting.

The **random movement of stock prices suggests that stock market is irrational**. Randomness and irrationality are two different things, if investors are rational and competitive, price changes are bound to be random.

Question 11

Explain the challenges to Efficient Market Theory.

Answer

Challenges to the Efficient Market Theory

(i) Information inadequacy: Information is neither freely available nor rapidly transmitted to all participants in the stock market. There is a calculated attempt by many companies to circulate misinformation.

(ii) Limited information processing capabilities: Human information processing capabilities are sharply limited. According to Herbert Simon every human organism lives in an environment

which generates millions of new bits of information every second but bottle necks of perceptual apparatus does not admit more than thousand bits per seconds and possibly much less.

(iii) **Irrational Behaviour:** It is generally believed that investors' rationality will ensure a close correspondence between market prices and intrinsic values. But in practice this is not true. J. M. Keynes argued that all sorts of consideration enter into the market valuation which is in no way relevant to the prospective yield. This was confirmed by L.C. Gupta who found that the market evaluation processes work haphazardly almost like a blind man firing a gun. The market seems to function largely on hit or miss tactics rather than on the basis of informed beliefs about the long-term prospects of individual enterprises.

(iv) **Monopolistic Influence:** A market is regarded as highly competitive. No single buyer or seller is supposed to have undue influence over prices. In practice, powerful institutions and big operators wield grate influence over the market. The monopolistic power enjoyed by them diminishes the competitiveness of the market.

CHAPTER - 5
Security Valuation

Section A – Practical Questions

Dividend Based Models

Question 1

ABC Ltd. has been maintaining a growth rate of 10 percent in dividends. The company has paid dividend @ ₹ 3 per share. The rate of return on market portfolio is 12 percent and the risk free rate of return in the market has been observed as 8 percent. The Beta co-efficient of company's share is 1.5.

You are required to calculate the expected rate of return on company's shares as per CAPM model and equilibrium price per share by dividend growth model.

Answer

CAPM formula for calculation of Expected Rate of Return is:

$ER = R_f + \beta (R_m - R_f)$

$= 8 + 1.5 (12 - 8)$

$= 8 + 1.5 (4)$

$= 8 + 6$

$= 14\%$ or 0.14

Applying Dividend Growth Model for the calculation of per share equilibrium price:

$$ER = \frac{D_1}{P_0} + g$$

$$0.14 = \frac{3 (1.10)}{P_0} + 0.10$$

$$0.14 - 0.10 = \frac{3.30}{P_0}$$

$$0.04\ P_0 = 3.30$$

$$P_0 = \frac{3.30}{0.04} = ₹\ 82.50$$

Per share equilibrium price will be ₹ 82.50.

Question 2

Amal Ltd. has been maintaining a growth rate of 12% in dividends. The company has paid dividend @ ₹ 3 per share. The rate of return on market portfolio is 15% and the risk-free rate of return in the market has been observed as 10%. The beta co-efficient of the company's share is 1.2.

You are required to calculate the expected rate of return on the company's shares as per CAPM model and the equilibrium price per share by dividend growth model.

Answer

Capital Asset Pricing Model (CAPM) formula for calculation of expected rate of return is

$E_R = R_f + \beta (R_m - R_f)$

Where,

E_R = Expected Return

β = Beta of Security

R_m = Market Return

R_f = Risk free Rate

$= 10 + [1.2 (15 - 10)]$

$= 10 + 6 = 16\%$ or 0.16

Applying dividend growth mode for the calculation of per share equilibrium price:

$$E_R = \frac{D_1}{P_0} + g$$

$$\text{or } 0.16 = \frac{3\ (1.12)}{P_0} + 0.12$$

$$\text{or } P_0 = \frac{3.36}{0.16 - 0.12} = ₹\ 84$$

Therefore, equilibrium price per share will be ₹ 84.

Question 3

A Company pays a dividend of ₹ 2.00 per share with a growth rate of 7%. The risk free rate is 9% and the market rate of return is 13%. The Company has a beta factor of 1.50. However, due to a decision of the Finance Manager, beta is likely to increase to 1.75. Find out the present as well as the likely value of the share after the decision.

Answer

In order to find out the value of a share with constant growth model, the value of K_e should be ascertained with the help of 'CAPM' model as follows:

$K_e = R_f + \beta (R_m - R_f)$

Where,

K_e = Cost of equity

R_f = Risk free rate of return

β = Portfolio Beta i.e. market sensitivity index

R_m = Expected return on market portfolio

By substituting the figures, we get

$K_e = 0.09 + 1.5 (0.13 - 0.09) = 0.15$ or 15%

and the value of the share as per constant growth model is

$$P_0 = \frac{D_1}{(k_e - g)}$$

Where,

P_0 = Price of a share

D_1 = Dividend at the end of the year 1

K_e = Cost of equity

g = growth

$$P_0 = \frac{2.00\ (1.07)}{(k_e - g)}$$

$$P_0 = \frac{2.00\ (1.07)}{0.15 - 0.07} = ₹\ 26.75$$

However, if the decision of finance manager is implemented, the beta (β) factor is likely to increase to 1.75 therefore, K_e would be

$K_e = R_f + \beta\ (R_m - R_f)$

$= 0.09 + 1.75\ (0.13 - 0.09) = 0.16$ or 16%

The value of share is

$$P_0 = \frac{D_1}{(k_e - g)}$$

$$P_0 = \frac{2.00\ (1.07)}{0.16 - 0.07} = ₹\ 23.78$$

Question 4

M/s X Ltd. has paid a dividend of ₹ 2.50 per share on a face value of ₹ 10 in the financial year ending on 31st March, 2022. The details are as follows:

Current market price of share	₹ 60
Growth rate of earnings and dividends	10%
Beta of share	0.75
Average market return	15%
Risk free rate of return	9%

Calculate the intrinsic value of the share.

Answer

Intrinsic Value $P_0 = \frac{D_1}{(k_e - g)}$

Using CAPM

$k_e = R_f + \beta\ (R_m - R_f)$

Where,

R_f = Risk Free Rate

β = Beta of Security

R_m = Market Return

$k_e = 9\% + 0.75\ (15\% - 9\%) = 13.5\%$

$$P_0 = \frac{2.5 \times 1.1}{0.135 - 0.10} = \frac{2.75}{0.035} = ₹\ 78.57$$

Question 5

The risk free rate of return R_f is 9 percent. The expected rate of return on the market portfolio R_m is 13 percent. The expected rate of growth for the dividend of Platinum Ltd. is 7 percent. The last dividend paid on the equity stock of firm A was ₹ 2.00. The beta of Platinum Ltd. equity stock is 1.2.

(i) What is the equilibrium price of the equity stock of Platinum Ltd.?

(ii) How would the equilibrium price change when

(a) The inflation premium increases by 2 percent?

(b) The expected growth rate increases by 3 percent?

(c) The beta of Platinum Ltd. equity rises to 1.3?

Answer

(i) Equilibrium price of Equity using CAPM

$= 9\% + 1.2\ (13\% - 9\%)$

$= 9\% + 4.8\% = 13.8\%$

$$P_0 = \frac{D_1}{k_e - g} = \frac{2.00\ (1.07)}{0.138 - 0.07} = \frac{2.14}{0.068} = ₹\ 31.47$$

(ii) New Equilibrium price of Equity using CAPM

(a) Inflation Premium increase by 2%. This raises R_X to 15.80%. Hence, new equilibrium price will be:

$$= \frac{2.00\ (1.07)}{0.158 - 0.07} = ₹\ 24.32$$

(b) Expected Growth rate increase by 3%. Hence, revised growth rate stands at 10%:

$$= \frac{2.00\ (1.10)}{0.138 - 0.10} = ₹\ 57.89$$

(c) Beta increases to 1.3. Hence, revised cost of equity shall be:

$= 9\% + 1.3\ (13\% - 9\%)$

$= 9\% + 5.2\% = 14.2\%$

As a result, New Equilibrium price shall be:

$$P_0 = \frac{D_1}{k_e - g} = \frac{2.00\ (1.07)}{0.142 - 0.07} = ₹\ 29.72$$

Question 6

A company has paid dividend of ₹ 2 per share last year. The growth of the dividends from the company

is estimated to be 5% p.a. Find out the present value of the share, given that the required rate of return of the equity investors is 15.5%. Also determine the estimated value of the equity share if the estimated growth rate of dividends (i) rises to 8%, and (ii) falls to 3%.

Answer

In this case the company has paid dividend of ₹ 2 per share during the last year. The growth rate (g) is 5%. Then, the current year dividend (D_1) with the expected growth rate of 5% will be ₹ 2.10

The share price is = $P_0 = \frac{D_1}{K_e - g} = \frac{₹\ 2.10}{0.155 - 0.05} = ₹\ 20$

If growth rate rises to 8% then dividend for current year (D_1) would be ₹ 2.16 and value would be

$= \frac{₹\ 2.16}{0.155 - 0.08} = ₹\ 28.80$

If growth rate falls to 3% then dividend for current year (D_1) would be ₹ 2.06 and value would be

$= \frac{₹\ 2.06}{0.155 - 0.03} = ₹\ 16.48$

Question 7

An investor is holding 1,000 shares of Fatlass Company. Presently the rate of dividend being paid by the company is ₹ 2 per share and the share is being sold at ₹ 25 per share in the market. However, several factors are likely to change during the course of the year as indicated below:

	Existing	Revised
Risk free rate	12%	10%
Market risk premium	6%	4%
Beta value	1.4	1.25
Expected growth rate	5%	9%

In view of the above factors whether the investor should buy, hold or sell the shares? And why?

Answer

On the basis of existing and revised factors, rate of return and price of share is to be calculated.

Existing rate of return

$= R_f + \text{Beta}\ (R_m - R_f)$

$= 12\% + 1.4\ (6\%) = 20.4\%$

Revised rate of return

$= 10\% + 1.25\ (4\%) = 15\%$

Price of share (original)

$P_0 = \frac{D\ (1+g)}{K_e - g} = \frac{2\ (1.05)}{0.204 - 0.05} = \frac{2.10}{0.154} = ₹\ 13.63$

Price of share (Revised)

$$P_0 = \frac{D(1+g)}{K_e - g} = \frac{2(1.09)}{0.15 - 0.09} = \frac{2.18}{0.06} = ₹ 36.33$$

In case of existing market price of ₹ 25 per share, rate of return (20.4%) and possible equilibrium price of share at ₹ 13.63, this share needs to be sold because the share is overpriced (₹ 25 – ₹ 13.63) by ₹ 11.37. However, under the changed scenario where growth of dividend has been revised at 9% and the return though decreased at 15% but possible price of share is to be at ₹ 36.33 and therefore, in order to expect price appreciation to ₹ 36.33, investor should hold the shares, if other things remain the same.

Question 8

An investor is holding 5,000 shares of X Ltd. Current year dividend rate is ₹ 3 per share. Market price of the share is ₹ 40 each. The investor is concerned about several factors which are likely to change during the next financial year as indicated below:

	Current Year	Next Year
Dividend paid per share (₹)	3	2.5
Risk free rate	12%	10%
Market Risk Premium	5%	4%
Beta Value	1.3	1.4
Expected growth	9%	7%

In view of the above, advise whether the investor should buy, hold or sell the shares.

Answer

On the basis of existing and revised factors, rate of return and price of share is to be calculated.

Existing rate of return

$= R_f + \text{Beta}\ (R_m - R_f) = 12\% + 1.3\ (5\%) = 18.5\%$

Revised rate of return

$= 10\% + 1.4\ (4\%) = 15.60\%$

Price of share (original)

$$P_0 = \frac{D(1+g)}{K_e - g} = \frac{3(1.09)}{0.185 - 0.09} = \frac{3.27}{0.095} = ₹ 34.42$$

Price of share (Revised)

$$P_0 = \frac{D(1+g)}{K_e - g} = \frac{2.50(1.07)}{0.156 - 0.07} = \frac{2.675}{0.086} = ₹ 31.10$$

Market price of share of ₹ 40 is higher in comparison to current equilibrium price of ₹ 34.42 and revised equity price of ₹ 31.10. Under this situation investor should sell the share.

Question 9

Following are the details of X Ltd. and Y Ltd.:

Particulars	X Ltd.	Y Ltd.
Dividend per Share (D_1)	₹ 4	₹ 4
Growth Rate	10%	10%
Beta	0.9	1.2
Current Market Price per Share	₹ 150	₹ 70

Other Information:

Risk Free Rate of Return is 7%.

Market Rate of Return is 14%.

(i) Calculate the price of shares of both the companies.

(ii) Write the comment on the valuation on the basis of price calculated and current market price.

(iii) As an investor what course of action should be followed?

Answer

(i) Calculation of Prices of shares of both companies

	X Ltd.	Y Ltd.
Beta	0.9	1.20
k_e using CAPM	7% + 0.9 [14% – 7%] = 13.30%	7% + 1.20[14% – 7%] = 15.40%
Growth Rate	10%	10%
Price of Share	$\frac{4.00}{0.133 - 0.10} = \frac{4.00}{0.033} = ₹ 121.21$	$\frac{4.00}{0.154 - 0.10} = \frac{4.00}{0.054} = ₹ 74.07$

(ii) and (iii)

Name of Company	Current Market Price	Value of the Share	Valuation	Action of the Investor
X Ltd.	₹ 150.00	₹ 121.21	Overpriced	To be sold
Y Ltd.	₹ 70.00	₹ 74.07	Underpriced	To be purchased

Question 10

Following Financial data are available for PQR Ltd. for the year 2022:

	(₹ in lakh)
8% debentures	125
10% bonds (2021)	50
Equity shares (₹ 10 each)	100
Reserves and Surplus	300
Total Assets	600
Assets Turnover ratio	1.1

Effective interest rate	8%
Effective tax rate	40%
Operating margin	10%
Dividend payout ratio	16.67%
Current market Price of Share	₹ 14
Required rate of return of investors	15%

You are required to:

(i) Draw income statement for the year

(ii) Calculate its sustainable growth rate of earnings

(iii) Calculate the fair price of the Company's share using dividend discount model, and

(iv) What is your opinion on investment in the company's share at current price?

Note: Present amounts in ₹ lakhs wherever required

Answer

Workings:

Asset turnover ratio	= 1.1
Total Assets	= ₹ 600
Turnover	= ₹ 600 lakhs x 1.1 = ₹ 660 lakhs
Effective interest rate	= Interest/Liabilities = 8%
Liabilities	= ₹ 125 lakhs + 50 lakhs = 175 lakh
Interest	= ₹ 175 lakhs x 0.08 = ₹ 14 lakh
Operating Margin	= 10%
Hence operating cost	= (1 – 0.10) x ₹ 660 lakhs = ₹ 594 lakh
Dividend Payout	= 16.67%
Tax rate	= 40%

(i) Income statement

	(₹ Lakhs)
Sale	660
Operating Exp	594
EBIT	66
Interest	14
EBT	52
Tax @ 40%	20.80
EAT	31.20
Dividend @ 16.67%	5.20
Retained Earnings	26.00

(ii) SGR = ROE (1 – b)

Where,

$$ROE = \frac{PAT}{NW} \text{ and } NW = ₹\ 100 \text{ lakh} + ₹\ 300 \text{ lakh} = 400 \text{ lakh}$$

$$ROE = \frac{₹\ 31.2 \text{ lakhs}}{₹\ 400 \text{ lakhs}} \times 100 = 7.8\%$$

$$SGR = 0.078\ (1 - 0.1667) = 6.5\%$$

(iii) Calculation of fair price of share using dividend discount model

$$P_0 = \frac{D_0\ (1 + g)}{k_e - g}$$

$$\text{Dividends} = \frac{₹\ 5.2 \text{ lakhs}}{₹\ 10 \text{ lakhs}} = ₹\ 0.52$$

Growth Rate = 6.5%

$$\text{Hence } P_0 = \frac{₹\ 0.52\ (1 + 0.065)}{0.15 - 0.065} = ₹\ 6.51$$

(iv) Since the current market price of share is ₹ 14, the share is overvalued. Hence the investor should not invest in the company.

Question 11

MNP Ltd. has declared and paid annual dividend of ₹ 4 per share. It is expected to grow @ 20% for the next two years and 10% thereafter. The required rate of return of equity investors is 15%. Compute the current price at which equity shares should sell.

Note: Present Value Interest Factor (PVIF) @ 15%:

For year 1 = 0.8696;

For year 2 = 0.7561

Answer

$D_0 = ₹\ 4$

$D_1 = ₹\ 4\ (1.20) = ₹\ 4.80$

$D_2 = ₹\ 4\ (1.20)^2 = ₹\ 5.76$

$D_3 = ₹\ 4\ (1.20)^2\ (1.10) = ₹\ 6.336$

$$P_0 = \frac{D_1}{(1 + k_e)} + \frac{D_2}{(1 + k_e)^2} + \frac{TV}{(1 + k_e)^2}$$

$$TV = \frac{D_3}{k_e - g} = \frac{6.336}{0.15 - 0.10} = 126.72$$

$$P_0 = \frac{4.80}{(1 + 0.15)} + \frac{5.76}{(1 + 0.15)^2} + \frac{126.72}{(1 + 0.15)^2}$$

$$= 4.80 \times 0.8696 + 5.76 \times 0.7561 + 126.72 \times 0.7561 = ₹\ 104.34$$

Question 12

The shares of G Ltd. are currently being traded at ₹ 46. The company published its results for the year ended 31st March 2022 and declared a dividend of ₹ 5. The company made a return of 15% on its capital and expects that to be the norm in which it operates. G Ltd. Also expects the dividends to grow at 10% for the first three years and thereafter at 5%.

You are required to advise whether the share of the company is being traded at a premium or discount.

PVIF @ 15% for the next 3 years is 0.870, 0.756 and 0.658 respectively.

Answer

Expected dividend for next three years

Year 1 (D_1) = 5 (1.1) = 5.5

Year 2 (D_2) = 5.5 (1.1) = 6.05

Year 3 (D_3) = 6.05 (1.1) = 6.655

Required Rate (K_e) = 15%

Present Value of Dividends

= 5.5 (0.870) + 6.05 (0.756) + 6.655 (0.658)

= 4.785 + 4.574 + 4.379

= 13.74

Now, PV at growth rate of 5%

$$P_3 = \frac{D_4}{(k_e - g)}$$

$$= \frac{6.655\ (1.05)}{0.15 - 0.05} = \frac{6.988}{0.10} = 69.88$$

Therefore, P_0 = 69.88 x 0.658 = 45.98

Now, adding the PV of dividend at two different growth rates, we get,

13.74 + 45.98 = 59.72

Hence, it is clear that shares are being traded at discount i.e. undervalued because intrinsic value of share is more than the market price.

Question 13

XYZ Ltd. paid a dividend of ₹ 2 for the current year. The dividend is expected to grow at 40% for the next 5 years and at 15% per annum thereafter. The return on 182 days T-bills is 11% per annum and the market return is expected to be around 18% with a variance of 24%.

The co-variance of XYZ's return with that of the market is 30%. You are required to calculate the required rate of return and intrinsic value of the stock.

Answer

$$\beta = \frac{\text{Covariance of Market Return and Security Return}}{\text{Variance of Market Return}}$$

$$\beta = \frac{30\%}{24\%} = 1.25$$

Expected Return = $R_f + \beta (R_m - R_f)$

= 11% + 1.25 (18% – 11%) = 11% + 8.75% = 19.75%

Intrinsic Value

Year	Dividend (₹)	PVF (19.75%,n)	Present Value (₹)
1	2.80	0.835	2.34
2	3.92	0.697	2.73
3	5.49	0.582	3.19
4	7.68	0.486	3.73
5	10.76	0.406	4.37
			16.36

PV of Terminal Value = $\frac{10.76\ (1.15)}{0.1975 - 0.15}$ x 0.406 = ₹ 105.77

Intrinsic Value = ₹ 16.36 + ₹ 105.77 = ₹ 122.13

Question 14

Seawell Corporation, a manufacturer of do-it-yourself hardware and housewares, reported earnings per share of € 2.10 in 2017, on which it paid dividends per share of € 0.69. Earnings are expected to grow 15% a year from 2018 to 2022, during this period the dividend payout ratio is expected to remain unchanged. After 2022, the earnings growth rate is expected to drop to a stable rate of 6%, and the payout ratio is expected to increase to 65% of earnings. The firm has a beta of 1.40 currently, and is expected to have a beta of 1.10 after 2022. The market risk premium is 5.5%. The Treasury bond rate is 6.25%.

(a) What is the expected price of the stock at the end of 2022?

(b) What is the value of the stock, using the two-stage dividend discount model?

Note: Consider 2 decimals in amounts and 4 decimals in PV Factor

Answer

The expected rate of return on equity after 2022 = 0.0625 + 1.10 (0.055) = 12.3%

The dividends from 2017 onwards can be estimated as:

Year	2017	2018	2019	2020	2021	2022	2023
Earnings Per Share (€)	2.10	2.42	2.78	3.19	3.67	4.22	4.48
Dividends Per Share (€)	0.69	0.79	0.91	1.05	1.21	1.39	2.91

(a) The price as of 2022 = 2.91/(0.123 – 0.06) = € 46.19

(b) The required rate of return upto 2022 = 0.0625 + 1.4 (0.055) = 13.95%

The dividends upto 2022 are discounted using this rate as follow:

Year	PV of Dividend
2018	0.79/1.1395 = 0.69
2019	$0.91/(1.1395)^2 = 0.70$
2020	$1.05/(1.1395)^3 = 0.71$
2021	$1.21/(1.1395)^4 = 0.72$
2022	$1.39/(1.1395)^5 = 0.72$
Total	**3.54**

The current price = $3.54 + 46.19/(1.1395)^5$ = € 27.58

Question 15

An investor is considering to purchase the equity shares of LX Ltd., whose current market price (CMP) is ₹ 112. The company is proposing a dividend of ₹ 4 for the next year. LX Ltd. is expected to grow @ 20 per cent per annum for the first four years. The growth will decline linearly to 16 per cent per annum after first four years. Thereafter, it will stabilise at 16 per cent per annum infinitely. The investor requires a return of 20 per cent per annum.

You are required

(i) To calculate the intrinsic value of the share of LX Ltd.

(ii) Whether it is worth to purchase the share at this price.

Period	1	2	3	4	5	6	7
PVIF (20%, n)	0.833	0.694	0.579	0.482	0.402	0.335	0.279

Answer

(i) D_1 = ₹ 4

D_2 = ₹ 4 (1.20) = ₹ 4.80

D_3 = ₹ 4 $(1.20)^2$ = ₹ 5.76

D_4 = ₹ 4 $(1.20)^3$ = ₹ 6.91

D_5 = ₹ 6.91 (1.19) = ₹ 8.22

D_6 = ₹ 6.91 (1.19) (1.18) = ₹ 9.70

D_7 = ₹ 6.91 (1.19) (1.18) (1.17) = ₹ 11.35

D_8 = ₹ 6.91 (1.19) (1.18) (1.17) (1.16) = ₹ 13.17

$$P = \frac{D_1}{(1+k_e)} + \frac{D_2}{(1+k_e)^2} + \frac{D_3}{(1+k_e)^3} + \frac{D_4}{(1+k_e)^4} + \frac{D_5}{(1+k_e)^5} + \frac{D_6}{(1+k_e)^6} + \frac{D_7}{(1+k_e)^7} + \frac{TV}{(1+k_e)^7}$$

$$TV = \frac{D_8}{(k_e - g)} = \frac{13.17}{0.20 - 0.16} = ₹\ 329.25$$

$$P = \frac{4.00}{(1+0.20)} + \frac{4.80}{(1+0.20)^2} + \frac{5.76}{(1+0.20)^3} + \frac{6.91}{(1+0.20)^4} + \frac{8.22}{(1+0.20)^5} + \frac{9.70}{(1+0.20)^6} + \frac{11.35}{(1+0.20)^7} + \frac{329.25}{(1+0.20)^7}$$

= 4.00 x 0.833 + 4.80 x 0.694 + 5.76 x 0.579 + 6.91 x 0.482 + 8.22 x 0.402 + 9.70 x 0.335 + 11.35 x 0.279 + 329.25 x 0.279

Intrinsic Value = ₹ 114.91

(ii) As Intrinsic Value of the share is higher than its selling price of ₹ 112, it is underpriced and can be acquired. However, other factors need to be taken into consideration since difference is only slightly higher.

Question 16

The current EPS of M/s VEE Ltd. is ₹ 4. The company has shown an extraordinary growth of 40% in its earnings in the last few years. This high growth rate is likely to continue for the next 5 years after which growth rate in earnings will decline from 40% to 10% during the next 5 years and remain stable at 10% thereafter. The decline in the growth rate during the five year transition period will be equal and linear. Currently, the company's pay-out ratio is 10%. It is likely to remain the same for the next five years and from the beginning of the sixth year till the end of the 10th year, the pay-out will linearly increase and stabilize at 50% at the end of the 10th year. The post-tax cost of capital is 17% and the PV factors are given below:

Years	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
PVIF @ 17%	0.855	0.731	0.625	0.534	0.456	0.390	0.333	0.285	0.244	0.209

You are required to calculate the intrinsic value of the company's stock based on expected dividend. If the current market price of the stock is ₹ 125, suggest if it is advisable for the investor to invest in the company's stock or not.

Answer

Working Notes:

(i) Computation of Growth Rate in Earning and EPS

Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Growth in Earning	40%	40%	40%	40%	40%	34%	28%	22%	16%	10%
EPS (₹)	5.60	7.84	10.98	15.37	21.51	28.82	36.89	45.00	52.20	57.42

(ii) Computation of Payout Ratio and Dividend

Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Payout Ratio	10%	10%	10%	10%	10%	18%	26%	34%	42%	50%
Dividend (₹)	0.56	0.78	1.10	1.54	2.15	5.19	9.59	15.30	21.92	28.71

(iii) Calculation of PV of Dividend

Year	**Dividend (₹)**	**PVF**	**PV of Dividend (₹)**
1	0.56	0.855	0.48
2	0.78	0.731	0.57

3	1.10	0.625	0.69
4	1.54	0.534	0.82
5	2.15	0.456	0.98
6	5.19	0.390	2.02
7	9.59	0.333	3.19
8	15.30	0.285	4.36
9	21.92	0.244	5.35
			18.46

$$TV = \frac{28.71}{0.17 - 0.10} \times 0.244 = ₹\ 100.07$$

Intrinsic Value = ₹ 18.46 + ₹ 100.07 = ₹ 118.53

Since the Intrinsic Value of Equity share is less than current market price, it is not advisable to invest in the same.

Question 17

You are interested in buying some equity stocks of RK Ltd. The company has 3 divisions operating in different industries. Division A captures 10% of its industries sales which is forecasted to be ₹ 50 crore for the industry. Division B and C captures 30% and 2% of their respective industry's sales, which are expected to be ₹ 20 crore and ₹ 8.5 crore respectively. Division A traditionally had a 5% net income margin, whereas divisions B and C had 8% and 10% net income margin respectively. RK Ltd. has 3,00,000 shares of equity stock outstanding, which sell at ₹ 250.

The company has not paid dividend since it started its business 10 years ago. However from the market sources you come to know that RK Ltd. will start paying dividend in 3 years' time and the pay-out ratio is 30%. Expecting this dividend, you would like to hold the stock for 5 year. By analysing the past financial statements, you have determined that RK Ltd.'s required rate of return is 18% and that P/E ratio of 10 for the next year.

Evaluate:

(i) Would you will be in purchasing RK Ltd. equity at this time based on your one year forecast?

(ii) Price you will like to pay for the stock of RK Ltd if you expect earnings to grow @ 15% continuously.

Ignore taxation.

PV factors are given below:

Years	**1**	**2**	**3**	**4**	**5**
PVIF @ 18%	0.847	0.718	0.609	0.516	0.437

Answer

Working Notes:

Computation of Earnings Per Share (EPS)

Particulars		Amount (₹)
Margin of Division A	(₹ 50 crore x 10% x 5%)	25,00,000
Margin of Division B	(₹ 20 crore x 30% x 8%)	48,00,000
Margin of Division C	(₹ 8.5 crore x 2% x 10%)	1,70,000
		74,70,000
No. of Equity Shares		3,00,000
EPS		₹ 24.90

(i) Market Price based on One Year Forecast

Expected Market Price at the end of the year = ₹ 24.90 x 10 = ₹ 249

PV of the Expected Price = ₹ 249 x 0.847 = ₹ 210.90

I would **NOT** like to purchase the share as the expected market price of shares is less than its current price of ₹ 250.

(ii) If Earning is expected to grow @ 15%

Year	EPS (₹)	Dividend (₹)	PVF @18%	PV (₹)
1	24.90	–	0.847	–
2	28.64	–	0.718	–
3	32.93	9.88	0.609	6.02
4	37.87	11.36	0.516	5.86
5	43.55	13.07	0.437	5.71
				17.59

Share Price after 5 years = $\frac{13.07\ (1.15)}{0.18 - 0.15}$ = ₹ 501.02

PV of the Market Price after 5 years = ₹ 501.02 x 0.437 = ₹ 218.95

Total PV of Inflows = ₹ 17.59 + ₹ 218.95 = ₹ 236.54

Thus, the maximum price I would be willing to pay for the share shall be ₹ 236.54.

Question 18

X Limited, just declared a dividend of ₹ 14.00 per share. Mr. B is planning to purchase the share of X Limited, anticipating increase in growth rate from 8% to 9%, which will continue for three years. He also expects the market price of this share to be ₹ 360.00 after three years.

You are required to determine:

(i) the maximum amount Mr. B should pay for shares, if he requires a rate of return of 13% per annum.

(ii) the maximum price Mr. B will be willing to pay for share, if he is of the opinion that the 9% growth can be maintained indefinitely and require 13% rate of return per annum.

(iii) the price of share at the end of three years, if 9% growth rate is achieved and assuming other

conditions remaining same as in (ii) above.

Calculate rupee amount up to two decimal points.

	Year-1	Year-2	Year-3
FVIF @ 9%	1.090	1.188	1.295
FVIF @ 13%	1.130	1.277	1.443
PVIF @ 13%	0.885	0.783	0.693

Answer

(i) Expected dividend for next 3 years

Year 1 (D_1) = ₹ 14.00 (1.09) = ₹ 15.26

Year 2 (D_2) = ₹ 14.00 $(1.09)^2$ = ₹ 16.63

Year 3 (D_3) = ₹ 14.00 $(1.09)^3$ = ₹ 18.13

Required rate of return = 13% (K_e)

Market price of share after 3 years = (P_3) = ₹ 360

The present value of share

$$P_0 = \frac{D_1}{(1+k_e)} + \frac{D_2}{(1+k_e)^2} + \frac{D_3}{(1+k_e)^3} + \frac{P_3}{(1+k_e)^3}$$

$$P_0 = \frac{15.26}{(1+0.13)} + \frac{16.63}{(1+0.13)^2} + \frac{18.13}{(1+0.13)^3} + \frac{360}{(1+0.13)^3}$$

$P_0 = 15.26\ (0.885) + 16.63\ (0.783) + 18.13\ (0.693) + 360\ (0.693)$

$P_0 = 13.50 + 13.02 + 12.56 + 249.48$

P_0 = ₹ 288.56

(ii) If growth rate 9% is achieved for indefinite period, then maximum price of share should Mr. A willing be to pay is

$$P_0 = \frac{D_1}{k_e - g} = \frac{₹\ 15.26}{0.13 - 0.09} = ₹\ 381.50$$

(iii) Assuming that conditions mentioned above remain same, the price expected after 3 years will be:

$$P_3 = \frac{D_4}{k_e - g} = \frac{D_3\ (1.09)}{0.13 - 0.09} = \frac{18.13 \times 1.09}{0.04} = \frac{19.76}{0.04} = ₹\ 494$$

Question 19

Mr. A is thinking of buying shares at ₹ 500 each having face value of ₹ 100. He is expecting a bonus at the ratio of 1:5 during the fourth year. Annual expected dividend is 20% and the same rate is expected to be maintained on the expanded capital base. He intends to sell the shares at the end of seventh year at an expected price of ₹ 900 each. Incidental expenses for purchase and sale of shares are estimated to be 5% of the market price. He expects a minimum return of 12% per annum.

Should Mr. A buy the share? If so, what maximum price should he pay for each share? Assume no tax on

dividend income and capital gain.

Answer

P.V. of dividend stream and sales proceeds

Year	Dividend/Sale	PVF (12%)	PV (₹)
1	₹ 20	0.893	17.86
2	₹ 20	0.797	15.94
3	₹ 20	0.712	14.24
4	₹ 24	0.636	15.26
5	₹ 24	0.567	13.61
6	₹ 24	0.507	12.17
7	₹ 24	0.452	10.85
7	₹ 1026 (₹ 900 x 1.2 x 0.95)	0.452	463.75
			₹ 563.68
	Less: Cost of Share (₹ 500 x 1.05)		₹ 525.00
	Net gain		**₹ 38.68**

Since Mr. A is gaining ₹ 38.68 per share, he should buy the share.

Maximum price Mr. A should be ready to pay is ₹ 563.68 which will include incidental expenses. So the maximum price should be ₹ 563.68 x 100/105 = ₹ 536.84

Question 20

SAM Ltd. has just paid a dividend of ₹ 2 per share and it is expected to grow @ 6% p.a. After paying dividend, the Board declared to take up a project by retaining the next three annual dividends. It is expected that this project is of same risk as the existing projects. The results of this project will start coming from the 4th year onward from now. The dividends will then be ₹ 2.50 per share and will grow @ 7% p.a.

An investor has 1,000 shares in SAM Ltd. and wants a receipt of atleast ₹ 2,000 p.a. from this investment.

Show that the market value of the share is affected by the decision of the Board. Also show as to how the investor can maintain his target receipt from the investment for first 3 years and improved income thereafter, given that the cost of capital of the firm is 8%.

Answer

Value of share at present = $\frac{D_1}{k_e - g}$

$= \frac{2\ (1.06)}{0.08 - 0.06} = ₹\ 106$

However, if the Board implement its decision, no dividend would be payable for 3 years and the dividend for year 4 would be ₹ 2.50 and growing at 7% p.a. The price of the share, in this case, now would be:

$$P_0 = \frac{2.50}{0.08 - 0.07} \times \frac{1}{(1 + 0.08)^3} = ₹\ 198.46$$

So, the price of the share is expected to increase from ₹ 106 to ₹ 198.45 after the announcement of the project. The investor can take up this situation as follows:

Expected market price after 3 years	$= \frac{2.50}{0.08 - 0.07}$	₹ 250.00
Expected market price after 2 years	$\frac{2.50}{0.08 - 0.07} \times \frac{1}{(1 + 0.08)}$	₹ 231.48
Expected market price after 1 years	$\frac{2.50}{0.08 - 0.07} \times \frac{1}{(1 + 0.08)^2}$	₹ 214.33

In order to maintain his receipt at ₹ 2,000 for first 3 year, he would sell

10 shares in first year @ ₹ 214.33 for	₹ 2,143.30
9 shares in second year @ ₹ 231.48 for	₹ 2,083.32
8 shares in third year @ ₹ 250 for	₹ 2,000.00

At the end of 3rd year, he would be having 973 shares valued @ ₹ 250 each i.e. ₹ 2,43,250. On these 973 shares, his dividend income for year 4 would be @ ₹ 2.50 i.e. ₹ 2,432.50.

So, if the project is taken up by the company, the investor would be able to maintain his receipt of at least ₹ 2,000 for first three years and would be getting increased income thereafter.

Question 21

Shares of Voyage Ltd. are being quoted at a price-earnings ratio of 8 times. The company retains ₹ 5 per share which is 45% of its expected Earnings Per Share.

You are required to compute

(i) The cost of equity to the company if the market expects a growth rate of 15% p.a.

(ii) If the anticipated growth rate is 16% per annum, calculate the indicative market price with the same cost of capital.

(iii) If the company's cost of capital is 20% p.a. & the anticipated growth rate is 19% p.a., calculate the market price per share.

Answer

(i) Cost of Capital

Retained earnings (45%)	₹ 5 per share
Dividend (55%)	₹ 6.11 per share
EPS (100%)	₹ 11.11 per share
P/E Ratio	8 times

Market price ₹ 11.11 x 8 = ₹ 88.88

Cost of equity capital

$$= \frac{\text{Div}}{\text{Price}} \times 100 + \text{Growth \%} = \frac{₹\ 6.11}{₹\ 88.88} \times 100 + 15\% = 21.87\%$$

(ii) Market Price

$$= \frac{\text{Dividend}}{\text{Cost of Capital (\%)} - \text{Growth Rate (\%)}}$$

$$= \frac{₹\ 6.11}{21.87\% - 16\%} = ₹\ 104.08 \text{ per share}$$

(iii) Market Price

$$= \frac{\text{Dividend}}{\text{Cost of Capital (\%)} - \text{Growth Rate (\%)}}$$

$$= \frac{₹\ 6.11}{20\% - 19\%} = ₹\ 611.00 \text{ per share}$$

Question 22

Piyush Loonker and Associates presently pay a dividend of ₹ 1.00 per share and has a share price of ₹ 20.00.

(i) If this dividend were expected to grow at a rate of 12% per annum forever, what is the firm's expected or required return on equity using a dividend-discount model approach?

(ii) Instead of this situation in part (i), suppose that the dividends were expected to grow at a rate of 20% per annum for 5 years and 10% per year thereafter. Now what is the firm's expected, or required, return on equity?

The relevant present value table is as follows:

Year	1	2	3	4	5
PVIF @ 18%	0.8475	0.7182	0.6086	0.5158	0.4371
PVIF @ 19%	0.8403	0.7061	0.5934	0.4986	0.4190

Answer

(i) Firm's Expected or Required Return on Equity (Using a dividend discount model approach)

According to Dividend discount model approach the firm's expected or required return on equity is computed as follows:

$$K_e = \frac{D_1}{P_0} + g$$

Where,

K_e = Cost of equity share capital or (Firm's expected or required return on equity share capital)

D_1 = Expected dividend at the end of year 1

P_0 = Current market price of the share

g = Expected growth rate of dividend

Now, $D_1 = D_0 (1 + g)$ or ₹ 1 (1 + 0.12) or ₹ 1.12, P_0 = ₹ 20 and g = 12% per annum

Therefore, $K_e = \frac{₹\ 1.12}{₹\ 20} + 12\%$

Or, K_e = ₹ 17.6%

(ii) Firm's Expected or Required Return on Equity

(If dividends were expected to grow at a rate of 20% per annum for 5 years and 10% per year thereafter)

Since in this situation if dividends are expected to grow at a super normal growth rate g_s, for n years and thereafter, at a normal, perpetual growth rate of g_n beginning in the year n + 1, then the cost of equity can be determined by using the following formula:

$$P_0 = \sum_{t=1}^{n} \frac{D_0 (1 + g_s)^t}{(1 + K_e)^t} + \frac{D_{n+1}}{K_e - g_n}$$

Where,

g_s = Rate of growth in earlier years.

g_n = Rate of constant growth in later years.

P_0 = Discounted value of dividend stream.

K_e = Firm's expected, required return on equity (cost of equity capital).

Now,

g_s = 20% for 5 years, g_n = 10%

Therefore,

$$P_0 = \sum_{t=1}^{n} \frac{D_0 (1 + 0.20)^t}{(1 + k_e)^t} + \frac{D_6}{k_e - 0.10} \times \frac{1}{(1 + k_e)^t}$$

$$P_0 = \frac{1.20}{(1 + k_e)^1} + \frac{1.44}{(1 + k_e)^2} + \frac{1.73}{(1 + k_e)^3} + \frac{2.07}{(1 + k_e)^4} + \frac{2.49}{(1 + k_e)^5} + \frac{2.49 (1 + 0.10)}{k_e - 0.10} \times \frac{1}{(1 + k_e)^5}$$

By trial and error we are required to find out K_e

Now, assume K_e = 18% then we will have

P_0 = ₹ 1.20 (0.8475) + ₹ 1.44 (0.7182) + ₹ 1.73 (0.6086) + ₹ 2.07 (0.5158) + ₹ 2.49 (0.4371) + ₹ 2.74 (0.4371)/(0.18 – 0.10)

= ₹ 1.017 + ₹ 1.034 + ₹ 1.053 + ₹ 1.068 + ₹ 1.09 + ₹ 14.97 = ₹ 20.23

Since the present value of dividend stream is more than required it indicates that K_e is greater than 18%.

Now, assume K_e = 19% we will have

P_0 = ₹ 1.20 (0.8403) + ₹ 1.44 (0.7061) + ₹ 1.73 (0.5934) + ₹ 2.07 (0.4986) + ₹ 2.49(0.4190) + ₹ 2.74 (0.4190)/(0.19 – 0.10)

= ₹ 1.008 + ₹ 1.017 + ₹ 1.026+ ₹ 1.032 + ₹ 1.043 + ₹ 12.76

= ₹ 17.89

Since the market price of share (expected value of dividend stream) is ₹ 20. Therefore, the discount rate is closer to 18% than it is to 19%, we can get the exact rate by interpolation by using the following formula:

$$K_e = LR + \frac{\text{NPV at LR}}{\text{NPV at LR} - \text{NPV at HR}} \times \Delta r$$

Where,

LR = Lower Rate

NPV at LR = Present value of share at LR

NPV at HR = Present value of share at Higher Rate

Δr = Difference in rates

$$K_e = 18\% + \frac{(₹\ 20.23 - ₹\ 20)}{₹\ 20.23 - ₹\ 17.89} \times 1\%$$

$$= 18\% + \frac{₹\ 0.23}{₹\ 2.34} \times 1\%$$

$$= 18\% + 0.10\% = 18.10\%$$

Therefore, the firm's expected, or required, return on equity is 18.10%. At this rate the present discounted value of dividend stream is equal to the market price of the share.

Earning Based Models

Question 23

On the basis of the following information:

Current dividend (D_0) = ₹ 2.50

Discount rate (k) = 10.5%

Growth rate (g) = 2%

(i) Calculate the present value of the stock of ABC Ltd.

(ii) Is its stock overvalued if stock price is ₹ 35, ROE = 9% and EPS = ₹ 2.25? Show detailed calculation using the PE Multiple Approach and Earnings Growth Model.

Answer

(i) Present Value of the stock of ABC Ltd. is:

$$V_0 = \frac{2.50\ (1.02)}{0.105 - 0.02} = ₹\ 30$$

(ii) (A) Value of stock under the PE Multiple Approach

Particulars	
Actual Stock Price	₹ 35.00
Return on equity	9%
EPS	₹ 2.25

PE Multiple (1/Return on Equity) = 1/9%	11.11
Market Price per Share	₹ 25.00

Since, Actual Stock Price is higher, hence it is overvalued.

(B) Value of the Stock under the Earnings Growth Model

Particulars	
Actual Stock Price	₹ 35.00
Return on equity	9%
EPS	₹ 2.25
Growth Rate	2%
Market Price per Share [EPS x (1 + g)]/(ROE – g) = ₹ 2.25 x 1.02/0.07	₹ 32.79

Since, Actual Stock Price is higher, hence it is overvalued.

Question 24

A company has a book value per share of ₹ 137.80. Its return on equity is 15% and it follows a policy of retaining 60% of its earnings. If the Opportunity Cost of Capital is 18%, compute the price of the share today using both Dividend Growth Model and Walter's Model.

Answer

The company earnings and dividend per share after a year are expected to be:

EPS = ₹ 137.8 x 0.15 = ₹ 20.67

Dividend = 0.40 x 20.67 = ₹ 8.27

The growth in dividend would be:

g = 0.6 x 0.15 = 0.09

(a) As per Dividend Growth Model

Perpetual growth model Formula: $P_0 = \frac{\text{Dividend}}{(k_e - g)}$

$$P_0 = \frac{8.27}{0.18 - 0.09}$$

$$P_0 = ₹ 91.89$$

(b) As per Walter's Model

$$V_c = \frac{D + \frac{R_a}{R_c}(E - D)}{R_c}$$

Where,

V_c = Market Price of the ordinary share of the company.

R_a = Return on internal retention i.e. the rate company earns on retained profits.

R_c = Capitalisation rate i.e. the rate expected by investors by way of return from particular category of shares.

E = Earnings per share.

D = Dividend per share.

Hence,

$$V_c = \frac{8.27 + \frac{0.15}{0.18}(20.67 - 8.27)}{0.18} = \frac{18.60}{0.18}$$

= ₹ 103.35

Question 25

The following information is given for QB Ltd.

Earnings per share	₹ 12
Dividend per share (D_1)	₹ 3
Cost of capital (k_e)	18%
Return on Equity	22%
Retention Ratio	75%

Calculate the market price per share using

(i) Gordon's formula

(ii) Walter's formula

Answer

(i) Gordon's Formula

$$P_0 = \frac{E(1-b)}{K_e - br}$$

Where,

P_0 = Present value of Market price per share

E = Earnings per share

K_e = Cost of Capital

b = Retention Ratio (%)

r = Return on Equity

br = Growth Rate

$$P_0 = \frac{12(1-0.75)}{0.18 - (0.75 \times 0.22)}$$

$$= \frac{3}{0.18 - 0.165} = ₹ 200$$

(ii) Walter's Formula

$$V_c = \frac{D + \frac{R_a}{R_c}(E - D)}{R_c}$$

Where,

V_c = Market Price

D = Dividend per share

R_a = Return on Equity

R_c = Cost of Capital

E = Earnings per share

$$= \frac{₹ 3 + \frac{0.22}{0.18}(₹ 12 - ₹ 3)}{0.18}$$

$$= \frac{₹ 3 + ₹ 11}{0.18} = ₹ 77.77$$

Question 26

Capital structure of Sun Ltd., as at 31.3.2022 was as under:

	(₹ in lakhs)
Equity share capital (Paid-up value per share is ₹ 100)	80
8% Preference share capital	40
12% Debentures	64
Reserves	32

Sun Ltd., earns a profit of ₹ 32 lakhs annually on an average before deduction of income-tax, which works out to 35%, and interest on debentures.

Normal return on equity shares of companies similarly placed is 9.6% provided:

(a) Profit after tax covers fixed interest and fixed dividends at least 3 times.

(b) Capital gearing ratio is 0.75.

(c) Yield on share is calculated at 50% of profits distributed and at 5% on undistributed profits.

Sun Ltd., has been regularly paying equity dividend of 8%.

Compute the value per equity share of the company assuming:

(i) 1% for every one time of difference for Interest and Fixed Dividend Coverage.

(ii) 2% for every one time of difference for Capital Gearing Ratio.

Answer

(a) Calculation of Profit after tax (PAT)

	₹
Profit before interest and tax (PBIT)	32,00,000

Less: Debenture interest (₹ 64,00,000 x 12/100)		7,68,000
Profit before tax (PBT)		24,32,000
Less: Tax @ 35%		8,51,200
Profit after tax (PAT)		15,80,800
Less: Preference Dividend (₹ 40,00,000 x 8/100)	3,20,000	
Equity Dividend (₹ 80,00,000 x 8/100)	6,40,000	9,60,000
Retained earnings (Undistributed profit)		6,20,800

(b) Calculation of Interest and Fixed Dividend Coverage

$$= \frac{\text{PAT + Debenture Interest}}{\text{Debenture Interest + Preference Dividend}}$$

$$= \frac{15,80,800 + 7,68,000}{7,68,000 + 3,20,000} = \frac{23,48,800}{10,88,000} = 2.16 \text{ times}$$

(c) Calculation of Capital Gearing Ratio

$$\text{Capital Gearing Ratio} = \frac{\text{Fixed interest bearing funds}}{\text{Equity shareholders' funds}}$$

$$= \frac{\text{Preference Share Capital + Debentures}}{\text{Equity Share Capital + Reserves}} = \frac{40,00,000 + 64,00,000}{80,00,000 + 32,00,000} = \frac{1,04,00,000}{1,12,00,000} = 0.93$$

(d) Calculation of Yield on Equity Shares:

Yield on equity shares is calculated at 50% of profits distributed and 5% on undistributed profits:

	(₹)
50% on distributed profits (₹ 6,40,000 x 50/100)	3,20,000
5% on undistributed profits (₹ 6,20,800 x 5/100)	31,040
Yield on equity shares	3,51,040

$$\text{Yield on equity shares \%} = \frac{\text{Yield on shares}}{\text{Equity share capital}} \times 100$$

$$= \frac{3,51,040}{80,00,000} \times 100 = 4.39\%$$

(e) Calculation of Expected Yield on Equity shares

(a) Interest and fixed dividend coverage of Sun Ltd. is 2.16 times but the industry average is 3 times. Therefore, risk premium is added to Sun Ltd. Shares @ 1% for every 1 time of difference.

Risk Premium = (3.00 – 2.16) (1%) = 0.84 (1%) = 0.84%

(b) Capital Gearing ratio of Sun Ltd. is 0.93 but the industry average is 0.75 times. Therefore, risk premium is added to Sun Ltd. shares @ 2% for every 1 time of difference.

Risk Premium = (0.75 – 0.93) (2%) = 0.18 (2%) = 0.36%

	(%)
Normal return expected	9.60

Add: Risk premium for low interest and fixed dividend coverage	0.84
Add: Risk premium for high interest gearing ratio	0.36
	10.80

(f) Value of Equity Share

$$= \frac{\text{Actual yield}}{\text{Expected yield}} \times \text{Paid-up value of share} = \frac{4.39}{10.80} \times 100 = ₹\ 40.65$$

Valuation of Rights

Question 27

Pragya Limited has issued 75,000 equity shares of ₹ 10 each. The current market price per share is ₹ 24. The company has a plan to make a rights issue of one new equity share at a price of ₹ 16 for every four shares held.

You are required to:

(i) Calculate the theoretical post-rights price per share;

(ii) Calculate the theoretical value of the right alone;

(iii) Show the effect of the rights issue on the wealth of a shareholder, who has 1,000 shares assuming he sells the entire rights; and

(iv) Show the effect, if the same shareholder does not take any action and ignores the issue.

Answer

(i) Calculation of theoretical post-rights (ex-right) price per share:

$$\text{Ex-right value} = \frac{(M \times N) + (S \times R)}{N + R}$$

Where,

M = Market price,

N = Number of old shares for a right share

S = Subscription price

R = Right share offer

$$\text{Ex-right value} = \frac{(₹\ 24 \times 4) + (₹\ 16 \times 1)}{4 + 1} = ₹\ 22.40$$

(ii) Calculation of theoretical value of the rights alone:

= Ex-right price – Cost of rights share

= ₹ 22.40 – ₹ 16 = ₹ 6.40

$$\text{Value of a Right Per Share Basis} = \frac{₹\ 22.40 - ₹\ 16}{4} = ₹\ 1.60$$

(iii) Calculation of effect of the rights issue on the wealth of a shareholder who has 1,000 shares assuming he sells the entire rights:

		₹
(a)	Value of shares before right issue (1,000 shares x ₹ 24)	24,000
(b)	Value of shares after right issue (1,000 shares x ₹ 22.40)	22,400
	Add: Sale proceeds of rights renunciation (250 shares x ₹ 6.40)	1,600
		24,000

There is no change in the wealth of the shareholder even if he sells his right.

(iv) Calculation of effect if the shareholder does not take any action and ignores the issue:

	₹
Value of shares before right issue (1,000 shares x ₹ 24)	24,000
Less: Value of shares after right issue (1,000 shares x ₹ 22.40)	22,400
Loss of wealth to shareholders, if rights ignored	1,600

Question 28

KLM Limited has issued 90,000 equity shares of ₹ 10 each. KLM Limited's shares are currently selling at ₹ 72. The company has a plan to make a rights issue of one new equity share at a price of ₹ 48 for every four shares held.

You are required to:

(a) Calculate the theoretical post-rights price per share and analyse the change.

(b) Calculate the theoretical value of the right alone.

(c) Suppose Mr. A who is holding 100 shares in KLM Ltd. is not interested in subscribing to the right issue, then advice what should he do.

Answer

(a) Calculation of theoretical post-rights (ex-right) price per share

$$\text{Ex-right value} = \frac{MN + SR}{N + R}$$

Where,

M = Market price,

N = Number of old shares for a right share

S = Subscription price

R = Right share offer

$$= \frac{₹\ 72 \times 4 + ₹\ 48 \times 1}{4 + 1} = ₹\ 67.20$$

Thus, post right issue the price of share has reduced by ₹ 4.80 per share.

(b) Calculation of theoretical value of the rights alone:

= Ex-right price – Cost of rights share

= ₹ 67.20 – ₹ 48 = ₹ 19.20

Value of a Right Per Share Basis = $\frac{₹\ 67.20 - ₹\ 48}{4}$ = ₹ 4.80

(c) If Mr. A is not interested in subscribing to the right issue, he can renounce his right eligibility @ ₹ 19.20 per right and can earn a gain of ₹ 480 (25 shares x ₹ 19.20).

Question 29

ABC Limited's shares are currently selling at ₹ 13 per share. There are 10,00,000 shares outstanding. The firm is planning to raise ₹ 20 lakhs to Finance a new project.

Required:

What are the ex-right price of shares and the value of a right, if

(i) The firm offers one right share for every two shares held.

(ii) The firm offers one right share for every four shares held.

(iii) How does the shareholders' wealth (holding 100 shares) change from (i) to (ii) assuming shareholder is exercising the right? How does right issue increase shareholders' wealth?

Answer

(i) Number of shares to be issued: 5,00,000

Subscription price = ₹ 20,00,000/5,00,000 = ₹ 4

Ex-right Price = $\frac{₹\ 1,30,00,000 + ₹\ 20,00,000}{15,00,000}$ = ₹ 10

Value of a Right = ₹ 10 – ₹ 4 = ₹ 6

Value of a Right Per Share Basis = $\frac{₹\ 10 - ₹\ 4}{2}$ = ₹ 3

(ii) Subscription price = ₹ 20,00,000/2,50,000 = ₹ 8

Ex-right Price = $\frac{₹\ 1,30,00,000 + ₹\ 20,00,000}{12,50,000}$ = ₹ 12

Value of a Right = ₹ 12 – ₹ 8 = ₹ 4

Value of a Right Per Share Basis = $\frac{₹\ 12 - ₹\ 8}{4}$ = ₹ 1

(iii) Calculation of effect of right issue on wealth of Shareholder's wealth who is holding 100 shares.

(a) When firm offers one share for two shares held.

Value of Shares after right issue (150 x ₹ 10)	₹ 1,500
Less: Amount paid to acquire right shares (50 x ₹ 4)	₹ 200
	₹ 1,300

(b) When firm offers one share for every four shares held.

Value of Shares after right issue (125 x ₹ 12)	₹ 1,500

Less: Amount paid to acquire right shares (25 x ₹ 8)	₹ 200
	₹ 1,300
Wealth of Shareholders before Right Issue	₹ 1,300

Thus, there will be no change in the wealth of shareholders from (i) and (ii).

Bond Pricing

Question 30

Nominal value of 10% bonds issued by a company is ₹ 100. The bonds are redeemable at ₹ 110 at the end of year 5.

Determine the value of the bond if required yield is (i) 5%, (ii) 5.1%, (iii) 10% and (iv) 10.1%.

Note: Use PV Factors upto 4 decimals

Answer

Case (i) Required yield rate = 5%

Year	Cash Flow ₹	DF (5%)	Present Value ₹
1-5	10	4.3295	43.295
5	110	0.7835	86.185
Value of bond			**129.48**

Case (ii) Required yield rate = 5.1%

Year	Cash Flow ₹	DF (5.1%)	Present Value ₹
1-5	10	4.3175	43.175
5	110	0.7798	85.778
Value of bond			**128.953**

Case (iii) Required yield rate = 10%

Year	Cash Flow ₹	DF (10%)	Present Value ₹
1-5	10	3.7908	37.908
5	110	0.6209	68.299
Value of bond			**106.207**

Case (iv) Required yield rate = 10.1%

Year	Cash Flow ₹	DF (10.1%)	Present Value ₹
1-5	10	3.7811	37.811
5	110	0.6181	67.991
Value of bond			**105.802**

Question 31

M/s Agfa Industries is planning to issue a debenture series on the following terms:

Face value ₹ 100

Term of maturity 10 years

Yearly coupon rate

Years	Coupon Rate
1 – 4	9%
5 – 8	10%
9 – 10	14%

The current market rate on similar debentures is 15 per cent per annum. The Company proposes to price the issue in such a manner that it can yield 16 per cent compounded rate of return to the investors. The Company also proposes to redeem the debentures at 5 per cent premium on maturity. Determine the issue price of the debentures.

Note: Calculate amount upto 3 decimals

Answer

The issue price of the debentures will be the sum of present value of interest payments during 10 years of its maturity and present value of redemption value of debenture.

Years	Cash out flow (₹)	PVIF @ 16%	PV
1	9	.862	7.758
2	9	.743	6.687
3	9	.641	5.769
4	9	.552	4.968
5	10	.476	4.76
6	10	.410	4.10
7	10	.354	3.54
8	10	.305	3.05
9	14	.263	3.682
10	14 + 105 = 119	.227	3.178 + 23.835
			71.327

Thus the debentures should be priced at ₹ 71.327

Question 32

Pet feed 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%.

(a) If an investor expects that interest will be 8%, six years from now then how much he should pay for this bond now.

(b) Now suppose, on the basis of that expectation, he invests in the Bond, but interest rate turns out to be 12%, six years from now, then what will be his potential loss/gain if the company extents the life of Bond for another 6 years.

Answer

(a) If the current interest rate is 8%, the company will not extent the duration of Bond and the maximum amount the investor would ready to pay will be:

= £ 1,000 PVIAF (8%, 6) + £ 10,000 PVIF (8%, 6)

= £ 1,000 x 4.623 + £ 10,000 x 0.630

= £ 4,623 + £ 6,300

= £ 10,923

(b) If the current interest rate is 12%, the company will extent the duration of Bond. After six years the value of Bond will be

= £ 1,000 PVIAF (12%, 6) + £ 10,000 PVIF (12%, 6)

= £ 1,000 x 4.111 + £ 10,000 x 0.507

= £ 4,111 + £ 5,070

= £ 9,181

Thus, potential loss will be £ 9,181 – £ 10,923 = £ 1,742

Question 33

ABC Ltd. wants to issue 9% Bonds redeemable in 5 years at its face value of ₹ 1,000 each. The annual spot yield curve for similar risk class of Bond is as follows:

Year	Interest Rate
1	12%
2	11.62%
3	11.33%
4	11.06%
5	10.80%

(i) Evaluate the expected market price of the Bond if it has a Beta value of 1.10 due to its popularity because of lesser risk.

(ii) Interpret the nature of the above yield curve and reasons for the same.

Note: Use PV Factors upto 4 decimal points and value in ₹ upto 2 decimal points.

Answer

(i) For finding expected market price first we shall calculate Intrinsic Value of Bond as follows:

PV of Interest + PV of Maturity Value of Bond

Forward rate of interests

1st Year	12%
2nd Year	11.62%
3rd Year	11.33%
4th Year	11.06%
5th Year	10.80%

$$\text{PV of Interest} = \frac{₹\,90}{(1+0.12)} + \frac{₹\,90}{(1+0.1162)^2} + \frac{₹\,90}{(1+0.1133)^3} + \frac{₹\,90}{(1+0.1106)^4} + \frac{₹\,90}{(1+0.1080)^5}$$

$$= ₹\,90 \times 0.8929 + ₹\,90 \times 0.8026 + ₹\,90 \times 0.7247 + ₹\,90 \times 0.6573 + ₹\,90 \times 0.5988$$

$$= ₹\,80.36 + ₹\,72.23 + ₹\,65.22 + ₹\,59.16 + ₹\,53.89$$

$$= ₹\,330.86$$

$$\text{PV of Maturity Value of Bond} = \frac{₹\,1,000}{(1+0.1080)^5}$$

$$= ₹\,1,000 \times 0.5988 = ₹\,598.80$$

Intrinsic value of Bond = ₹ 330.86 + ₹ 598.80 = ₹ 929.66

Expected Price = Intrinsic Value x Beta Value

= ₹ 929.66 x 1.10 = ₹ 1,022.63

(ii) The given yield curve is inverted yield curve.

The main reason for this shape of curve is expectation for forthcoming recession when investors are more interested in Short-term rates over the long term.

Question 34

On 31st March, 2022, the following information about Bonds is available:

Name of Security	Face Value ₹	Maturity Date	Coupon Rate	Coupon Date(s)
Zero coupon	10,000	31st March, 2032	N.A.	N.A.
T-Bill	1,00,000	20th June, 2022	N.A.	N.A.
10.71% GOI 2032	100	31st March, 2032	10.71	31st March
10% GOI 2027	100	31st March, 2027	10.00	31st March & 30th September

Calculate:

(i) If 10 years yield is 7.5% p.a. what price the Zero Coupon Bond would fetch on 31st March, 2022?

(ii) What will be the annualized yield if the T-Bill is traded @ 98,500?

(iii) If 10.71% GOI 2032 Bond having yield to maturity is 8%, what price would it fetch on April 1, 2022 (after coupon payment on 31st March)?

(iv) If 10% GOI 2027 Bond having yield to maturity is 8%, what price would it fetch on April 1, 2022 (after coupon payment on 31st March)?

Note: Consider PV Factor upto 4 decimals

Answer

(i) Rate used for discounting shall be yield. Accordingly ZCB shall fetch:

$$= \frac{10,000}{(1 + 0.075)^{10}} = ₹ 4,852$$

(ii) The day count basis is actual number days/365. Accordingly annualized yield shall be:

$$\text{Yield} = \frac{\text{FV} - \text{Price}}{\text{Price}} \times \frac{365}{\text{No. of days}} = \frac{1,00,000 - 98,500}{98,500} \times \frac{365}{81} = 6.86\%$$

(iii) Price GOI 2032 would fetch

= ₹ 10.71 PVAF (8%, 10) + ₹ 100 PVF (8%, 10)

= ₹ 10.71 x 6.71 + ₹ 100 x 0.4632

= ₹ 71.86 + ₹ 46.32 = ₹ 118.18

(iv) Price GOI 2027 Bond would fetch:

= ₹ 5 PVAF (4%, 10) + ₹ 100 PVF (4%, 10)

= ₹ 5 x 8.11 + ₹ 100 x 0.6756

= 40.55 + 67.56 = 108.11

Bond Yield

Question 35

Based on the credit rating of bonds, Mr. Z has decided to apply the following discount rates for valuing bonds:

Credit Rating	Discount Rate
AAA	364 day T bill rate + 3% spread
AA	AAA + 2% spread
A	AAA + 3% spread

He is considering to invest in AA rated, ₹ 1,000 face value bond currently selling at ₹ 1,025.86. The bond has five years to maturity and the coupon rate on the bond is 15% p.a. payable annually. The next interest payment is due one year from today and the bond is redeemable at par. (Assume the 364 day T-bill rate to be 9%).

(a) You are required to calculate the intrinsic value of the bond for Mr. Z. Should he invest in the bond?

(b) Also calculate the current yield and the Yield to Maturity (YTM) of the bond.

The relevant present value table is as follows:

Year	1	2	3	4	5
PVIF @ 14%	0.877	0.769	0.675	0.592	0.519
PVIF @ 15%	0.870	0.756	0.657	0.572	0.497

Answer

(a) The appropriate discount rate for valuing the bond for Mr. Z is:

R = 9% + 3% + 2% = 14%

Time	CF	PVIF 14%	PV (CF)
1	150	0.877	131.55
2	150	0.769	115.35
3	150	0.675	101.25
4	150	0.592	88.80
5	1,150	0.519	596.85
∑ PV (CF) i.e. P_0 =			**1,033.80**

Since, the current market value is less than the intrinsic value; Mr. Z should buy the bond.

(b) Current yield = Annual Interest/Price = 150/1,025.86 = 14.62%

The YTM of the bond is calculated as follows:

@15%

$P = 150 \times PVIFA_{15\%, 4} + 1,150 \times PVIF_{15\%, 5}$

$= 150 \times 2.855 + 1,150 \times 0.497$

$= 428.25 + 571.55 = 999.80$

@14%,

As found in sub part (a) $P_0 = 1,033.80$

By interpolation we get,

$$= 14\% + \frac{7.94}{7.94 - (-26.06)} \times (15\% - 14\%) = 14\% + \frac{7.94}{34}$$

YTM = 14.23%

Question 36

An investor is considering the purchase of the following Bond:

Face value	₹ 100
Coupon rate	11%
Maturity	3 years

(i) If he wants a yield of 13% what is the maximum price, he should be ready to pay for?

(ii) If the Bond is selling for ₹ 97.60, what would be his yield?

The relevant present value table is as follows:

Year	1	2	3
PVIF @ 12%	0.893	0.797	0.712
PVIF @ 13%	0.885	0.783	0.693

Answer

(i) Calculation of Maximum price

B_0 = ₹ 11 x PVIFA (13%, 3) + ₹ 100 x PVIF (13%, 3)

= ₹ 11 x 2.361 + ₹ 100 x 0.693

= ₹ 25.97 + ₹ 69.30 = ₹ 95.27

(ii) Calculation of yield

At 12% the value = ₹ 11 x PVIFA (12%,3) + 100 x PVIF (12%,3)

= ₹ 11 x 2.402 + ₹ 100 x 0.712 = ₹ 26.42 + ₹ 71.20 = ₹ 97.62

It the bond is selling at ₹ 97.60 which is more than the fair value, the YTM of the bond would be less than 13%. This value is almost equal to the amount price of ₹ 97.60. Therefore, the YTM of the bond would be 12%.

Question 37

Today being 1st January 2022, Ram is considering to purchase an outstanding Corporate Bond having a face value of ₹ 1,000 that was issued on 1st January 2020 which has 9.5% Annual Coupon and 11 years of original maturity (i.e. maturing on 31st December 2030). Since the bond was issued, the interest rates have been on downside and it is now selling at a premium of ₹ 125.75 per bond.

Determine the prevailing interest on the similar type of Bonds if it is held till the maturity which shall be at Par.

PV Factors:

	1	2	3	4	5	6	7	8	9
6%	0.943	0.890	0.840	0.792	0.747	0.705	0.665	0.627	0.592
8%	0.926	0.857	0.794	0.735	0.681	0.630	0.583	0.540	0.500

Answer

To determine the prevailing rate of interest for the similar type of Bonds we shall compute the YTM of this Bond using IRR method as follows:

M = ₹ 1,000

Interest = ₹ 95 (0.095 x ₹ 1,000)

n = 9 years

V_0 = ₹ 1,125.75 (₹ 1,000 + ₹ 125.75)

YTM can be determined from the following equation

₹ 95 x PVIFA (YTM, 9) + ₹ 1,000 x PVIF (YTM, 9) = ₹ 1,125.75

Let us discount the cash flows using two discount rates 8% and 10% as follows:

Year	Cash Flows	PVF @ 6%	PV @ 6%	PVF @ 8%	PV @ 8%
0	-1,125.75	1	-1,125.75	1	-1,125.75
1	95	0.943	89.59	0.926	87.97
2	95	0.890	84.55	0.857	81.42
3	95	0.840	79.80	0.794	75.43
4	95	0.792	75.24	0.735	69.83
5	95	0.747	70.97	0.681	64.70
6	95	0.705	66.98	0.630	59.85
7	95	0.665	63.18	0.583	55.39
8	95	0.627	59.57	0.540	51.30
9	1,095	0.592	648.24	0.500	547.50
			112.37		-32.36

Now we use interpolation formula

$$= 6.00\% + \frac{112.37}{112.37 - (-32.36)} \times 2.00\%$$

$$= 6.00\% + \frac{112.37}{144.73} \times 2.00\% = 6.00\% + 1.553\%$$

YTM = 7.553% say 7.55%

Thus, prevailing interest rate on similar type of Bonds shall be approx. 7.55%.

Question 38

A hypothetical company ABC Ltd. issued a 10% Debenture (Face Value of ₹ 1,000) of the maturity of 10 years is currently trading at ₹ 850 per debenture. The bond is convertible into 50 equity shares being currently quoted at ₹ 17 per share. It is redeemable at par at ₹ 1,000.

If yield on equivalent comparable bond is 11.80%, then calculate the spread of yield of the above bond from this comparable bond.

The relevant present value table is as follows:

Present Values	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}
PVIF (0.11, t)	0.901	0.812	0.731	0.659	0.593	0.535	0.482	0.434	0.391	0.352
PVIF (0.13, t)	0.885	0.783	0.693	0.613	0.543	0.480	0.425	0.376	0.333	0.295

Answer

Conversion Price = ₹ 50 x 17 = ₹ 850

Intrinsic Value = ₹ 850

Accordingly the yield (r) on the bond shall be:

₹ 850 = ₹ 100 PVAF (r, 10) + ₹ 1,000 PVF (r, 10)

Let us discount the cash flows by 11%

850 = 100 PVAF (11%, 10) + 1,000 PVF (11%, 10)

850 = 100 x 5.890 + 1,000 x 0.352

= 90.90

Now let us discount the cash flows by 13%

850 = 100 PVAF (13%, 10) + 1,000 PVF (13%, 10)

850 = 100 x 5.426 + 1,000 x 0.295

= −12.40

Accordingly, IRR

$$= 11\% + \frac{90.90}{90.90 - (-12.40)} \times (13\% - 11\%)$$

$$= 11\% + \frac{90.90}{103.30} \times (13\% - 11\%)$$

= 12.76%

The spread from comparable bond = 12.76% − 11.80% = 0.96%

Question 39

Calculate Market Price of:

(i) 10% Government of India security currently quoted at ₹ 110, but yield is expected to go up by 1%.

(ii) A bond with 7.5% coupon interest, Face Value ₹ 10,000 & term to maturity of 2 years, presently yielding 6%. Interest payable half yearly.

Note: Consider PV Factor upto 4 decimals

Answer

(i) Current yield = (Coupon Interest/Market Price) x 100

= (10/110) x 100

= 9.09%

If current yield go up by 1% i.e. 10.09, the market price would be

10.09 = (10/Market Price) x 100

Market Price = ₹ 99.11

(ii) Market Price of Bond = P.V. of Interest + P.V. of Principal

= ₹ 1,394 + ₹ 8,885

= ₹ 10,279

Bond Forward Rates

Question 40

ABC Ltd. issued 9%, 5 year bonds of ₹ 1,000 each having a maturity of 3 years. The present rate of interest is 12% for one year tenure. It is expected that Forward rate of interest for one year tenure is going to fall by 75 basis points and further by 50 basis points for every next year in further for the same tenure. This bond has a beta value of 1.02 and is more popular in the market due to less credit risk.

Calculate

(i) Intrinsic value of bond

(ii) Expected price of bond in the market

Answer

(i) Intrinsic value of Bond

PV of Interest + PV of Maturity Value of Bond

Forward rate of interests

1st Year	12%
2nd Year	11.25%
3rd Year	10.75%

$$\text{PV of interest} = \frac{₹\ 90}{(1+0.12)} = \frac{₹\ 90}{(1+0.12)(1+0.1125)} = \frac{₹\ 90}{(1+0.12)(1+0.1125)(1+0.1075)}$$

$$= ₹\ 217.81$$

$$\text{PV of Maturity Value of Bond} = \frac{₹\ 1,000}{(1+0.12)(1+0.1125)(1+0.1075)} = ₹\ 724.67$$

Intrinsic value of Bond = ₹ 217.81 + ₹ 724.67 = ₹ 942.48

(ii) Expected Price = Intrinsic Value x Beta Value

= ₹ 942.48 x 1.02 = ₹ 961.33

Question 41

From the following data for Government securities, calculate the forward rates:

Face value (₹)	Coupon rate	Maturity (Year)	Current price (₹)
1,00,000	0%	1	91,500
1,00,000	10%	2	98,500
1,00,000	10.5%	3	99,000

Answer

Consider one-year Government Security

$$91,500 = \frac{1,00,000}{(1+r_1)}$$

$$1 + r_1 = \frac{1,00,000}{91,500} = 1.092896$$

$r_1 = 0.0929$ or 0.093 say 9.3%

Consider two-year Government Security

$$98,500 = \frac{10,000}{1.093} + \frac{1,10,000}{1.093\ (1 + r_2)}$$

$$98,500 = 9,149.131 + \frac{1,10,000}{1.093\ (1 + r_2)}$$

$$= 89,350.87 = \frac{1,00,640.4}{1 + r_2}$$

$= 1 + r_2 = 1.126351$

$= r_2 = 0.12635$

$= r_2 = 0.1263$ say 12.63%

Consider three-year Government Securities:

$$99,000 = \frac{10,500}{1.093} + \frac{10,500}{1.093 \times 1.1263} + \frac{1,10,500}{1.093 \times 1.1263\ (1 + r_3)}$$

$$99,000 = 9,606.587 + 8,529.65 + \frac{89,761.07}{1 + r_3}$$

$$= 80,863.763 = \frac{89,761.07}{1 + r_3}$$

$= 1 + r_3 = 1.1100284$

$= r_3 = 0.1100284$ say 11.003%

Question 42

Following are the yields on Zero Coupon Bonds (ZCB) having a face value of ₹ 1,000

Maturity (Years)	Yield to Maturity (YTM)
1	10%
2	11%
3	12%

Assume that the term structure of interest rate will remain the same.

You are required to

(i) Calculate the implied one year forward rates

(ii) Expected Yield to Maturity and prices of one year and two year Zero Coupon Bonds at the end of the first year.

Answer

(i) Calculation of Forward Rates

Maturity	YTM (%)	PVIF	Face value	Price	Forward rate
1	10	0.909	1,000	909.09	0.10 i.e. 10%
2	11	0.812	1,000	811.62	0.1201 i.e. 12.01%
3	12	0.712	1,000	711.78	0.1403 i.e. 14.03%

(ii) Calculation of Expected Prices and YTM

Maturity	Forward rate	Face value	Price	YTM
2	0.1201	1,000	$\frac{1,000}{(1+0.1201)} = 892.78$	0.1201 i.e. 12.01%
3	0.1403	1,000	$\frac{1,000}{(1+0.1201)(1+0.1403)} = 782.93$	0.1302* i.e. 13.02%

* $\sqrt{\left(\frac{1,000}{782.93}\right)} - 1 = 0.1302$

Bond Duration

Question 43

The following data are available for a bond:

Face Value ₹ 10,000 to be redeemed at par on maturity

Coupon rate 8.5 per cent per annum

Years to Maturity 5 years

Yield to Maturity (YTM) 10 per cent

You are required to calculate:

(i) Current market price of the Bond,

(ii) Macaulay's Duration,

(iii) Volatility of the Bond,

(iv) Convexity of the Bond,

(v) Expected market price, if there is a decrease in the YTM by 200 basis points

  (a) By Macaulay's Duration based estimate

  (b) By Intrinsic Value Method

Given

Years	1	2	3	4	5
PVIF (10%, n)	0.909	0.826	0.751	0.683	0.621
PVIF (8%, n)	0.926	0.857	0.794	0.735	0.681

Answer

(i) Current Market Price of Bond

= ₹ 850 (PVIAF 10%, 5) + ₹ 10,000 (PVIF 10%, 5)

= ₹ 850 (3.79) + ₹ 10,000 (0.621) = ₹ 3,221.50 + ₹ 6,210 = ₹ 9,431.5

(ii) Macaulay's Duration

Year	Cash flow	P.V. @ 10%		Proportion of bond value	Proportion of bond value x time (year)
1	850	0.909	772.65	0.082	0.082
2	850	0.826	702.10	0.074	0.148
3	850	0.751	638.35	0.068	0.204
4	850	0.683	580.55	0.062	0.248
5	10,850	0.621	6,737.85	0.714	3.57
			9,431.50	1.000	**4.252**

Duration of the Bond is 4.252 years

(iii) Volatility of Bond

$$\text{Volatility of Bonds} = \frac{\text{Duration}}{(1 + \text{YTM})} = \frac{4.252}{1.10} = 3.865$$

(iv) Convexity of Bond

$C^* \times (\Delta Y)^2 \times 100$

$$C^* = \frac{V_+ + V_- - 2V_0}{2V_0 (\Delta Y)^2}$$

Year	Cash flow	P.V. @ 8%		P.V @12%	
1	850	0.926	787.10	0.892	758.20
2	850	0.857	728.45	0.797	677.45
3	850	0.794	674.90	0.712	605.20
4	850	0.735	624.75	0.636	540.60
5	10,850	0.681	7,388.85	0.567	6,151.95
			10,204.05		8,733.40

$$C^* = \frac{10,204.05 + 8,733.40 - 2 \times 9,431.50}{2 \times 9,431.50 \times (0.02)^2}$$

= 74.45/7.5452

= 9.867

Convexity of Bond = $9.867 \times (0.02)^2 \times 100 = 0.395\%$

(v) The expected market price if decrease in YTM by 200 basis points

(A) By Macaulay's duration-based estimate

= ₹ 9,431.50 x 2 (3.865/100) = ₹ 729.05

Hence expected market price is = ₹ 9,431.50 + ₹ 729.05 = ₹ 10,160.55

Hence, the market price will increase.

(B) By Intrinsic Value method

Intrinsic Value at YTM of 10%	₹ 9,431.50
Intrinsic Value at YTM of 8%	₹ 10,204.05
Price increased by	₹ 772.55

Hence, expected market price is ₹ 10,204.05

Question 44

The following data are available for a bond

Face value	₹ 1,000
Coupon Rate	16%
Years to Maturity	6
Redemption value	₹ 1,000
Yield to maturity	17%

What is the current market price, duration and volatility of this bond? Calculate the expected market price, if increase in required yield is by 75 basis points.

PV Factors:

	1	2	3	4	5	6
PVIF @ 17%	0.855	0.731	0.624	0.534	0.456	0.390

Answer

(i) Calculation of Market price:

= 160 (PVIAF 17%, 6) + 1,000 (PVIF 17%, 6)

= 160 (3.590) + 1,000 (0.390) = 574.40 + 390 = 964.40

(ii) Duration

Year	Cash flow	P.V. @ 17%		Proportion of bond value	Proportion of bond value x time (year)
1	160	.855	136.80	0.142	0.142
2	160	.731	116.96	0.121	0.246
3	160	.624	99.84	0.103	0.309
4	160	.534	85.44	0.089	0.356
5	160	.456	72.96	0.076	0.380
6	1,160	.390	452.40	0.469	2.814
			964.40	1.000	**4.247**

Duration of the Bond is 4.247 years

(iii) Volatility

$$\text{Volatility of the bonds} = \frac{\text{Duration}}{(1+\text{yield})} = \frac{4.247}{1.17} = 3.63$$

(iv) The expected market price if increase in required yield is by 75 basis points

= ₹ 964.40 x 0.75 (3.63/100) = ₹ 26.26

Then, the market price will be ₹ 964.40 – ₹ 26.26 = ₹ 938.14

Hence, the market price will decrease.

Question 45

A Ltd. has issued convertible bonds, which carries a coupon rate of 14%. Each bond is convertible into 20 equity shares of the company A Ltd. The prevailing interest rate for similar credit rating bond is 8%. The convertible bond has 5 years maturity. It is redeemable at par at ₹ 100. The relevant present value table is as follows.

Present values	t_1	t_2	t_3	t_4	t_5
PVIF (0.14, t)	0.877	0.769	0.675	0.592	0.519
PVIF (0.08, t)	0.926	0.857	0.794	0.735	0.681

You are required to estimate:

(Calculations be made upto 3 decimal places)

(i) current market price of the bond, assuming it being equal to its fundamental value,

(ii) minimum market price of equity share at which bond holder should exercise conversion option; and

(iii) duration of the bond.

Answer

(i) Current Market Price of Bond

Time	CF	PVIF 8% PV (CF)	PV (CF)
1	14	0.926	12.964
2	14	0.857	11.998
3	14	0.794	11.116
4	14	0.735	10.290
5	114	0.681	77.634
Σ PV (CF) i.e. P_0 =			**124.002**

(ii) Minimum Market Price of Equity Shares at which Bondholder should exercise conversion option:

= 124/20 = ₹ 6.20

(iii) Duration of the Bond

Year	Cash flow	P.V. @ 8%		Proportion of bond value	Proportion of bond value x time (year)
1	14	0.926	12.964	0.105	0.105
2	14	0.857	11.998	0.097	0.194
3	14	0.794	11.116	0.089	0.267
4	14	0.735	10.290	0.083	0.332
5	114	0.681	77.634	0.626	3.130
			124.002	1.000	**4.028**

Question 46

XL Ispat Ltd. has made an issue of 14 per cent non-convertible debentures on January 1, 2022. These debentures have a face value of ₹ 100 and is currently traded in the market at a price of ₹ 90.

Interest on these NCDs will be paid through post-dated cheques dated June 30 and December 31. Interest payments for the first 3 years will be paid in advance through post-dated cheques while for the last 2 years post-dated cheques will be issued at the third year. The bond is redeemable at par on December 31, 2026 at the end of 5 years.

Required:

(i) Estimate the current yield and YTM of the bond.

(ii) Calculate the duration of the NCD.

(iii) Assuming that intermediate coupon payments are not available for reinvestment, calculate the realised yield on the NCD.

The relevant present value table is as follows:

Half-yearly Periods	1	2	3	4	5	6	7	8	9	10
PVIF @ 7.50%	0.930	0.865	0.805	0.749	0.697	0.648	0.603	0.561	0.522	0.485
PVIF @ 9%	0.917	0.842	0.772	0.708	0.650	0.596	0.547	0.502	0.460	0.422

Answer

(i) Current yield

$$= \frac{7}{90} \times \frac{12}{6} \times 100 = 15.55\%$$

YTM can be determined from the following equation

7 x PVIFA (YTM, 10) + 100 x PVIF (YTM, 10) = 90

Let us discount the cash flows using two discount rates 7.50% and 9% as follows:

Half-yearly Periods	Cash Flows	PVF @7.5%	PV @7.50%	PVF @9%	PV @9%
0	–90	1	–90	1	–90
1	7	0.930	6.51	0.917	6.419
2	7	0.865	6.055	0.842	5.894

3	7	0.805	5.635	0.772	5.404
4	7	0.749	5.243	0.708	4.956
5	7	0.697	4.879	0.650	4.550
6	7	0.648	4.536	0.596	4.172
7	7	0.603	4.221	0.547	3.829
8	7	0.561	3.927	0.502	3.514
9	7	0.522	3.654	0.460	3.220
10	107	0.485	51.90	0.422	45.154
			6.560		–2.888

Now we use interpolation formula

$$7.50\% + \frac{6.560}{6.560 - (-2.888)} \times 1.50\%$$

$$7.50\% + \frac{6.560}{9.448} \times 1.50\% = 7.50\% + 1.041\%$$

YTM = 8.54%

(ii) The duration can be calculated as follows:

Half-yearly Periods	Cash Flow	PVF@ 8.54%	PV @ 8.54%	Proportion of NCD value	Proportion of NCD value x time
1	7	0.921	6.447	0.0717	0.0717
2	7	0.849	5.943	0.0661	0.1322
3	7	0.782	5.474	0.0608	0.1824
4	7	0.721	5.047	0.0561	0.2244
5	7	0.664	4.648	0.0517	0.2585
6	7	0.612	4.284	0.0476	0.2856
7	7	0.563	3.941	0.0438	0.3066
8	7	0.519	3.633	0.0404	0.3232
9	7	0.478	3.346	0.0372	0.3348
10	107	0.441	47.187	0.5246	5.2460
			89.95	1.0000	**7.3654**

Duration = 7.3654 half years i.e. 3.683 years

(iii) Realised Yield can be calculated as follows:

$$\frac{(7 \times 10) + 100}{(1 + R)^{10}} = 90$$

$$(1 + R)^{10} = \frac{170}{90}$$

$R = (170/90)^{1/10} - 1 = 0.06567$ or 6.567% for half yearly and 13.134% annually

Question 47

Mr. A is planning for making investment in bonds of one of the two companies X Ltd. and Y Ltd. The detail of these bonds is as follows:

Company	Face Value	Coupon Rate	Maturity Period
X Ltd.	₹ 10,000	6%	5 Years
Y Ltd.	₹ 10,000	4%	5 Years

The current market price of X Ltd.'s bond is ₹ 10,797.20 and both bonds have same Yield to Maturity (YTM). Since Mr. A considers duration of bonds as the basis of decision making, you are required to calculate the duration of each bond and your decision.

The relevant present value table is as follows:

Years	1	2	3	4	5
PVIF @ 4%	0.9615	0.9246	0.8890	0.8548	0.8219
PVIF @ 5%	0.9524	0.9070	0.8638	0.8227	0.7835

Answer

To calculate duration of bond we need YTM, which shall be calculated as follows:

Let us try NPV of Bond @ 5%

$$= \frac{600}{(1.05)^1} + \frac{600}{(1.05)^2} + \frac{600}{(1.05)^3} + \frac{600}{(1.05)^4} + \frac{10,600}{(1.05)^5} - 10,797.20$$

= ₹ 571.44 + ₹ 544.20 + ₹ 518.28 + ₹ 493.62 + ₹ 8,305.10 – ₹ 10,797.20 = – ₹ 364.56

Let us now try NPV @ 4%

$$= \frac{600}{(1.04)^1} + \frac{600}{(1.04)^2} + \frac{600}{(1.04)^3} + \frac{600}{(1.04)^4} + \frac{10,600}{(1.04)^5} - 10,797.20$$

= ₹ 576.90 + ₹ 554.76 + ₹ 533.40 + ₹ 512.88 + ₹ 8,712.14 – ₹ 10,797.20 = ₹ 92.88

Let us now interpolation formula

$$= 4\% + \frac{92.88}{92.88 - (-364.56)} \times (5\% - 4\%)$$

$$= 4\% + \frac{92.88}{92.88 + 364.56} \times 1\%$$

$$= 4\% + \frac{92.88}{457.44} = 4.20\%$$

Duration of X Ltd.'s Bond

Year	Cash flow	P.V. @ 4.20%		Proportion of bond value	Proportion of bond value x time (year)
1	600	0.9597	575.82	0.0533	0.0533
2	600	0.9210	552.60	0.0512	0.1024
3	600	0.8839	530.34	0.0491	0.1473

4	600	0.8483	508.98	0.0472	0.1888
5	10,600	0.8141	8,629.46	0.7992	3.9960
			10,797.20	1.0000	**4.4878**

Duration of the Bond is 4.4878 years say 4.49 years.

Duration of Y Ltd.'s Bond

Year	Cash flow	P.V. @ 4.20%		Proportion of bond value	Proportion of bond value x time (year)
1	400	0.9597	383.88	0.0387	0.0387
2	400	0.9210	368.40	0.0372	0.0744
3	400	0.8839	353.56	0.0357	0.1071
4	400	0.8483	339.32	0.0342	0.1368
5	10,400	0.8141	8,466.64	0.8542	4.2710
			9,911.80	1.0000	**4.6280**

Duration of the Bond is 4.6280 years say 4.63 years.

Decision: Since the duration of Bond of X Ltd. is lower and also carrying higher interest rate hence it should be preferred.

Bond Immunization

Question 48

Mr. A will need ₹ 1,00,000 after two years for which he wants to make one time necessary investment now. He has a choice of two types of bonds. Their details are as below:

	Bond X	Bond Y
Face value	₹ 1,000	₹ 1,000
Coupon	7% payable annually	8% payable annually
Years to maturity	1	4
Current price	₹ 972.73	₹ 936.52
Current yield	10%	10%

Advice Mr. A whether he should invest all his money in one type of bond or he should buy both the bonds and, if so, in which quantity? Assume that there will not be any call risk or default risk.

Answer

Duration of Bond X

Year	Cash flow	P.V. @ 10%		Proportion of bond value	Proportion of bond value x time (year)
1	1,070	0.909	972.63	1.000	1.000

Duration of the Bond is 1 year

Duration of Bond Y

Year	Cash flow	P.V. @ 10%		Proportion of bond value	Proportion of bond value x time (year)
1	80	0.909	72.72	0.077	0.077
2	80	0.826	66.08	0.071	0.142
3	80	0.751	60.08	0.064	0.192
4	1,080	0.683	737.64	0.788	3.152
			936.52	1.000	**3.563**

Duration of the Bond is 3.563 years

Let x_1 be the investment in Bond X and therefore investment in Bond Y shall be $(1 - x_1)$. Since the required duration is 2 year the proportion of investment in each of these two securities shall be computed as follows:

$2 = x_1 + (1 - x_1)\ 3.563$

$x_1 = 0.61$

Accordingly, the proportion of investment shall be 61% in Bond X and 39% in Bond Y respectively.

Amount of investment:

Bond X	Bond Y
PV of ₹ 1,00,000 for 2 years @ 10% x 61%	PV of ₹ 1,00,000 for 2 years @ 10% x 39%
= ₹ 1,00,000 (0.826) x 61%	= ₹ 1,00,000 (0.826) x 39%
= ₹ 50,386	= ₹ 32,214
No. of Bonds to be purchased	No. of Bonds to be purchased
= ₹ 50,386/₹ 972.63 = 51.80 i.e. approx. 52 bonds	= ₹ 32,214/₹ 936.52 = 34.40 i.e. approx. 34 bonds

Note: The investor has to keep the money invested for two years. Therefore, the investor can invest in both bonds with the assumption that Bond X will be reinvested for another one year on same returns.

Question 49

The following data are available for three bonds A, B and C. These bonds are used by a bond portfolio manager to fund an outflow scheduled in 6 years. Current yield is 9%. All bonds have face value of ₹ 100 each and will be redeemed at par. Interest is payable annually.

Bond	Maturity (Years)	Coupon rate
A	10	10%
B	8	11%
C	5	9%

(i) Calculate the duration of each bond.

(ii) The bond portfolio manager has been asked to keep 45% of the portfolio money in Bond A. Calculate the percentage amount to be invested in bonds B and C that need to be purchased to immunise the portfolio.

(iii) After the portfolio has been formulated, an interest rate change occurs, increasing the yield to 11%. The new duration of these bonds are: Bond A = 7.15 Years, Bond B = 6.03 Years and Bond C = 4.27 years.

Is the portfolio still immunized? Why or why not?

(iv) Determine the new percentage of B and C bonds that are needed to immunize the portfolio. Bond A remaining at 45% of the portfolio.

Present values be used as follows:

Present Values	t_1	t_2	t_3	t_4	t_5	t_6	t_7	t_8	t_9	t_{10}
PVIF 0.09,t	0.917	0.842	0.772	0.708	0.650	0.596	0.547	0.502	0.460	0.4224

Answer

(i) Calculation of Bond Duration

Bond A

Year	Cash flow	P.V. @ 9%		Proportion of bond value	Proportion of bond value x time (year)
1	10	0.917	9.17	0.086	0.086
2	10	0.842	8.42	0.079	0.158
3	10	0.772	7.72	0.073	0.219
4	10	0.708	7.08	0.067	0.268
5	10	0.650	6.50	0.061	0.305
6	10	0.596	5.96	0.056	0.336
7	10	0.547	5.47	0.051	0.357
8	10	0.502	5.02	0.047	0.376
9	10	0.460	4.60	0.043	0.387
10	110	0.4224	46.46	0.437	4.370
			106.40	1.000	**6.862**

Duration of the bond is 6.862 years or 6.86 year

Bond B

Year	Cash flow	P.V. @ 9%		Proportion of bond value	Proportion of bond value x time (year)
1	11	0.917	10.087	0.091	0.091
2	11	0.842	9.262	0.083	0.166
3	11	0.772	8.492	0.076	0.228
4	11	0.708	7.788	0.070	0.280

5	11	0.650	7.150	0.064	0.320
6	11	0.596	6.556	0.059	0.354
7	11	0.547	6.017	0.054	0.378
8	111	0.502	55.772	0.502	4.016
			111.224	1.000	**5.833**

Duration of the bond B is 5.833 years or 5.84 years

Bond C

Year	Cash flow	P.V. @ 9%		Proportion of bond value	Proportion of bond value x time (year)
1	9	0.917	8.253	0.082	0.082
2	9	0.842	7.578	0.076	0.152
3	9	0.772	6.948	0.069	0.207
4	9	0.708	6.372	0.064	0.256
5	109	0.650	70.850	0.709	3.545
			100.00	1.000	**4.242**

Duration of the bond C is 4.242 years or 4.24 years

(ii) Amount of Investment required in Bond B and C

Period required to be immunized — 6.000 Year

Less: Period covered from Bond A (6.86 x 45%) — 3.087 Year

To be immunized from B and C — 2.913 Year

Let proportion of investment in Bond B and C is b and c respectively then

$b + c = 0.55$ ------(1)

$5.833b + 4.242c = 2.913$ ------(2)

On solving these equations, the value of b and c comes 0.3639 and 0.1861 respectively and accordingly, the % of investment of B and C is 36.39% and 18.61% respectively.

(iii) With revised yield the Revised Duration of Bond stands

= 0.45 x 7.15 + 0.3639 x 6.03 + 0.1861 x 4.27 = 6.21 year

No portfolio is not immunized as the duration of the portfolio has been increased from 6 years to 6.21 years.

(iv) New percentage of B and C bonds that are needed to immunize the portfolio

Period required to be immunized — 6.0000 Year

Less: Period covered from Bond A (7.15 x 45%) — 3.2175 Year

To be immunized from B and C — 2.7825 Year

Let proportion of investment in Bond B and C is b and c respectively, then

$b + c = 0.55$ ------(3)

$6.03b + 4.27c = 2.7825$ ------(4)

On solving these equations, the value of b and c comes 0.2466 and 0.3034 respectively and accordingly, the % of investment of B and C is 24.66% and 30.34% respectively.

Bond Refunding

Question 50

M/s Transindia Ltd. is contemplating calling ₹ 3 crores of 30 years, ₹ 1,000 bond issued 5 years ago with a coupon interest rate of 14 per cent. The bonds have a call price of ₹ 1,140 and had initially collected proceeds of ₹ 2.91 crores due to a discount of ₹ 30 per bond. The initial floating cost was ₹ 3,60,000. The Company intends to sell ₹ 3 crores of 12 per cent coupon rate, 25 years bonds to raise funds for retiring the old bonds. It proposes to sell the new bonds at their par value of ₹ 1,000. The estimated floatation cost is ₹ 4,00,000. The company is paying 40% tax and its after tax cost of debt is 8 per cent. As the new bonds must first be sold and their proceeds, then used to retire old bonds, the company expects a two months period of overlapping interest during which interest must be paid on both the old and new bonds. What is the feasibility of refunding bonds?

Answer

NPV for bond refunding

	₹
PV of annual cash flow savings (W.N. 2) (3,49,600 x PVIFA 8%,25) i.e. 10.675	37,31,980
Less: Initial investment (W.N. 1)	29,20,000
NPV	8,11,980

Recommendation: Refunding of bonds is recommended as NPV is positive.

Working Notes:

(1) Initial investment:

(a)	Call premium		
	Before tax (1,140 – 1,000) x 30,000	42,00,000	
	Less tax @ 40%	16,80,000	25,20,000
(b)	Floatation cost		4,00,000
(c)	Overlapping interest		
	Before tax (0.14 x 2/12 x 3 crores)	7,00,000	
	Less tax @ 40%	2,80,000	4,20,000
(d)	Tax saving on unamortised discount on old bond		
	(25/30 x 9,00,000 x 40%)		(3,00,000)
(e)	Tax savings from unamortised Floatation		
	Cost of old bond (25/30 x 3,60,000 x 40%)		(1,20,000)
			29,20,000

(2) Annual cash flow savings:

(a)	Old bond		
	(i) Interest cost (0.14 x 3 crores)	42,00,000	
	Less tax @ 40%	16,80,000	25,20,000
	(ii) Tax savings from amortisation of discount [(9,00,000/30) x 40%]		(12,000)
	(iii) Tax savings from amortisation of floatation cost [(3,60,000/30) x 40%]		(4,800)
	Annual after tax cost payment under old Bond (A)		25,03,200
(b)	New bond		
	(i) Interest cost before tax (0.12 x 3 crores)	36,00,000	
	Less tax @ 40%	14,40,000	21,60,000
	(ii) Tax savings from amortisation of floatation cost [(4,00,000/25) x 40%]		(6,400)
	Annual after tax payment under new Bond (B)		21,53,600
	Annual Cash Flow Saving (A) – (B)		3,49,600

Question 51

ABC Ltd. has ₹ 300 million, 12 per cent bonds outstanding with six years remaining to maturity. Since interest rates are falling, ABC Ltd. is contemplating of refunding these bonds with a ₹ 300 million issue of 6 year bonds carrying a coupon rate of 10 per cent. Issue cost of the new bond will be ₹ 6 million and the call premium is 4 per cent. ₹ 9 million being the unamortized portion of issue cost of old bonds can be written off no sooner the old bonds are called off. Marginal tax rate of ABC Ltd. is 30 per cent. You are required to analyse the bond refunding decision.

Note: Present all amounts in ₹ million

Answer

(i)	**Calculation of initial outlay:**	**₹ (million)**
a.	Face value	300
	Add: Call premium	12
	Cost of calling old bonds	312
b.	Gross proceed of new issue	300
	Less: Issue costs	6
	Net proceeds of new issue	294
c.	Tax savings on call premium and unamortized cost [0.30 (12 + 9)]	6.3

So, Initial outlay = ₹ 312 million – ₹ 294 million – ₹ 6.3 million = ₹ 11.7 million

(ii) Calculation of net present value of refunding the bond:	₹ (million)
Saving in annual interest expenses [300 x (0.12 – 0.10)]	6.00
Less: Tax saving on interest and amortization [0.30 x {6 + (9 – 6)/6}]	1.95
Annual net cash saving	4.05
PVIFA (7%, 6 years)	4.766
∴ Present value of net annual cash saving	₹ 19.30 million
Less: Initial outlay	₹ 11.70 million
Net present value of refunding the bond	₹ 7.60 million

Decision: The bonds should be refunded

Convertible Bond

Question 52

The data given below relates to a convertible bond:

Face value	₹ 250
Coupon rate	12%
No. of shares per bond	20
Market price of share	₹ 12
Straight value of bond	₹ 235
Market price of convertible bond	₹ 265

Calculate:

(i) Stock value of bond

(ii) The percentage of downside risk

(iii) The conversion premium

(iv) The conversion parity price of the stock

Answer

(i) Stock value or conversion value of bond

= 12 x 20 = ₹ 240

(ii) Percentage of the downside risk

$$\frac{₹\ 265 - ₹\ 235}{₹\ 265} \times 100 = 11.32\%$$

This ratio gives the percentage price decline experienced by the bond if stock becomes worthless.

(iii) Conversion Premium

$$\frac{\text{Market Price} - \text{Conversion Value}}{\text{Conversion Value}} \times 100$$

$$\frac{₹\ 265 - ₹\ 240}{₹\ 240} \times 100 = 10.42\%$$

(iv) Conversion Parity Price

$$\frac{\text{Bond Price}}{\text{No. of Shares on Conversion}}$$

$$\frac{₹\ 265}{20} = ₹\ 13.25$$

This indicates that if the price of shares rises to ₹ 13.25 from ₹ 12 the investor will neither gain nor lose on buying the bond and exercising it. Observe that ₹ 1.25 (₹ 13.25 – ₹ 12.00) is 10.42% of ₹ 12, the Conversion Premium.

Question 53

GHI Ltd., AAA rated company has issued, fully convertible bonds on the following terms, a year ago:

Face value of bond	₹ 1,000
Coupon (interest rate)	8.5%
Time to Maturity (remaining)	3 years
Interest Payment	Annual, at the end of year
Principal Repayment	At the end of bond maturity
Conversion ratio (Number of shares per bond)	25
Current market price per share	₹ 45
Market price of convertible bond	₹ 1,175

AAA rated company can issue plain vanilla bonds without conversion option at an interest rate of 9.5%.

Required: Calculate as of today:

(i) Straight Value of bond

(ii) Conversion Value of the bond

(iii) Conversion Premium

(iv) Percentage of downside risk

(v) Conversion Parity Price

t	1	2	3
PVIF (0.095, t)	0.9132	0.8340	0.7617

Answer

(i) Straight Value of Bond

= ₹ 85 x 0.9132 + ₹ 85 x 0.8340 + ₹ 1,085 x 0.7617 = ₹ 974.96

(ii) Conversion Value

= Conversion Ration x Market Price of Equity Share = ₹ 45 x 25 = ₹ 1,125

(iii) Conversion Premium

$$= \frac{₹\ 1,175 - ₹\ 1,125}{₹\ 1,125} \times 100 = 4.44\%$$

(iv) Percentage of Downside Risk

$$= \frac{₹\ 1,175 - ₹\ 974.96}{₹\ 1,175} \times 100 = 17.02\%$$

(v) Conversion Parity Price

$$= \frac{\text{Bond Price}}{\text{No. of Share on Conversion}}$$

$$= \frac{₹\ 1,175}{25} = ₹\ 47$$

Question 54

The following data is related to 8.5% Fully Convertible (into Equity shares) Debentures issued by JAC Ltd. at ₹ 1,000.

Market Price of Debenture	₹ 900
Conversion Ratio	30
Straight Value of Debenture	₹ 700
Market Price of Equity share on the date of Conversion	₹ 25
Expected Dividend Per Share	₹ 1

You are required to calculate:

(a) Conversion Value of Debenture

(b) Market Conversion Price

(c) Conversion Premium per share

(d) Ratio of Conversion Premium

(e) Premium over Straight Value of Debenture

(f) Favourable income differential per share

(g) Premium payback period

Answer

(a) Conversion Value of Debenture

= Market Price of one Equity Share x Conversion Ratio

= ₹ 25 x 30 = ₹ 750

(b) Market Conversion Price

$$= \frac{\text{Market Price of Convertible Debenture}}{\text{Conversion Ratio}}$$

$$= \frac{₹\ 900}{30} = ₹\ 30$$

(c) Conversion Premium per share

= Market Conversion Price – Market Price of Equity Share

= ₹ 30 – ₹ 25 = ₹ 5

(d) Ratio of Conversion Premium

$$= \frac{\text{Conversion premium per share}}{\text{Market Price of Equity Share}} = \frac{₹\ 5}{₹\ 25} = 20\%$$

(e) Premium over Straight Value of Debenture

$$= \frac{\text{Market Price of Convertible Bond}}{\text{Straight Value of Bond}} - 1 = \frac{₹\ 900}{₹\ 700} - 1 = 28.6\%$$

(f) Favourable income differential per share

$$= \frac{\text{Coupon Interest from Debenture} - \text{Conversion Ratio x Dividend Per Share}}{\text{Conversion Ratio}}$$

$$= \frac{₹\ 85 - 30 \text{ x } ₹\ 1}{30} = ₹\ 1.833$$

(g) Premium payback period

$$= \frac{\text{Conversion premium per share}}{\text{Favourable Income Differential Per Share}} = \frac{₹\ 5}{₹\ 1.833} = 2.73 \text{ years}$$

Question 55

A convertible bond with a face value of ₹ 1,000 is issued at ₹ 1,350 with a coupon rate of 10.5%. The conversion rate is 14 shares per bond. The current market price of bond and share is ₹ 1,475 and ₹ 80 respectively. What is the premium over conversion value?

Answer

Conversion rate is 14 shares per bond.

Market price of share = ₹ 80

Conversion Value = 14 x ₹ 80 = ₹ 1,120

Market price of bond = ₹ 1,475

Premium over Conversion Value = (₹ 1,475 – ₹ 1,120)/₹ 1,120 = (₹ 355/₹ 1,120) x 100 = 31.70%

Question 56

Saranam Ltd. has issued convertible debentures with coupon rate 12%. Each debenture has an option to convert to 20 equity shares at any time until the date of maturity. Debentures will be redeemed at ₹ 100 on maturity of 5 years. An investor generally requires a rate of return of 8% p.a. on a 5 year security. As an investor when will you exercise conversion for given market prices of the equity share of (i) ₹ 4, (ii) ₹ 5 and (iii) ₹ 6.

Cumulative PV factor for 8% for 5 years: 3.993

PV factor for 8% for year 5: 0.681

Answer

If Debentures are not converted its value is as under:

	PVF @ 8 %	₹
Interest – ₹ 12 for 5 years	3.993	47.916
Redemption – ₹ 100 in 5th year	0.681	68.100
		116.016

Value of equity shares:

Market Price	No. of Shares	Total
₹ 4	20	₹ 80
₹ 5	20	₹ 100
₹ 6	20	₹ 120

Hence, unless the market price is ₹ 6 conversion should not be exercised.

Money Market Instruments

Question 57

RBI sold a 91-day T-bill of face value of ₹ 100 at a yield of 6%. What was the issue price?

Answer

Let the issue price be X

By the terms of the issue of the T-bills:

$$6\% = \frac{100 - x}{x} \times \frac{365}{91} \times 100$$

$$\frac{6 \times 91 \times x}{36{,}500} = (100 - x)$$

$$0.01496\,x = 100 - x$$

$$x = \frac{100}{1.01496} = ₹\,98.53$$

Question 58

Z Co. Ltd. issued commercial paper worth ₹ 10 crores as per following details:

Date of issue: 16th January, 2022

Date of maturity: 17th April, 2022

No. of days: 91

Interest rate 12.04% p.a

What was the net amount received by the company on issue of CP? (Charges of intermediary may be ignored)

Note: Provide answer in ₹ crores

Answer

The company had issued commercial paper worth ₹ 10 crores

No. of days involves = 91 days

Interest rate applicable = 12.04 % p.a.

$$\text{Price} = \frac{₹\ 10\ \text{Crores}}{1 + (12.04\% \times 91/365)} = ₹\ 9.70857\ \text{Crores}$$

So, Net amount received at the time of issue: ₹ 9.70857 Crores

Question 59

M Ltd. has to make a payment on 30th January, 2022 of ₹ 80,00,000. It has surplus cash today, i.e. 31st October, 2021; and has decided to invest sufficient cash in a bank's Certificate of Deposit scheme offering a yield of 8% p.a. on simple interest basis. What is the amount to be invested now?

Note: Assume 365 days in a year

Answer

Calculation of Investment Amount

Amount required for making payment on 30th January, 2022 = ₹ 80,00,000

Investment in Certificates of Deposit (CDs) on 31st October, 2021

Rate of interest = 8% p.a.

No. of days to maturity = 91 days

Calculation of amount to be invested now to get ₹ 80,00,000 after 91 days:

$$= \frac{₹\ 80,00,000}{1 + (0.08 \times 91/365)} = ₹\ 78,43,559$$

Question 60

A money market instrument with face value of ₹ 100 and discount yield of 6% will mature in 45 days. You are required to calculate:

(i) Current price of the instrument

(ii) Bond equivalent yield

(iii) Effective annual return

Note: Assume 360 days in a year

Answer

(i) Current price of the Bond

$$6\% = \frac{100 - x}{100} \times \frac{360}{45} \times 100$$

$$\frac{6 \times 45 \times 100}{36{,}000} = (100 - x)$$

$x = ₹\ 99.25$

(ii) Bond equivalent yield

$$= \frac{100 - 99.25}{99.25} \times \frac{360}{45} \times 100 = 6.045\%\ \text{p.a.}$$

(iii) Effective annual return

$= [1 + (0.06045 \times 45/360)]^{360/45} - 1 = 6.207\%$ p.a.

Question 61

Wonderland Limited has excess cash of ₹ 20 lakhs, which it wants to invest in short term marketable securities. Expenses relating to investment will be ₹ 50,000.

The securities invested will have an annual yield of 9%.

The company seeks your advice

(i) as to the period of investment so as to earn a pre-tax income of 5%. (discuss)

(ii) the minimum period for the company to breakeven its investment expenditure overtime value of money.

Answer

(i) Pre-tax Income required on investment of ₹ 20,00,000

Let the period of Investment be 'P' and return required on investment ₹ 1,00,000 (₹ 20,00,000 x 5%)

Accordingly,

(₹ 20,00,000 x 9% x P/12) – ₹ 50,000 = ₹ 1,00,000

P = 10 months

(ii) Break-Even its investment expenditure

(₹ 20,00,000 x 9% x P/12) – ₹ 50,000 = 0

P = 3.33 months

Question 62

AXY Ltd. is able to issue commercial paper of ₹ 50,00,000 every 4 months at a yield rate of 12.5% p.a. The cost of placement of commercial paper issue is ₹ 2,500 per issue. AXY Ltd. is required to maintain line of credit ₹ 1,50,000 in bank balance. The applicable income tax rate for AXY Ltd. is 30%. What is the

cost of funds (after taxes) to AXY Ltd. for commercial paper issue? The maturity of commercial paper is four months.

Answer

Since Commercial Paper is a discount instrument, it shall be issued at discounted price. Accordingly, answer shall be as follows:

$$\text{Issue Price} = \frac{50,00,000}{1 + (12.5\% \times 4/12)} = ₹\ 48,00,000$$

	₹
Issue Price	48,00,000
Less: Issue Expenses	2,500
Less: Minimum Balance	1,50,000
Net Amount Received	46,47,500

$$\text{Cost of Funds} = \frac{(2,00,000 + 2,500)\ (1 - 0.30)}{46,47,500} \times \frac{12}{4} \times 100 = 9.15\%$$

Note: Interest Expense = ₹ 50,00,000 – ₹ 48,00,000 = ₹ 2,00,000

Question 63

Bank A enter into a Repo for 14 days with Bank B in 10% Government of India Bonds 2028 @ 5.65% for ₹ 8 crore. Assuming that clean price (the price that does not have accrued interest) be ₹ 99.42 and initial Margin be 2% and days of accrued interest be 262 days. You are required to determine

(i) Dirty Price

(ii) Repayment at maturity

(Consider 360 days in a year)

Answer

(i) Dirty Price

= Clean Price + Interest Accrued

= 99.42 + (100 x 10% x 262/360) = 106.70

(ii) First Leg (Start Proceeds)

$$= \text{Nominal Value} \times \frac{\text{Dirty Price}}{100} \times \frac{100 - \text{Initial Margin}}{100}$$

$$= ₹\ 8,00,00,000 \times \frac{106.70}{100} \times \frac{100 - 2}{100} = ₹\ 8,36,52,800$$

Second Leg (Repayment at Maturity)

= Start Proceed x (1+ Repo rate x No. of days/360)

= ₹ 8,36,52,800 x (1+ 0.0565 x 14/360) = ₹ 8,38,36,604

Miscellaneous

Question 64

Following information is available of M/s. TS Ltd.

Particulars	(₹ in crores)
PBIT	5.00
Less: Interest on Debt (10%)	1.00
PBT	4.00
Less: Tax @ 25%	1.00
PAT	3.00
No. of outstanding shares of ₹ 10 each	40 lakhs
EPS (₹)	7.5
Market price of share (₹)	75
P/E ratio	10 Times

TS Ltd. has an undistributed reserves of ₹ 8 crores. The company requires ₹ 3 crores for the purpose of expansion which is expected to earn the same rate of return on capital employed as present. However, if the debt to capital employed ratio is higher than 35%, then P/E ratio is expected to decline to 8 Times and rise in the cost of additional debt to 14%. Given this data which of the following options the company would prefer, and why?

Option (i): If the required amount is raised through debt, and

Option (ii): If the required amount is raised through equity and the new shares will be issued at a price of ₹ 25 each.

Note: Present all amounts in ₹ crores in 4 decimals.

Answer

Working Notes

(1) Calculation of Return on Capital Employed (ROCE)

	₹ in crores
Capital Employed:	
Share Capital (₹ 10 x 40 lakhs)	4
Reserves	8
Debt (₹ 1 cr. x 100/10)	10
	22
PBIT	5
ROCE	22.73%

(2) Revised PBIT

Existing Capital Employed	22
Additional	3
Revised Capital Employed	25
ROCE	22.73%
Revised PBIT	5.6825

(3) New Debt/Equity

Existing Debt	10
Additional Under Option (i)	3
Total Debt	13
Total Equity	12

New Debt to Capital Employed Ratio = $\frac{13}{25}$ = 0.52

So, P/E Ratio to be reduced to 8 times

(4) Debt to Capital Employed Ratio in Option (ii)

= $\frac{10}{25}$ = 0.40

So, P/E Ratio to be reduced to 8 times in this case also

(5) Number of additional shares to be issued in case of Option (ii)

Funds to be raised = ₹ 3 crore

Price per share = ₹ 25

No. of additional shares to be issued ₹ 3 crore/₹ 25 = 12 lakhs

Particulars	Option (i)	Option (ii)
PBIT (Revised) (₹ Crore)	5.6825	5.6825
Less: Interest on Debt	1.42	1.00
PBT (₹ Crore)	4.2625	4.6825
Tax @ 25% (₹ Crore)	1.0656	1.1706
PAT (₹ Crore)	3.1969	3.5119
No. of shares outstanding	40 lakhs	52 lakhs
EPS	₹ 7.99	₹ 6.75
P/E Ratio	8	8
New Share Price	₹ 63.92	₹ 54.00

Decision:

Since the MPS is expected to be more in the case of additional financing done through debt. Hence, Option (i) is preferred.

Question 65

The Balance Sheet of M/s. Sundry Ltd. as on 31-03-2022 is follows:

Liabilities	₹ in lakhs	Assets	₹ in lakhs
Share Capital	300	Fixed Assets	600
Reserves	200	Inventory	500
Long Term Loan	400	Receivables	240
Short Term Loan	300	Cash	60
Payables & Provisions	200		
Total	**1,400**	**Total**	**1,400**

Sales for the year was ₹ 600 lakhs. The sales are expected to grow by 20% during the year. The profit margin and dividend pay-out ratio are expected to be 4% and 50% respectively.

The company further desires that during the current year Sales to Short Term Loan and Payables and Provision should be in the ratio of 4:3. Ratio of fixed assets to Long Term Loans should be 1.5. Debt Equity Ratio should not exceed 1.5.

You are required to determine:

(i) The amount of External Fund Requirement (EFR)

(ii) The amount to be raised from Short Term, Long Term and Equity funds.

Note: Present all amounts in ₹ lakhs in 2 decimals.

Answer

(i) External Funds Requirement (EFR):

	(₹ in lakhs)
Expected sales (₹ 600 + 20% of ₹ 600)	720.00
Profit margin @ 4%	28.80
Dividend payout ratio @ 50%	14.40
Balance to be ploughed back (A)	14.40
Additional funds required (₹ 1,400 – ₹ 200*) x 0.20 (B)	240.00
Balance to be met from external source (B – A)	225.60

*As Payables & Provisions shall also be increased proportionately with increase in sales.

(ii) Amount to be raised from different sources with following conditions:

- Sales to short term loans and payables & provisions 4:3
- Ratio of fixed assets to long term loans 1.5
- Debt equity ratio should not exceed 1.5

(1) Amount to be raised from short term funds:

	(₹ in lakhs)
New amount of short-term loans and payables & provision (720 x 3/4)	540

Less: Existing Amount of short-term loans and payables & provision	500
Amount to be raised from short term funds	40

(2) Amount to be raised from Long term funds:

	(₹ in lakhs)
New fixed assets (₹ 600 + 20% of ₹ 600)	720
New long-term loans (₹ 720/1.5)	480
Less: Existing long-term loans	400
Amount to be raised from Long term funds	80

(3) Amount to be raised from equity funds:

	(₹ in lakhs)
Amount to be raised from external sources	225.60
Less: Amount to be raised from short term funds	40.00
Less: Amount to be raised from Long term funds	80.00
Balance amount to be raised from equity funds	105.60

Question 66

The directors of Implant Inc. wishes to make an equity issue to finance a $ 10 million expansion scheme which has an expected Net Present Value of $ 2.2 million and to re-finance an existing $ 6 million 15% Bonds due for maturity in 5 years' time. For early redemption of these bonds there is a $ 3,50,000 penalty charges. The Co. has also obtained approval to suspend these pre-emptive rights and make a $ 15 million placement of shares which will be at a price of $ 0.5 per share. The floatation cost of issue will be 4% of Gross proceeds. Any surplus funds from issue will be invested in IDRs which is currently yielding 10% per year.

The Present capital structure of Co. is as under:

	$ '000
Ordinary Share ($ 1 per share)	7,000
Share Premium	10,500
Free Reserves	25,500
	43,000
15% Term Bonds	6,000
11% Debenture (2015-2023)	8,000
	57,000

Current share price is $ 2 per share and debenture price is $ 103 per debenture. Cost of capital of Co. is 10%. It may be further presumed that stock market is semi-strong form efficient and no information about the proposed use of funds from the issue has been made available to the public. You are required to calculate expected share price of company once full details of the placement and to which the finance

is to be put, are announced.

Note: PVIF @ 10% for year 5 = 0.621; PVAF @ 10% for 5 years = 3.791

Answer

In semi-strong form of stock market, the share price should accurately reflect new relevant information when it is made publicly available including Implant Inc. expansion scheme and redemption of the term loan.

The existing Market Value ($ 2 x 70,00,000)		$ 1,40,00,000
The new investment has an expected NPV		$ 22,00,000
Proceeds of New Issue		$ 1,50,00,000
Issue Cost		($ 6,00,000)
PV of Benefit of early redemption:		
Interest of $ 9,00,000 ($ 60,00,000 x 15%) x 3.791	34,11,900	
Add: PV of Repayment in 5 years ($ 60,00,000 x 0.621)	37,26,000	
	71,37,900	
Less: Redemption Cost Now	(60,00,000)	
Less: Penalty charges	(3,50,000)	7,87,900
Expected Total Market value		3,13,87,900
New No. of shares (30 million + 7 million)		3,70,00,000
Expected Share Price of Company		$ 0.848

Question 67

AB Industries has Equity Capital of ₹ 12 Lakhs, total Debt of ₹ 8 Lakhs, and annual sales of ₹ 30 Lakhs. Two mutually exclusive proposals are under consideration for the next year. The details of the proposals are as under:

Particulars	Proposal no. 1	Proposal no. 2
Target Assets to Sales Ratio	0.667	0.62
Target Net Profit Margin (%)	4	5
Target Debt Equity Ratio (DER)	2:3	4:1
Target Retention Ratio (of Earnings)	0.75	-
Annual Dividend (₹ in Lakhs)	-	0.30
New Equity Raised (₹ in Lakhs)	-	1

Proposal no. 1 is based on the assumption that AB Industries is maintaining same Capital, Assets and Sales in the next year.

You are required to calculate sustainable growth rate for both the proposals.

Note: Consider amount in ₹ lakhs upto 3 decimals

Answer

Sustainable Growth Rate under Proposal 1

Sales		₹ 30 Lakhs
Total Assets	₹ 30 Lakhs x 0.667	₹ 20 Lakhs
Net Profit	₹ 30 Lakhs x 4%	₹ 1.20 Lakhs
ROE	$\frac{1.20 \text{ Lakhs}}{12 \text{ Lakhs}} \times 100$	10%

Sustainable Growth Rate = ROE x Retention Ratio = 10% x 0.75 = 7.50%

Sustainable Growth Rate under Proposal 2

New Equity = ₹ 12 Lakhs + ₹ 1 Lakh = ₹ 13 Lakhs

Since Target Debt Equity Ratio is 4:1

Hence, New Debt = ₹ 13 Lakhs x 4 = ₹ 52 Lakhs

Total Assets = ₹ 13 Lakhs + ₹ 52 Lakhs = ₹ 65 Lakhs

Target Assets to Sales Ratio (Given)		0.62
Sales	₹ 65 Lakhs/0.62	₹ 104.839 Lakhs
Net Profit	₹ 104.839 Lakhs x 5%	₹ 5.242 Lakhs
ROE	$\frac{5.242 \text{ Lakhs}}{13 \text{ Lakhs}} \times 100$	40.323%
Retention Ratio	$\frac{5.242 \text{ Lakhs} - 0.30 \text{ Lakhs}}{5.242 \text{ Lakhs}}$	0.943

Sustainable Growth Rate = ROE x Retention Ratio = 40.323% x 0.943 = 38.024%

Section B – Theory Questions

Question 1

Why should the duration of a coupon carrying bond always be less than the time to its maturity?

Answer

Duration is the **weighted average time** within which an investor **gets back the promised principal and** the promised **YTM.** Investment **coupon bearing bond always has a duration which is lesser** than its maturity. **Higher the coupon rate, lesser would be the duration** and higher the yield-to-maturity, lower will be the duration of a bond.

Question 2

Write short note on Zero Coupon Bonds.

Answer

As name indicates, **these bonds do not pay interest** during the life of the bonds. Instead, Zero Coupon Bonds (ZCBs) **are issued at discounted price to their face value**, which is the amount a bond will be worth when it matures or comes due. **When** a zero coupon bond **matures, the investor will receive one lump sum (face value)** equal to the initial investment plus interest that has been accrued on the investment made. The **maturity dates** on zero coupon bonds are usually **long term**. These maturity dates allow an investor for a long range planning. Zero coupon bonds **issued by banks, government and private sector companies**. However, bonds issued by corporate sector carry a potentially higher degree of risk, depending on the financial strength of the issuer and longer maturity period, but they also provide an opportunity to achieve a higher return.

CHAPTER - 6
Portfolio Management

Section A – Practical Questions

Return and Risk of a Security

Question 1

A stock costing ₹ 120 pays no dividends. The possible prices that the stock might sell for at the end of the year with the respective probabilities are:

Price	Probability
115	0.1
120	0.1
125	0.2
130	0.3
135	0.2
140	0.1

Required:

(i) Calculate the expected return.

(ii) Calculate the Standard deviation of returns.

Answer

(i) Here, the probable returns have to be calculated using the formula

$$R = \frac{D + P_1 - P_0}{P_0}$$

Calculation of Probable Returns

Possible prices (P_1) ₹	$P_1 - P_0$ ₹	$[(P_1 - P_0)/P_0] \times 100$ Return (percent)
115	–5	–4.17
120	0	0.00
125	5	4.17
130	10	8.33
135	15	12.50
140	20	16.67

Calculation of Expected Returns

Possible return X_i	Probability $p(X_i)$	Product $X_i \times p(X_i)$

–4.17	0.1	–0.417
0.00	0.1	0.000
4.17	0.2	0.834
8.33	0.3	2.499
12.50	0.2	2.500
16.67	0.1	1.667
		$\overline{X}$ = 7.083

Expected return ($\overline{X}$) = 7.083%

(ii) Calculation of Standard Deviation of Returns

Probable return X_i	Probability $p(X_i)$	Deviation $(X_i - \overline{X})$	Deviation squared $(X_i - \overline{X})^2$	Product $(X_i - \overline{X})^2 p(Xi)$
–4.17	0.1	–11.253	126.63	12.66
0.00	0.1	–7.083	50.17	5.017
4.17	0.2	–2.913	8.49	1.698
8.33	0.3	1.247	1.56	0.467
12.50	0.2	5.417	29.34	5.869
16.67	0.1	9.587	91.91	9.191
				σ^2 = 34.902

Variance, σ^2 = 34.902 percent

Standard deviation, $\sigma = \sqrt{34.902}$ = 5.908 percent

Question 2

Following information is available in respect of expected dividend, market price and market condition after one year.

Market condition	Probability	Market Price (₹)	Dividend per share (₹)
Good	0.25	115	9
Normal	0.50	107	5
Bad	0.25	97	3

The existing market price of an equity share is ₹ 106 (F.V. ₹ 1), which is cum 10% bonus debenture of ₹ 6 each, per share. M/s. X Finance Company Ltd. had offered the buy-back of debentures at face value.

Find out the expected return and variability of returns of the equity shares if buyback offer is accepted by the investor.

And also advise-Whether to accept buy back offer?

Answer

The Expected Return of the equity share may be found as follows:

Market Condition	Probability	Total Return	Cost*	Net Return
Good	0.25	₹ 124	₹ 100	₹ 24
Normal	0.50	₹ 112	₹ 100	₹ 12
Bad	0.25	₹ 100	₹ 100	₹ 0

$$\text{Expected Return} = \frac{(24 \times 0.25) + (12 \times 0.50) + (0 \times 0.25)}{100} \times 100 = \frac{12}{100} \times 100 = 12\%$$

The variability of return can be calculated in terms of standard deviation.

$$\text{Variance} = 0.25\,(24 - 12)^2 + 0.50\,(12 - 12)^2 + 0.25\,(0 - 12)^2$$

$$= 0.25\,(12)^2 + 0.50\,(0)^2 + 0.25\,(-12)^2$$

$$= 36 + 0 + 36$$

$$= 72$$

Standard Deviation = $\sqrt{72}$

Standard Deviation = 8.485 or say 8.49

*The present market price of the share is ₹ 106 cum bonus 10% debenture of ₹ 6 each; hence the net cost is ₹ 100.

M/s X Finance company has offered the buyback of debenture at face value. There is reasonable 10% rate of interest compared to expected return 12% from the market. Considering the dividend rate and market price the creditworthiness of the company seems to be very good. The decision regarding buy-back should be taken considering the maturity period and opportunity in the market. Normally, if the maturity period is low say up to 1 year better to wait otherwise to opt buy back option.

Return and Risk of Portfolio

Question 3

The historical rates of return of two securities over the past ten years are given. Calculate the Covariance and the Correlation coefficient of the two securities:

Years:	1	2	3	4	5	6	7	8	9	10
Security 1: (Return percent)	12	8	7	14	16	15	18	20	16	22
Security 2: (Return percent)	20	22	24	18	15	20	24	25	22	20

Answer

Calculation of Covariance

Year	R_1	Deviation $(R_1 - \overline{R_1})$	Deviation $(R_1 - \overline{R_1})^2$	R_2	Deviation $(R_2 - \overline{R_2})$	Deviation $(R_2 - \overline{R_2})^2$	Product of deviations

1	12	−2.8	7.84	20	−1	1	2.8
2	8	−6.8	46.24	22	1	1	−6.8
3	7	−7.8	60.84	24	3	9	−23.4
4	14	−0.8	0.64	18	−3	9	2.4
5	16	1.2	1.44	15	−6	36	−7.2
6	15	0.2	0.04	20	−1	1	−0.2
7	18	3.2	10.24	24	3	9	9.6
8	20	5.2	27.04	25	4	16	20.8
9	16	1.2	1.44	22	1	1	1.2
10	22	7.2	51.84	20	−1	1	−7.2
$R_1 = \frac{148}{10} = 14.8$			$\Sigma = 207.60$	$R_2 = \frac{210}{10} = 21$		$\Sigma = 84.00$	$\Sigma = -8$

$$\text{Covariance} = \frac{\sum_{i=1}^{N}[R_1 - \overline{R_1}][R_2 - \overline{R_2}]}{N} = -8/10 = -0.8$$

Standard Deviation of Security 1

$$\sigma_1 = \sqrt{\frac{(R_1 - \overline{R_1})^2}{N}}$$

$$\sigma_1 = \sqrt{\frac{207.60}{10}} = \sqrt{20.76}$$

$\sigma_1 = 4.56$

Standard Deviation of Security 2

$$\sigma_2 = \sqrt{\frac{(R_2 - \overline{R_2})^2}{N}}$$

$$\sigma_2 = \sqrt{\frac{84}{10}} = \sqrt{8.40}$$

$\sigma_2 = 2.90$

Correlation Coefficient

$$r_{12} = \frac{Cov_{12}}{\sigma_1 \sigma_2} = \frac{-0.8}{4.56 \times 2.90} = \frac{-0.8}{13.22} = -0.0605$$

Question 4

Mr. A is interested to invest ₹ 1,00,000 in the securities market. He selected two securities B and D for this purpose. The risk return profile of these securities are as follows:

Security	Risk (σ)	Expected Return (ER)

B	10%	12%
D	18%	20%

Co-efficient of correlation between B and D is 0.15.

You are required to calculate the portfolio return and risk of the following portfolios of B and D to be considered by Mr. A for his investment.

(i) 100 percent investment in B only;

(ii) 50 percent of the fund in B and the rest 50 percent in D;

(iii) 75 percent of the fund in B and the rest 25 percent in D; and

(iv) 100 percent investment in D only.

Also indicate that which portfolio is best for him from risk as well as return point of view?

Answer

We have $E_p = W_1E_1 + W_3E_3 + \ldots\ldots\ldots W_nE_n$

and for standard deviation $\sigma^2_p = \sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j \sigma_{ij}$

$$\sigma^2_p = \sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j \rho_{ij} \sigma_i \sigma_j$$

Two asset portfolio

$\sigma^2_p = w^2_1\sigma^2_1 + w^2_2\sigma^2_2 + 2\, w_1w_2\sigma_1\sigma_2\rho_{12}$

Substituting the respective values we get,

(i) All funds invested in B

$E_p = 12\%$

$\sigma_p = 10\%$

(ii) 50% of funds in each of B & D

$E_p = 0.50 \times 12\% + 0.50 \times 20\% = 16\%$

$\sigma^2_p = (0.50)^2\,(10\%)^2 + (0.50)^2\,(18\%)^2 + 2\,(0.50)\,(0.50)\,(0.15)\,(10\%)\,(18\%)$

$\sigma^2_p = 25 + 81 + 13.5 = 119.50$

$\sigma_p = 10.93\%$

(iii) 75% in B and 25% in D

$E_p = 0.75\% \times 12\% + 0.25\% \times 20 = 14\%$

$\sigma^2_p = (0.75)^2\,(10\%)^2 + (0.25)^2\,(18\%)^2 + 2\,(0.75)\,(0.25)\,(0.15)\,(10\%)\,(18\%)$

$\sigma^2_p = 56.25 + 20.25 + 10.125 = 86.625$

$\sigma_p = 9.31\%$

(iv) All funds in D

$E_p = 20\%$

$\sigma_p = 18\%$

Portfolio	(i)	(ii)	(iii)	(iv)
Return	12	16	14	20
σ	10	10.93	9.31	18

In the terms of return, we see that portfolio (iv) is the best portfolio. In terms of risk, we see that portfolio (iii) is the best portfolio.

Question 5

Consider the following information on two stocks, A and B:

Year	Return on A (%)	Return on B (%)
2022	10	12
2023	16	18

You are required to determine:

(i) The expected return on portfolio containing A and B in proportion of 40% and 60% respectively.

(ii) The Standard Deviation of return from each of the two stocks.

(iii) The covariance of returns from the two stocks.

(iv) Correlation coefficient between the returns of the two stocks.

(v) The risk of a portfolio containing A and B in the proportion of 40% and 60%.

Answer

(i) Expected return of the portfolio A and B

E (A) = (10 + 16)/2 = 13%

E (B) = (12 + 18)/2 = 15%

$$R_p = \sum_{i=1}^{N} X_i R_i = 0.4\ (13) + 0.6\ (15) = 14.2\%$$

(ii) Stock A:

Variance = $0.5\ (10 - 13)^2 + 0.5\ (16 - 13)^2 = 9$

Standard deviation = $\sqrt{9} = 3\%$

Stock B:

Variance = $0.5\ (12 - 15)^2 + 0.5\ (18 - 15)^2 = 9$

Standard deviation = $\sqrt{9} = 3\%$

(iii) Covariance of stocks A and B

$Cov_{AB} = 0.5\ (10 - 13)\ (12 - 15) + 0.5\ (16 - 13)\ (18 - 15) = 9$

(iv) Correlation of coefficient

$$r_{AB} = \frac{Cov_{AB}}{\sigma_A \sigma_B} = \frac{9}{3 \times 3} = 1$$

(v) Portfolio Risk

$$\sigma_p = \sqrt{X_A^2\sigma_A^2 + X_B^2\sigma_B^2 + 2X_AX_B(\sigma_A\sigma_B r_{AB})}$$

$$= \sqrt{(0.4)^2(3)^2 + (0.6)^2(3)^2 + 2\,(0.4)(0.6)(3)(3)(1)}$$

$$= \sqrt{1.44 + 3.24 + 4.32} = 3\%$$

Question 6

Ramesh has identified stocks of two companies A and B having good investment potential:

Following data is available for these stocks:

Year	A (Market Price per Share in ₹)	B (Market Price per Share in ₹)
2017	19.60	8.70
2018	18.75	12.80
2019	33.42	16.20
2020	42.64	18.25
2021	43.25	15.60
2022	44.60	13.25
2023	34.75	18.60

You are required to calculate:

(i) The Risk and Return by investing in Stock A and B

(ii) The Risk and Return by investing in a portfolio of these Stocks if he invests in Stock A and B in proportion of 6:4.

(iii) The better opportunity for investment

Answer

	A				B				
Year	**Market Price Per Share**	**Return (%)**	**Return – $\bar{A}$**	**Squared**	**Market Price Per Share**	**Return (%)**	**Return – $\bar{B}$**	**Squared**	**(Return – $\bar{A}$) x (Return – $\bar{B}$)**
2017	19.60				8.70				
2018	18.75	–4.34	–18.33	335.9889	12.80	47.13	30.94	957.2836	–567.1302
2019	33.42	78.24	64.25	4128.0625	16.20	26.56	10.37	107.5369	666.2725
2020	42.64	27.59	13.60	184.9600	18.25	12.65	–3.54	12.5316	–48.1440
2021	43.25	1.43	–12.56	157.7536	15.60	–14.52	–30.71	943.1041	385.7176
2022	44.60	3.12	–10.87	118.1569	13.25	–15.06	–31.25	976.5625	339.6875
2023	34.75	–22.09	–36.08	1301.7664	18.60	40.38	24.19	585.1561	–872.7752

Mean ($\bar{A}$)	83.95		6226.6883	Mean ($\bar{B}$)	97.14		3582.1748	-96.3718
	13.99	Variance	1037.7814		16.19	Variance	597.0291	Cov = -16.062

(i) Return A = 13.99% and Risk (SD) = $\sqrt{1037.7814}$ = 32.2146% and

Return B = 16.19% and Risk (SD) = $\sqrt{597.0291}$ = 24.4342%

(ii) Return of Portfolio = 0.60 x 13.99% + 0.40 x 16.19% = 14.87%

Risk (Standard Deviation) of Portfolio

= $[0.60^2 \times 1037.7814 + 0.40^2 \times 597.0291 + 2 \times 0.60 \times 0.40 \times (-16.0620)]^{½}$

= $[373.6013 + 95.5247 - 7.7098]^{½}$ = 21.4806%

(iii) On the basis of Return 'B' is preferable and on the basis of Risk 'Portfolio Investment' is preferable over the individual stocks.

Minimum Risk Portfolio

Question 7

An investor has decided to invest ₹ 1,00,000 in the shares of two companies, namely, ABC and XYZ. The projections of returns from the shares of the two companies along with their probabilities are as follows:

Probability	ABC (%)	XYZ (%)
0.20	12	16
0.25	14	10
0.25	-7	28
0.30	28	-2

You are required to

(i) Comment on return and risk of investment in individual shares.

(ii) Compare the risk and return of these two shares with a Portfolio of these shares in equal proportions.

(iii) Find out the proportion of each of the above shares to formulate a minimum risk portfolio.

Answer

(i)

Probability (1)	ABC (%) (2)	XYZ (%) (3)	1 x 2 (%) (4)	1 x 3 (%) (5)
0.20	12	16	2.40	3.2
0.25	14	10	3.50	2.5
0.25	-7	28	-1.75	7.0

0.30	28	−2	8.40	−0.6
Average return			12.55	12.1

Hence the expected return from ABC = 12.55% and XYZ is 12.1%

Probability (1)	(ABC − $\overline{ABC}$) (2)	(ABC − $\overline{ABC}$)² (3)	1 x 3 (4)	(XYZ − $\overline{XYZ}$) (5)	(XYZ − $\overline{XYZ}$)² (6)	(1) x (6)
0.20	−0.55	0.3025	0.06	3.9	15.21	3.04
0.25	1.45	2.1025	0.53	−2.1	4.41	1.10
0.25	−19.55	382.2025	95.55	15.9	252.81	63.20
0.30	15.45	238.7025	71.61	−14.1	198.81	59.64
			167.75			126.98

$\sigma^2_{ABC} = 167.75(\%)^2$; σ ABC = 12.95%

$\sigma^2_{XYZ} = 126.98(\%)^2$; σ XYZ = 11.27%

(ii) In order to find risk of portfolio of two shares, the covariance between the two is necessary here.

Probability (1)	(ABC − $\overline{ABC}$) (2)	(XYZ − $\overline{XYZ}$) (3)	2 x 3 (4)	1 x 4 (5)
0.20	−0.55	3.9	−2.145	−0.429
0.25	1.45	−2.1	−3.045	−0.761
0.25	−19.55	15.9	−310.845	−77.71
0.30	15.45	−14.1	−217.845	−65.35
				−144.25

$\sigma^2_P = (0.5 \times 0.5 \times 167.75) + (0.5 \times 0.5 \times 126.98) + 2 \times (-144.25) \times 0.5 \times 0.5$

$\sigma^2_P = 41.9375 + 31.745 - 72.125$

$\sigma^2_P = 1.5575$ or $1.56(\%)^2$

$\sigma_P = \sqrt{1.56} = 1.25\%$

$E(R_p) = (0.5 \times 12.55) + (0.5 \times 12.1) = 12.325\%$

Hence, the return is 12.325% with the risk of 1.25% for the portfolio. Thus the portfolio results in the reduction of risk by the combination of two shares.

(iii) For constructing the minimum risk portfolio the condition to be satisfied is

$$X_{ABC} = \frac{\sigma^2_X - r_{AX}\sigma_A\sigma_X}{\sigma^2_A + \sigma^2_X - 2r_{AX}\sigma_A\sigma_X} \text{ or } = \frac{\sigma^2_X - Cov_{AX}}{\sigma^2_A + \sigma^2_X - 2Cov_{AX}}$$

σ_X = Standard Deviation of XYZ

σ_A = Standard Deviation of ABC

r_{AX} = Coefficient of Correlation between XYZ and ABC

Cov_{AX} = Covariance between XYZ and ABC

Therefore,

$$\% \text{ ABC} = \frac{126.98 - (-144.25)}{126.98 + 167.75 - [2 \times (-144.25)]} = \frac{271.23}{583.23} = 0.46 \text{ or } 46\%$$

% ABC = 46%,

% XYZ = 1 – 0.46 = 0.54 or 54%

Question 8

An investor has two portfolios known to be on minimum variance set for a population of three securities A, B and C having below mentioned weights:

	W_A	W_B	W_C
Portfolio X	0.30	0.40	0.30
Portfolio Y	0.20	0.50	0.30

It is supposed that there are no restrictions on short sales.

(i) What would be the weight for each stock for a portfolio constructed by investing ₹ 5,000 in portfolio X and ₹ 3,000 in portfolio Y?

(ii) Suppose the investor invests ₹ 4,000 out of ₹ 8,000 in security A. How he will allocate the balance between security B and C to ensure that his portfolio is on minimum variance set?

Answer

(i) Investment committed to each security would be:

	A (₹)	B (₹)	C (₹)	Total (₹)
Portfolio X	1,500	2,000	1,500	5,000
Portfolio Y	600	1,500	900	3,000
Combined Portfolio	2,100	3,500	2,400	8,000
∴ Stock weights	0.26	0.44	0.30	

(ii) The equation of critical line takes the following form:

$W_B = a + b\, W_A$

Substituting the values of W_A & W_B from portfolio X and Y in above equation, we get

0.40 = a + 0.30b, and

0.50 = a + 0.20b

Solving above equation, we obtain the slope and intercept, a = 0.70 and b= –1 and thus, the critical line is

$W_B = 0.70 - W_A$

If half of the funds is invested in security A then,

$W_B = 0.70 - 0.50 = 0.20$

Since $W_A + W_B + W_C = 1$

$W_C = 1 - 0.50 - 0.20 = 0.30$

∴ Allocation of funds to security B = 0.20 x 8,000 = ₹ 1,600, and

Security C = 0.30 x 8,000 = ₹ 2,400

Markowitz Efficient Portfolio

Question 9

Following is the data regarding six securities:

	A	B	C	D	E	F
Return (%)	8	8	12	4	9	8
Risk (Standard deviation)	4	5	12	4	5	6

(i) Assuming three will have to be selected, state which ones will be picked.

(ii) Assuming perfect correlation, show whether it is preferable to invest 75% in A and 25% in C or to invest 100% in E.

Answer

(i) Security A has a return of 8% for a risk of 4, whereas B and F have a higher risk for the same return. Hence, among them A dominates.

For the same degree of risk 4, security D has only a return of 4%. Hence, D is also dominated by A.

Security C & E remain in reckoning as they have higher return though with higher degree of risk.

Hence, the ones to be selected are A, C & E.

(ii) The average values for A and C for a proportion of 3:1 will be:

$$\text{Risk} = \frac{(3 \times 4) + (1 \times 12)}{4} = 6\%$$

$$\text{Return} = \frac{(3 \times 8) + (1 \times 12)}{4} = 9\%$$

Therefore:	75% A	100% E
	25% C	–
Risk	6%	5%
Return	9%	9%

For the same 9% return the risk is lower in E. Hence, E will be preferable.

Question 10

X Co., Ltd., invested on 01.04.2022 in certain equity shares as below:

Name of Co.	No. of shares	Cost (₹)
M Ltd.	1,000 (₹ 100 each)	2,00,000
N Ltd.	500 (₹ 10 each)	1,50,000

In September, 2022, 10% dividend was paid out by M Ltd. and in October, 2022, 30% dividend paid out by N Ltd. On 31.3.2023 market quotations showed a value of ₹ 220 and ₹ 290 per share for M Ltd. and N Ltd. respectively.

On 01.04.2023, investment advisors indicate (a) that the dividends from M Ltd. and N Ltd. for the year ending 31.03.2024 are likely to be 20% and 35%, respectively and (b) that the probabilities of market quotations on 31.03.2024 are as below:

Probability factor	Price/share of M Ltd.	Price/share of N Ltd.
0.2	220	290
0.5	250	310
0.3	280	330

You are required to:

(i) Calculate the average return from the portfolio for the year ended 31.03.2023;

(ii) Calculate the expected average return from the portfolio for the year 2023-24; and

(iii) Advise X Co. Ltd., of the comparative risk in the two investments by calculating the standard deviation in each case.

(iv) Analyse the two investments from Risk-Return Trade off viewpoint for X Co. Ltd.

Answer

Workings:

Particulars	(Calculation in ₹/share)		
	M	N	
Calculation of return on portfolio for 2022-23			
Dividend received during the year	10	3	
Capital gain/loss by 31.03.23			
Market value by 31.03.23	220	290	
Cost of investment	200	300	
Gain/loss	20	(–) 10	
Yield	30	(–) 7	
Cost	200	300	
% return	15%	(–) 2.33%	
Weight in the portfolio (2,00,000:1,50,000)	57	43	
Weighted average return			7.55%
Calculation of estimated return for 2023-24			
Expected dividend	20	3.5	
Capital gain by 31.03.24			
(220 x 0.2) + (250 x 0.5) + (280 x 0.3) – 220 = (253 – 220)	33	–	
(290 x 0.2) + (310 x 0.5) + (330 x 0.3) – 290 = (312 – 290)	–	22	

Yield	53	25.5	
Market Value 01.04.23	220	290	
% return	24.09%	8.79%	
Weight in portfolio* [(1,000 x 220):(500 x 290)]	60.3	39.7	
Weighted average (Expected) return			18.02%

*The market value on 31.03.23 is used as the base for calculating yield for 2023-24

(i) Average Return from Portfolio for the year ended 31.03.2023 is 7.55%

(ii) Expected Average Return from portfolio for the year 2023-24 is 18.02%

(iii) Calculation of Standard Deviation

M Ltd.

Exp. market value	Exp. gain	Exp. div.	Exp. Yield	Exp. Return (%) (1)	Prob. Factor (2)	(1) x (2)	Dev. ($P_M - P_M$)	Square of dev. (3)	(2) x (3)
220	0	20	20	9.09	0.2	1.82	-15.01	225.30	45.06
250	30	20	50	22.73	0.5	11.37	-1.37	1.88	0.94
280	60	20	80	36.36	0.3	10.91	12.26	150.31	45.09
						24.10			σ^2_M = 91.09

Standard Deviation (σ_M) = 9.54%

N Ltd.

Exp. market value	Exp. gain	Exp. div.	Exp. Yield	Exp. Return (%) (1)	Prob. Factor (2)	(1) x (2)	Dev. ($P_N - P_N$)	Square of dev. (3)	(2) x (3)
290	0	3.5	3.5	1.21	0.2	0.24	-7.58	57.46	11.49
310	20	3.5	23.5	8.10	0.5	4.05	-0.69	0.48	0.24
330	40	3.5	43.5	15.00	0.3	4.50	6.21	38.56	11.57
						8.79			σ^2_N = 23.30

Standard Deviation (σ_N) = 4.83%

Share of company M Ltd. is more risky as the S.D. is more than company N Ltd.

(iv) To analyse the investments from risk-return trade off view point, we shall compute the Coefficient of Variation (CV) of each investment as follows:

$$\text{M Ltd.} = \frac{SD}{Mean} \times 100 = \frac{9.54}{24.10} \times 100 = 39.59\%$$

$$\text{N Ltd.} = \frac{SD}{Mean} \times 100 = \frac{4.83}{8.79} \times 100 = 54.95\%$$

Thus, from risk-reward trade off view point investment in M Ltd. is better.

Capital Asset Pricing Model (CAPM)

Question 11

The risk premium for the market is 10%. Assuming Beta values of Security K are 0, 0.25, 0.42, 1.00 and 1.67. Compute the risk premium on Security K.

Answer

Market Risk Premium is 10%

β Value of K	Risk Premium of K
0.00	0%
0.25	2.50%
0.42	4.20%
1.00	10.00%
1.67	16.70%

Question 12

A company's beta is 1.40. The market return is 14% and the risk free rate is 10%.

(i) What is the expected return of the company's stock based on CAPM.

(ii) If the risk premium on the market goes up by 2.50% points, what would be the revised expected return on this stock?

Answer

(i) Computation of expected return based on CAPM

$R_j = R_f + \beta (R_m - R_f) = 10\% + 1.40 (14\% - 10\%) = 10\% + 5.6\% = 15.6\%$

(ii) Computation of expected return if the market risk premium goes up by 2.50% points

The return from the market goes up by 2.50% i.e. 14% + 2.50% = 16.50%

Expected Return based on CAPM is given by

$R_j = 10\% + 1.40 (16.5\% - 10\%) = 10\% + 1.40 \times 6.5\% = 10\% + 9.10\% = 19.10\%$

Question 13

Pearl Ltd. expects that considering the current market prices, the equity shareholders as per Moderate Approach, should get a return of at least 15.50% while the current return on the market is 12%. RBI has closed the latest auction for ₹ 2,500 crores of 182 day bills for the lowest bid of 4.3% although there were bidders at a higher rate of 4.6% also for lots of less than ₹ 10 crores. What is Pearl Ltd's Beta?

Answer

Determining Risk free rate: Two risk free rates are given. The aggressive approach would be to

consider 4.6% while the conservative approach would be to take 4.3%. If we take the moderate value then the simple average of the two i.e. 4.45% would be considered.

Application of CAPM

$R_j = R_f + \beta (R_m - R_f)$

$15.50\% = 4.45\% + \beta (12\% - 4.45\%)$

$$\beta = \frac{15.50\% - 4.45\%}{12\% - 4.45\%} = \frac{11.05}{7.55}$$

$$= 1.464$$

Question 14

Mr. Tempest has the following portfolio of four shares:

Name	Beta	Investment ₹ Lakh
Oxy Rin Ltd.	0.45	0.80
Boxed Ltd.	0.35	1.50
Square Ltd.	1.15	2.25
Ellipse Ltd.	1.85	4.50

The risk free rate of return is 7% and the market rate of return is 14%.

Required:

(i) Determine the portfolio return.

(ii) Calculate the portfolio Beta.

Note: Round off calculations to 4 decimals.

Answer

First we shall compute Portfolio Beta using the weighted average method as follows:

$$Beta_P = 0.45 \times \frac{0.80}{9.05} + 0.35 \times \frac{1.50}{9.05} + 1.15 \times \frac{2.25}{9.05} + 1.85 \times \frac{4.50}{9.05}$$

$$= 0.45 \times 0.0884 + 0.35 \times 0.1657 + 1.15 \times 0.2486 + 1.85 \times 0.4972$$

$$= 0.0398 + 0.058 + 0.2859 + 0.9198 = 1.3035$$

Accordingly,

(i) Portfolio Return using CAPM formula will be as follows:

$R_P = R_F + Beta_P (R_M - R_F)$

$= 7\% + 1.3035 (14\% - 7\%)$

$= 7\% + 1.3035 (7\%)$

$= 7\% + 9.1245\% = 16.1245\%$

(ii) Portfolio Beta

As calculated above 1.3035

Question 15

Mr. FedUp wants to invest an amount of ₹ 520 lakhs and had approached his Portfolio Manager. The Portfolio Manager had advised Mr. FedUp to invest in the following manner:

Security	Moderate	Better	Good	Very Good	Best
Amount (in ₹ Lakhs)	60	80	100	120	160
Beta	0.5	1.00	0.80	1.20	1.50

You are required to advise Mr. FedUp in regard to the following, using Capital Asset Pricing Methodology:

(i) Expected return on the portfolio, if Government Securities are at 8% and NIFTY is yielding 10%.

(ii) Advisability of replacing Security 'Better' with NIFTY.

Note: Round off calculations to 3 decimals.

Answer

(i) Computation of Expected Return from Portfolio

$$\text{Average } \beta = 0.50 \times \frac{60}{520} + 1.00 \times \frac{80}{520} + 0.80 \times \frac{100}{520} + 1.20 \times \frac{120}{520} + 1.50 \times \frac{160}{520} = 1.104$$

As per CAPM

$= 0.08 + 1.104 (0.10 - 0.08) = 0.10208$ i.e. 10.208%

(ii) As computed above the expected return from Better is 10% same as from Nifty, hence there will be no difference even if the replacement of security is made. The main logic behind this neutrality is that the beta of security 'Better' is 1 which clearly indicates that this security shall yield same return as market return.

Question 16

A company has a choice of investments between several different equity oriented mutual funds. The company has an amount of ₹ 1 crore to invest. The details of the mutual funds are as follows:

Mutual Fund	Beta
A	1.6
B	1.0
C	0.9
D	2.0
E	0.6

Required:

(i) If the company invests 20% of its investment in each of the first two mutual funds and an equal amount in the mutual funds C, D and E, what is the beta of the portfolio?

(ii) If the company invests 15% of its investment in C, 15% in A, 10% in E and the balance in equal amount in the other two mutual funds, what is the beta of the portfolio?

(iii) If the expected return of market portfolio is 12% at a beta factor of 1.0, what will be the portfolios expected return in both the situations given above?

Answer

(i) With 20% investment in each MF Portfolio Beta is the weighted average of the Betas of various securities calculated as below:

Investment	Beta (β)	Investment (₹ Lacs)	Weighted Investment
A	1.6	20	32
B	1.0	20	20
C	0.9	20	18
D	2.0	20	40
E	0.6	20	12
		100	122

Weighted Beta (β) = 122/100 = 1.22

(ii) With varied percentages of investments portfolio beta is calculated as follows:

Investment	Beta (β)	Investment (₹ Lacs)	Weighted Investment
A	1.6	15	24
B	1.0	30	30
C	0.9	15	13.5
D	2.0	30	60
E	0.6	10	6
		100	133.5

Weighted Beta (β) = 133.5/100 = 1.335

(iii) Expected return of the portfolio with pattern of investment as in case (i) = 12% x 1.22 i.e. 14.64%

Expected Return with pattern of investment as in case (ii) = 12% x 1.335 i.e., 16.02%

Question 17

Treasury Bills give a return of 5%. Market Return is 13%.

(i) What is the market risk premium

(ii) Compute the β Value and required returns for the following combination of investments.

Treasury Bill	100	70	30	0
Market	0	30	70	100

Answer

Market Risk Premium = $R_m - R_f$ = 13% – 5% = 8%

β is the weighted average investing in portfolio consisting of market (β = 1) and treasury bills (β = 0)

Portfolio	Treasury Bills:Market	β	$R_j = R_f + \beta \times (R_m - R_f)$
1	100:0	0	5% + 0 (13% – 5%) = 5%
2	70:30	0.7 (0) + 0.3 (1) = 0.3	5% + 0.3 (13% – 5%) = 7.40%
3	30:70	0.3 (0) + 0.7 (1) = 0.7	5% + 0.7 (13% – 5%) = 10.60%
4	0:100	1	5% + 1.0 (13% – 5%) = 13%

Question 18

Mr. A is having 1 lakh shares of K Ltd. The beta of the company is 1.40. Mr. B a financial advisor has suggested having the following portfolio:

Security	Beta	% holding
L	1.20	10
M	0.75	10
N	0.40	30
O	1.40	50
		100

Market Return is 12%. Risk free rate is 8%.

You are required to calculate the following for the present investment and suggested portfolio:

(i) What is the expected return based on CAPM and also

(1) If the market goes up by 2.5%.

(2) If the market goes down by 2.5%.

(3) If the market is giving a negative return of 2.5%.

(ii) If probability of market giving negative return is more, please advise Mr. A whether to continue the holdings of M/s. K Ltd. or to buy the portfolio as per the suggestion of Mr. B. If so, why?

Answer

Working Notes

Calculation of Portfolio Beta suggested by Mr. B

Security	Beta	Wt. of Holding	Beta x Wt. of Holding
L	1.20	0.1	0.120
M	0.75	0.1	0.075
N	0.40	0.3	0.120
O	1.40	0.5	0.700
Total		1.0	1.015

Portfolio Beta is 1.015

Calculation of Expected Return based on CAPM at present situation-

Particulars	Risk Free Rate (R_f)	Beta	Market Return	Risk Premium = $R_m - R_f$	Beta x Risk Premium	Expected Return
a	b	c	d	e = d – b	f = c x e	g = b + f
K Ltd.	8	1.400	12	4	5.600	13.60
Portfolio	8	1.015	12	4	4.060	12.06

(i) (1) Calculation of Expected Return based on CAPM if market goes up by 2.5%:

Particulars	Risk Free Rate (R_f)	Beta	Market Return	Risk Premium = $R_m - R_f$	Beta x Risk Premium	Expected Return
a	b	c	d	e = d – b	f = c x e	g = b + f
K Ltd.	8	1.400	14.5	6.5	9.100	17.10
Portfolio	8	1.015	14.5	6.5	6.598	14.60

(2) Calculation of Expected Return based on CAPM if market goes down by 2.5%:

Particulars	Risk Free Rate (R_f)	Beta	Market Return	Risk Premium = $R_m - R_f$	Beta x Risk Premium	Expected Return
a	b	c	d	e = d – b	f = c x e	g = b + f
K Ltd.	8	1.400	9.5	1.5	2.100	10.10
Portfolio	8	1.015	9.5	1.5	1.523	9.52

(3) Calculation of Expected Return based on CAPM if market gives negative returns of 2.5%:

Particulars	Risk Free Rate (R_f)	Beta	Market Return	Risk Premium = $R_m - R_f$	Beta x Risk Premium	Expected Return
a	b	c	d	e = d – b	f = c x e	g = b + f
K Ltd.	8	1.400	–2.5	–10.5	–14.700	–6.70
Portfolio	8	1.015	–2.5	–10.5	–10.658	–2.66

(ii) If the probability of market giving negative return is more, it is advisable to Mr. A to buy the portfolio suggested by Mr. B because Beta of the portfolio is less than of K Ltd.

Question 19

A holds the following portfolio:

Share/Bond	Beta	Initial Price (₹)	Dividends (₹)	Market Price at end of year (₹)

Epsilon Ltd.	0.8	25	2	50
Sigma Ltd.	0.7	35	2	60
Omega Ltd.	0.5	45	2	135
GOI Bonds	0.01	1,000	140	1,005

Calculate:

(i) The expected rate of return of each security using Capital Asset Pricing Method (CAPM)

(ii) The Simple average return of his portfolio.

Risk-free return is 14%.

Answer

(i) Expected rate of return

	Total Investments	Dividends	Capital Gains
Epsilon Ltd.	25	2	25
Sigma Ltd.	35	2	25
Omega Ltd.	45	2	90
GOI Bonds	1,000	140	5
	1,105	**146**	**145**

Expected Return on market portfolio $= \frac{146 + 145}{1,105} = 26.33\%$

CAPM: $E(R_P) = R_F + \beta [E(R_M) - R_F]$

Epsilon Ltd	14 + 0.8 [26.33 – 14] =	14 + 9.86	= 23.86%
Sigma Ltd.	14 + 0.7 [26.33 – 14] =	14 + 8.63	= 22.63%
Omega Ltd.	14 + 0.5 [26.33 – 14] =	14 + 6.17	= 20.17%
GOI Bonds	14 + 0.01 [26.33 – 14] =	14 + 0.12	= 14.12%

(ii) Average Return of Portfolio

$$= \frac{23.86 + 22.63 + 20.17 + 14.12}{4} = \frac{80.78}{4} = 20.20\%$$

Alternatively, Portfolio Beta $= \frac{0.8 + 0.7 + 0.5 + 0.01}{4} = \frac{2.01}{4} = 0.5025$

$= 14 + 0.5025 (26.33 - 14) = 14 + 6.20 = 20.20\%$

Question 20

Your client is holding the following securities:

Particulars of Securities	Cost (₹)	Dividends (₹)	Market Price (₹)	Beta
Equity Shares:				

Co. X	8,000	800	8,200	0.8
Co. Y	10,000	800	10,500	0.7
Co. Z	16,000	800	22,000	0.5
PSU Bonds	34,000	3,400	32,300	0.2

Assuming a Risk-free rate of 15%, calculate:

- Expected rate of return in each, using the Capital Asset Pricing Model (CAPM).
- Simple Average return of the portfolio.

Answer

Calculation of expected return on market portfolio (R_m)

Investment	Cost (₹)	Dividends (₹)	Capital Gains (₹)
Shares X	8,000	800	200
Shares Y	10,000	800	500
Shares Z	16,000	800	6,000
PSU Bonds	34,000	3,400	–1,700
	68,000	5,800	5,000

$$R_m = \frac{5,800 + 5,000}{68,000} \times 100 = 15.88\%$$

Calculation of expected rate of return on individual security:

Shares X = 15 + 0.8 (15.88 – 15) = 15.70%

Shares Y = 15 + 0.7 (15.88 – 15) = 15.62%

Shares Z = 15 + 0.5 (15.88 – 15) = 15.44%

PSU Bonds = 15 + 0.2 (15.88 – 15) = 15.18%

Calculation of the Average Return of the Portfolio:

$$= \frac{15.70 + 15.62 + 15.44 + 15.18}{4} = 15.49\%$$

Question 21

Your client is holding the following securities:

Particulars of Securities	Cost (₹)	Dividends/Interest (₹)	Market price (₹)	Beta
Equity Shares:				
Gold Ltd.	10,000	1,725	9,800	0.6
Silver Ltd.	15,000	1,000	16,200	0.8
Bronze Ltd.	14,000	700	20,000	0.6
GOI Bonds	36,000	3,600	34,500	0.01

Simple average return of the portfolio is 15.7%, calculate:

(i) Expected rate of return in each, using the Capital Asset Pricing Model (CAPM).

(ii) Risk free rate of return.

Answer

Particulars of Securities	Cost (₹)	Dividend (₹)	Capital gain (₹)
Gold Ltd.	10,000	1,725	-200
Silver Ltd.	15,000	1,000	1,200
Bronze Ltd.	14,000	700	6,000
GOI Bonds	36,000	3,600	-1,500
Total	**75,000**	**7,025**	**5,500**

Expected rate of return on market portfolio

$$= \frac{\text{Dividend Earned + Capital appreciation}}{\text{Initial investment}} \times 100$$

$$= \frac{₹\ 7,025 + ₹\ 5,500}{₹\ 75,000} \times 100 = 16.7\%$$

Risk free return

Simple average of Betas* = (0.6 + 0.8 + 0.6 + 0.01)/4 = 0.50

*Since Simple average return of the portfolio is given in question.

Average return = Risk free return + Average Betas (Expected return – Risk free return)

15.7 = Risk free return + 0.50 (16.7 – Risk free return)

Risk free return = 14.7%

Expected Rate of Return for each security is

Rate of Return = $R_f + B\ (R_m - R_f)$

Gold Ltd. = 14.7 + 0.6 (16.7 – 14.7) = 15.90%

Silver Ltd. = 14.7 + 0.8 (16.7 – 14.7) = 16.30%

Bronze Ltd. = 14.7 + 0.6 (16.7 – 14.7) = 15.90%

GOI Bonds = 14.7 + 0.01 (16.7 – 14.7) = 14.72%

Question 22

Suppose one of your HNI clients is holding the following portfolio as per his risk appetite:

Particulars	No. of Securities
Equity Shares:	
G Ltd.	1,000
S Ltd.	1,000
B Ltd.	500

PSU Bonds	20,000

The other data related to each of these securities (per share/bond) is as follows:

Cost	Dividends/Interest	Market price	Beta
₹	₹	₹	
10,000	1,725	9,800	0.6
15,000	1,000	16,200	0.8
28,000	1,400	28,300	0.6
1,800	180	1,725	0.10

Your client is interested in investing some more funds in Bonds issued by GOI.

(1) Estimate the minimum rate of return that your client would expect from these Bonds keeping in view his risk appetite and assuming Market Return as 12.70%.

(2) Analyze whether this portfolio has out-performed the market or not assuming Risk Free Rate of Return as 7%.

Answer

(1) Working Notes:

Calculation of Return on each single security

	Cost ₹ (1)	No. of Securities (2)	Total Cost (3) = (1) x (2)	Dividend/ Interest	Capital gain	Total (4)	Total Income (5) = (2) x (4)	Beta (6)	(6) x (3)
G Ltd.	10,000	1,000	1,00,00,000	1,725	–200	1,525	15,25,000	0.6	60,00,000
S Ltd.	15,000	1,000	1,50,00,000	1,000	1,200	2,200	22,00,000	0.8	1,20,00,000
B Ltd.	28,000	500	1,40,00,000	1,400	300	1,700	8,50,000	0.6	84,00,000
PSU Bonds	1,800	20,000	3,60,00,000	180	–75	105	21,00,000	0.10	36,00,000
Total			**7,50,00,000**				**66,75,000**		**3,00,00,000**

Rate of Return earned on the Portfolio

$$= \frac{\text{Dividend Earned + Capital appreciation}}{\text{Initial investment}} \times 100$$

$$= \frac{₹\ 66,75,000}{₹\ 7,50,00,000} \times 100 = 8.90\%$$

Weighted Average Beta of the Portfolio

$$= \frac{3,00,00,000}{7,50,00,000} = 0.40$$

Expected Risk Free Rate of Return using CAPM

$8.90\% = R_f + 0.40\ [12.70\% - R_f]$

$8.90\% = R_f + 5.08 - 0.40\ R_f$

$3.82\% = 0.60\ R_f$

$R_f = 6.37\%$

Thus keeping in view the present risk appetite, the client would expect at least a return of 6.37% on Bonds.

(2) The expected return on the Portfolio using CAPM:

$= 7\% + 0.40\ [12.70\% - 7\%] = 9.28\%$

Since the actual return is 8.90% which is quite lower than expected return considering the systematic risk borne by the investor and hence portfolio has not outperformed the market rather has underperformed.

Question 23

XYZ Ltd. has substantial cash flow and until the surplus funds are utilised to meet the future capital expenditure, likely to happen after several months, are invested in a portfolio of short-term equity investments, details for which are given below:

Investment	No. of shares	Beta	Market price per share (₹)	Expected dividend yield
I	60,000	1.16	4.29	19.50%
II	80,000	2.28	2.92	24.00%
III	1,00,000	0.90	2.17	17.50%
IV	1,25,000	1.50	3.14	26.00%

The current market return is 19% and the risk free rate is 11%.

Required to:

(i) Calculate the risk of XYZ's short-term investment portfolio relative to that of the market;

(ii) Whether XYZ should change the composition of its portfolio.

Answer

(i) Computation of Beta of Portfolio

Investment	No. of shares	Market Price	Market Value	Dividend Yield	Dividend	Composition	β	Weighted β
I	60,000	4.29	2,57,400	19.50%	50,193	0.2339	1.16	0.27
II	80,000	2.92	2,33,600	24.00%	56,064	0.2123	2.28	0.48
III	1,00,000	2.17	2,17,000	17.50%	37,975	0.1972	0.90	0.18
IV	1,25,000	3.14	3,92,500	26.00%	1,02,050	0.3566	1.50	0.53
			11,00,500		2,46,282	1.0000		1.46

Return of the Portfolio = $\frac{₹\ 2,46,282}{₹\ 11,00,500} = 0.2238$

Beta of Portfolio = 1.46

Market Risk implicit

$0.2238 = 0.11 + \beta\ (0.19 - 0.11)$

$0.08\ \beta + 0.11 = 0.2238$

$$\beta = \frac{0.2238 - 0.11}{0.08} = 1.42$$

Market β implicit is 1.42 while the portfolio β is 1.46. Thus the portfolio is marginally risky compared to the market.

(ii) The decision regarding change of composition may be taken by comparing the dividend yield (given) and the expected return as per CAPM as follows:

Expected return	**R_S as per CAPM is:**
	$R_S = R_F + (R_M - R_F)\ \beta$
For investment I	$R_S = 0.11 + (0.19 - 0.11)\ 1.16$
	$= 20.28\%$
For investment II	$R_S = 0.11 + (0.19 - 0.11)\ 2.28$
	$= 29.24\%$
For investment III	$R_S = 0.11 + (0.19 - 0.11)\ 0.90$
	$= 18.20\%$
For investment IV	$R_S = 0.11 + (0.19 - 0.11)\ 1.50$
	$= 23\%$

Comparison of dividend yield with the expected return Rs shows that the dividend yields of investment I, II and III are less than the corresponding R_S. So, these investments are over-priced and should be sold by the investor. However, in case of investment IV, the dividend yield is more than the corresponding Rs, so, XYZ Ltd. should increase its proportion.

Question 24

A Ltd. has an expected return of 22% and Standard deviation of 40%. B Ltd. has an expected return of 24% and Standard deviation of 38%. A Ltd. has a beta of 0.86 and B Ltd. has a beta of 1.24. The correlation coefficient between the return of A Ltd. and B Ltd. is 0.72. The Standard deviation of the market return is 20%. Suggest:

(i) Is investing in B Ltd. better than investing in A Ltd.?

(ii) If you invest 30% in B Ltd. and 70% in A Ltd., what is your expected rate of return and portfolio Standard deviation?

(iii) What is the market portfolios expected rate of return and how much is the risk-free rate?

(iv) What is the beta of Portfolio if A Ltd.'s weight is 70% and B Ltd.'s weight is 30%?

Answer

(i) A Ltd. has lower return and higher risk than B Ltd. investing in B Ltd. is better than in A Ltd. because the returns are higher and the risk, lower. However, investing in both will yield diversification advantage.

(ii) $R_{AB} = 0.22 \times 0.7 + 0.24 \times 0.3 = 22.6\%$

$\sigma^2_{AB} = 0.40^2 \times 0.7^2 + 0.38^2 \times 0.3^2 + 2 \times 0.7 \times 0.3 \times 0.72 \times 0.40 \times 0.38 = 0.1374$

$\sigma_{AB} = \sqrt{\sigma^2_{AB}} = \sqrt{0.1374} = 0.3707 = 37.07\%$

(iii) This risk-free rate will be the same for A and B Ltd. Their rates of return are given as follows:

$R_A = 22 = R_f + (R_m - R_f)\ 0.86$

$R_B = 24 = R_f + (R_m - R_f)\ 1.24$

$R_A - R_B = -2 = (R_m - R_f)\ (-0.38)$

$R_m - R_f = -2/-0.38 = 5.26\%$

$R_A = 22 = R_f + (5.26)\ 0.86$

$R_f = 17.48\%$

$R_B = 24 = R_f + (5.26)\ 1.24$

$R_f = 17.48\%$

$R_m - 17.48 = 5.26$

$R_m = 22.74\%$

(iv) $\beta_{AB} = \beta_A \times W_A + \beta_B \times W_B$

$= 0.86 \times 0.7 + 1.24 \times 0.3 = 0.974$

Question 25

The expected returns and Beta of three stocks are given below

Stock	A	B	C
Expected Return (%)	18	11	15
Beta Factor	1.7	0.6	1.2

If the risk free rate is 9% and the expected rate of return on the market portfolio is 14% which of the above stocks are over, under or correctly valued in the market? What shall be the strategy?

Answer

Required Rate of Return is given by

$R_j = R_f + \beta\ (R_m - R_f)$

For Stock A, $R_j = 9 + 1.7\ (14 - 9) = 17.50\%$

Stock B, $R_j = 9 + 0.6\ (14 - 9) = 12.00\%$

Stock C, $R_j = 9 + 1.2\ (14 - 9) = 15.00\%$

Required Return %	Expected Return %	Valuation	Decision
17.50%	18.00%	Under Valued	Buy
12.00%	11.00%	Over Valued	Sell
15.00%	15.00%	Correctly Valued	Hold

Question 26

Information related to an investment is as follows:

Risk free rate	10%
Market Return	15%
Beta	1.2

(i) What would be the return from this investment?

(ii) If the projected return is 18%, is the investment rightly valued?

(iii) What is your strategy?

Answer

(i) Required rate of Return as per CAPM is given by

$R_j = R_f + \beta (R_m - R_f) = 10 + 1.2 (15 - 10) = 16\%$

(ii) Since projected return is 18%, the stock is not rightly valued rather undervalued as return as per CAPM less than Projected Return.

(iii) Had this Project Return is considered as expected return, the decision should be to BUY the share.

Question 27

An investor holds two stocks A and B. An analyst prepared ex-ante probability distribution for the possible economic scenarios and the conditional returns for two stocks and the market index as shown below:

Economic scenario	Probability	Conditional Returns %		
		A	B	Market
Growth	0.40	25	20	18
Stagnation	0.30	10	15	13
Recession	0.30	–5	–8	–3

The risk free rate during the next year is expected to be around 11%. Determine whether the investor should liquidate his holdings in stocks A and B or on the contrary make fresh investments in them. CAPM assumptions are holding true.

Answer

Expected Return on stock A = E (A) = $\sum_{i=G,S,R} P_i A_j$

(G, S & R denotes Growth, Stagnation and Recession)

Expected Return on 'A' = 0.40 x 25 + 0.30 x 10 + 0.30 x (–5) = 11.5%

Expected Return on 'B' = 0.40 x 20 + 0.30 x 15 + 0.30 x (–8) = 10.1%

Expected Return on Market index = 0.40 x 18 + 0.30 x 13 + 0.30 x (–3) = 10.2%

Variance of Market index = $(18 - 10.2)^2 (0.40) + (13 - 10.2)^2 (0.30) + (-3 - 10.2)^2 (0.30)$

$= 24.34 + 2.35 + 52.27 = 78.96 (\%)^2$

Covariance of stock A and Market Index M

$$\text{Cov (AM)} = \sum_{i=G,S,R} [A_i - E(A)][M_i - E(M)]P$$

= (25 – 11.5) (18 – 10.2) (0.40) + (10 – 11.5) (13 – 10.2) (0.30) + (–5 – 11.5) (–3 – 10.2) (0.30)

= 42.12 + (–1.26) + 65.34 = 106.20

Covariance of stock B and Market index M

= (20 – 10.1) (18 – 10.2) (0.40) + (15 – 10.1) (13 – 10.2) (0.30) + (–8 – 10.1) (–3 – 10.2) (0.30)

= 30.89 + 4.12 + 71.67 = 106.68

$$\text{Beta for stock A} = \frac{\text{Cov (AM)}}{\text{Var M}} = \frac{106.20}{78.96} = 1.345$$

$$\text{Beta for stock B} = \frac{\text{Cov (BM)}}{\text{Var M}} = \frac{106.68}{78.96} = 1.351$$

Required Return for A

$R(A) = R_f + \beta (R_m - R_f)$

11% + 1.345 (10.2 – 11)% = 9.924%

Required Return for B

11% + 1.351 (10.2 – 11)% = 9.92%

Jensen's Alpha for Stock A

E (A) – R (A) i.e. 11.5 % – 9.924% = 1.576%

Jensen's Alpha for Stock B

E (B) – R (B) i.e. 10.1% – 9.92% = 0.18%

Since stock A and B both have positive Alpha, therefore, they are UNDERPRICED. The investor should make fresh investment in them.

Beta

Question 28

The distribution of return of security 'F' and the market portfolio 'P' is given below:

Probability	Return %	
	F	P
0.30	30	–10
0.40	20	20
0.30	0	30

You are required to calculate the expected return of security 'F' and the market portfolio 'P', the covariance between the market portfolio and security and beta for the security.

Answer

Security F

Prob (P)	R_F	P x R_F	Deviations of F ($R_F - ER_F$)	(Deviation)^2 of F	P x (Deviations)^2
0.3	30	9	13	169	50.7
0.4	20	8	3	9	3.6
0.3	0	0	−17	289	86.7
		$ER_F = 17$			$Var_F = 141$

Standard Deviation $\sigma_F = \sqrt{141} = 11.87$

Market Portfolio, P

R_M %	P_M	Exp. Return R_M x P_M	Dev. of P ($R_M - ER_M$)	(Dev. of P)^2	(Dev.)^2 P_M	(Deviation of F) x (Deviation of P)	(Dev. of F x Dev. of P) x P
−10	0.3	−3	−24	576	172.8	−312	−93.6
20	0.4	8	6	36	14.4	18	7.2
30	0.3	9	16	256	76.8	−272	−81.6
		$ER_M = 14$			$Var_M = 264$ $\sigma_M = 16.25$		Co Var P_M = −168

Beta = $\frac{\text{Co Var } P_M}{\sigma^2_M} = \frac{-168}{264} = -0.636$

Question 29

Given below is information of market rates of Returns and Data from two Companies A and B:

	Year 1	Year 2	Year 3
Market (%)	12.0	11.0	9.0
Company A (%)	13.0	11.5	9.8
Company B (%)	11.0	10.5	9.5

You are required to determine the beta coefficients of the Shares of Company A and Company B.

Answer

Company A:

Year	Return % (R_A)	Market return % (R_M)	Deviation R_A	Deviation R_M	D R_A x D R_M	R_M^2
1	13.0	12.0	1.57	1.33	2.09	1.77
2	11.5	11.0	0.07	0.33	0.02	0.11
3	9.8	9.0	−1.63	−1.67	2.72	2.79
	34.3	32.0			4.83	4.67

Average $R_A = 11.43$

Average R_M = 10.67

$$\text{Covariance} = \frac{\sum(R_m - \overline{R_m})(R_a - \overline{R_a})}{N}$$

$$\text{Covariance} = \frac{4.83}{3} = 1.61$$

$$\text{Variance } (\sigma_M^2) = \frac{\sum(R_m - \overline{R_m})^2}{N}$$

$$= \frac{4.67}{3} = 1.557$$

$$ß = \frac{1.61}{1.557}$$

= 1.03

Company B:

Year	Return % (R_B)	Market return % (R_M)	Deviation R_B	Deviation R_M	D R_B x D R_M	R_M^2
1	11.0	12.0	0.67	1.33	0.89	1.77
2	10.5	11.0	0.17	0.33	0.06	0.11
3	9.5	9.0	−0.83	−1.67	1.39	2.79
	31.0	32.0			2.34	4.67

Average R_B = 10.33

Average R_M = 10.67

$$\text{Covariance} = \frac{\sum(R_m - \overline{R_m})(R_b - \overline{R_b})}{N}$$

$$\text{Covariance} = \frac{2.34}{3} = 0.78$$

$$\text{Variance } (\sigma_M^2) = \frac{\sum(R_m - \overline{R_m})^2}{N}$$

$$= \frac{4.67}{3} = 1.557$$

$$ß = \frac{0.78}{1.557}$$

= 0.50

Question 30

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(%)^2
Coefficient of Correlation	0.75

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

Answer

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:

$15\% = R_f + \beta_x (R_m - R_f)$

$15\% = 5\% + \beta_x (15\% - 5\%)$

$\beta_x = 1$

(i) Standard Deviation of Market Return

$$\beta_m = \frac{Cov_{x,m}}{\sigma^2_m} = \frac{225}{\sigma^2_m} = 1$$

$\sigma^2_m = 225$

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

(ii) Standard Deviation of Security Return

$$\beta_x = \frac{\sigma_x}{\sigma_m} \times \rho_{xm} = \frac{\sigma_x}{15} \times 0.75 = 1$$

$$\sigma_x = \frac{15}{0.75} = 20\%$$

Question 31

The following information are available with respect of Krishna Ltd.

Year	Krishna Ltd.		Market		Return on Govt. Bonds
	Average share price (₹)	Dividend per Share (₹)	Average Index	Dividend Yield	
2020	245	20	2013	4%	7%
2021	253	22	2130	5%	6%
2022	310	25	2350	6%	6%
2023	330	30	2580	7%	6%

Compute Beta Value of the Krishna Ltd. at the end of 2023 and state your observation.

Answer

(i) Computation of Beta Value

Calculation of Returns

$$\text{Returns} = \frac{D_1 + (P_1 - P_0)}{P_0} \times 100$$

Year	Returns
2020–21	[{22 + (253 – 245)}/245] x 100 = 12.24%
2021–22	[{25 + (310 – 253)}/253] x 100 = 32.41%
2022–23	[{30 + (330 – 310}/310] x 100 = 16.13%

Calculation of Returns from market Index

Year	% of Index Appreciation	Dividend Yield %	Total Return %
2020–21	[(2130 – 2013)/2013] x 100 = 5.81%	5%	10.81%
2021–22	[(2350 – 2130)/2130] x 100 = 10.33%	6%	16.33%
2022–23	[(2580 – 2350)/2350] x 100 = 9.79%	7%	16.79%

Computation of Beta

Year	Krishna Ltd. (X)	Market Index (Y)	XY	Y^2
2020–21	12.24%	10.81%	132.31	116.86
2021–22	32.41%	16.33%	529.25	266.67
2022–23	16.13%	16.79%	270.82	281.90
Total	60.78%	43.93%	932.38	665.43

$$\text{Average Return of Krishna Ltd.} = \frac{60.78}{3} = 20.26\%$$

$$\text{Average Market Return} = \frac{43.93}{3} = 14.64\%$$

$$\text{Beta } (ß) = \frac{\sum XY - n\bar{X}\bar{Y}}{\sum Y^2 - n(\bar{Y})^2}$$

$$= \frac{932.38 - 3 \times 20.26 \times 14.64}{665.43 - 3\,(14.64)^2} = 1.897$$

(ii) Observation

	Expected Return (%)	Actual Return (%)	Action
2018 – 19	6% + 1.897 (10.81% – 6%) = 15.12%	12.24%	Sell
2019 – 20	6% + 1.897 (16.33% – 6%) = 25.60%	32.41%	Buy
2020 – 21	6% + 1.897 (16.79% – 6%) = 26.47%	16.13%	Sell

Question 32

The following information is available with respect of Jaykay Ltd.

Year	Jay Kay Limited		Market		Return on Govt. Bonds
	Average Share Price (₹)	DPS (₹)	Average Index	Dividend Yield (%)	
2020	242	20	1812	4	6
2021	279	25	1950	5	5
2022	305	30	2258	6	4
2023	322	35	2220	7	5

Compute Beta Value of the company as at the end of 2023. What is your observation?

Answer

(i) Computation of Beta Value

Calculation of Returns

$$\text{Returns} = \frac{D_1 + (P_1 - P_0)}{P_0} \times 100$$

Year	Returns
2020–21	[{25 + (279 – 242)}/242] x 100 = 25.62%
2021–22	[{30 + (305 – 279)}/279] x 100 = 20.07%
2022–23	[{35 + (322 – 305}/305] x 100 = 17.05%

Calculation of Returns from market Index

Year	% of Index Appreciation	Dividend Yield %	Total Return %
2020–21	[(1950 – 1812)/1812] x 100 = 7.62%	5%	12.62%
2021–22	[(2258 – 1950)/1950] x 100 = 15.79%	6%	21.79%
2022–23	[(2220 – 2258)/2258] x 100 = (–)1.68%	7%	5.32%

Computation of Beta

Year	X	Y	XY	Y^2
2020–21	25.62	12.62	323.32	159.26
2021–22	20.07	21.79	437.33	474.80
2022–23	17.05	5.32	90.71	28.30
	62.74	39.73	851.36	662.36

$$\text{Average Return of Jay Kay Ltd.} = \frac{62.74}{3} = 20.91\%$$

$$\text{Average Market Return} = \frac{39.73}{3} = 13.24\%$$

$$\text{Beta } (ß) = \frac{\sum XY - n\bar{X}\bar{Y}}{\sum Y^2 - n(\bar{Y})^2}$$

$$= \frac{851.36 - 3 \times 20.91 \times 13.24}{662.36 - 3\,(13.24)^2} = 0.15$$

(ii) Observation

	Expected Return (%)	Actual Return (%)	Action
2020–21	5% + 0.15 (12.62% – 5%) = 6.143%	25.62%	Buy
2021–22	4% + 0.15 (21.79% – 4%) = 6.669%	20.07%	Buy
2022–23	5% + 0.15 (5.32% – 5%) = 5.048%	17.05%	Buy

Question 33

The total market value of the equity share of O.R.E. Company is ₹ 60,00,000 and the total value of the debt is ₹ 40,00,000. The treasurer estimate that the beta of the stock is currently 1.5 and that the expected risk premium on the market is 10 percent. The treasury bill rate is 8 percent.

Required:

(1) What is the beta of the Company's existing portfolio of assets?

(2) Estimate the Company's Cost of capital and the discount rate for an expansion of the company's present business.

Answer

(1) $\beta_{asset} = \beta_{equity} \times \frac{V_E}{V_O} + \beta_{debt} \times \frac{V_D}{V_O}$

Note: Since β_{debt} is not given it is assumed that company debt capital is virtually riskless.

If company's debt capital is riskless than above relationship become: $\beta_{company} = \beta_{equity} \frac{V_E}{V_O}$

Here $\beta_{equity} = 1.5$

As $\beta_{debt} = 0$

V_E = ₹ 60 lakhs

V_D = ₹ 40 lakhs

V_O = ₹ 100 lakhs

$$\beta_{asset} = 1.5 \times \frac{₹\ 60\ lakhs}{₹\ 100\ lakhs}$$

$$= 0.9$$

(2) Cost of Capital for discounting company's expansion of existing business shall be computed as follows:

Company's cost of capital = $R_f + \beta_A \times$ Market Risk premium

Where,

R_f = Risk free rate of return

β_A = Beta of company assets

Therefore, company's cost of capital (WACC) = 8% + 0.9 x 10 = 17%

Question 34

Equity of KGF Ltd. (KGFL) is ₹ 410 Crores, its debt, is worth ₹ 170 Crores. Printer Division segments value is attributable to 74%, which has an Asset Beta (β_P) of 1.45, balance value is applied on Spares and Consumables Division, which has an Asset Beta (β_{SC}) of 1.20. KGFL Debt beta (β_D) is 0.24.

You are required to calculate:

(i) Equity Beta (β_E),

(ii) Ascertain Equity Beta (β_E), if KGF Ltd. decides to change its Debt Equity position by raising further debt and buying back of equity to have its Debt Equity Ratio at 1.90. Assume that the present Debt Beta (β_{D1}) is 0.35 and any further funds raised by way of Debt will have a Beta (β_{D2}) of 0.40.

(iii) Whether the new Equity Beta (β_E) justifies increase in the value of equity on account of leverage?

Note: Present all calculations in ₹ Crore

Answer

(i) Equity Beta

To calculate Equity Beta first we shall calculate Weighted Average of Asset Beta as follows:

= 1.45 x 0.74 + 1.20 x 0.26

= 1.073 + 0.312 = 1.385

Now we shall compute Equity Beta using the following formula:

$$\beta_{Asset} = \beta_{Equity} \times \frac{E}{E + D(1-t)} + \beta_{Debt} \times \frac{D(1-t)}{E + D(1-t)}$$

Accordingly,

$$1.385 = \beta_{Equity} \times \frac{410}{410 + 170} + \beta_{Debt} \times \frac{170}{410 + 170}$$

$$1.385 = \beta_{Equity} \times \frac{410}{580} + 0.24 \times \frac{170}{580}$$

β_{Equity} = 1.86

(ii) Equity Beta on change in Capital Structure Amount of Debt to be raised:

Particulars	Value
Total Value of Firm (Equity ₹ 410 cr + Debt ₹ 170 cr)	₹ 580 Cr
Desired Debt Equity Ratio	1.90 : 1.00
Desired Debt Level = (Total Value x Debt Ratio)/(Debt Ratio + Equity Ratio)	₹ 380 Cr

Less: Value of Existing Debt	(₹ 170 Cr)
Value of Debt to be Raised	₹ 210 Cr

Equity after Repurchase = Total value of Firm – Desired Debt Value

= ₹ 580 Cr – ₹ 380 Cr

= ₹ 200 Cr

Weighted Average Beta of KGFL:

Source of Finance	Investment (₹ Cr)	Weight	Beta of the Division	Weighted Beta
Equity	200	0.345	$\beta_{(E=X)}$	0.345x
Debt – 1	170	0.293	0.35	0.103
Debt – 2	210	0.362	0.40	0.145
	580	**Weighted Average Beta**		**0.248 + (0.345x)**

$B_{Asset} = 0.248 + 0.345x$

$1.385 = 0.248 + 0.345x$

$0.345x = 1.385 - 0.248$

$0.345x = 1.137$

$x = 1.137/0.345 = 3.296$

$\beta_{Equity} = 3.296$

(iii) Yes, it justifies the increase as it leads to increase in the Value of Equity due to increase in Beta.

Portfolio Beta Management

Question 35

A Portfolio Manager (PM) has the following four stocks in his portfolio:

Security	No. of Shares	Market Price per share (₹)	β
VSL	10,000	50	0.9
CSL	5,000	20	1.0
SML	8,000	25	1.5
APL	2,000	200	1.2

Compute the following:

(a) Portfolio beta.

(b) If the PM seeks to reduce the beta to 0.8, how much risk free investment should he bring in?

(c) If the PM seeks to increase the beta to 1.2, how much risk free investment should he bring in?

Also show the revised portfolio and verify the Portfolio Beta in (b) and (c) above.

Answer

(i)

Security	No. of shares (1)	Market Price Per Share (2)	(1) x (2)	% to total (w)	ß (x)	wx
VSL	10,000	50	5,00,000	0.4167	0.9	0.375
CSL	5,000	20	1,00,000	0.0833	1	0.083
SML	8,000	25	2,00,000	0.1667	1.5	0.250
APL	2,000	200	4,00,000	0.3333	1.2	0.400
			12,00,000	1		1.108

Portfolio beta = 1.108

(ii) Required Beta 0.8

It should become (0.8/1.108) 72.2 % of present portfolio

If ₹ 12,00,000 is 72.20%, total portfolio should be (₹ 12,00,000 x 100/72.20) = ₹ 16,62,050

Additional investment in zero risk should be (₹ 16,62,050 – ₹ 12,00,000) = ₹ 4,62,050

Revised Portfolio will be

Security	No. of shares (1)	Market Price Per Share (2)	(1) x (2)	% to total (w)	ß (x)	wx
VSL	10,000	50	5,00,000	0.3008	0.9	0.271
CSL	5,000	20	1,00,000	0.0602	1	0.060
SML	8,000	25	2,00,000	0.1203	1.5	0.180
APL	2,000	200	4,00,000	0.2407	1.2	0.289
Risk free asset	46,205	10	4,62,050	0.2780	0	0
			16,62,050	1		0.800

(iii) To increase Beta to 1.2

Required beta 1.2

It should become (1.2/1.108) 108.30% of present beta

If ₹ 2,00,000 is 108.30%, the total portfolio should be

(₹ 12,00,000 x 100/108.30) = ₹ 11,08,033 say ₹ 11,08,030

Additional investment should be (–) 91,967 i.e. Divest ₹ 91,970 of Risk Free Asset

Revised Portfolio will be

Security	No. of shares (1)	Market Price Per Share (2)	(1) x (2)	% to total (w)	ß (x)	wx

VSL	10,000	50	5,00,000	0.4513	0.9	0.406
CSL	5,000	20	1,00,000	0.0903	1	0.090
SML	8,000	25	2,00,000	0.1805	1.5	0.271
APL	2,000	200	4,00,000	0.3610	1.2	0.433
Risk free asset	–9,197	10	–91,970	–0.0830	0	0
			11,08,030	1		1.20

Portfolio beta = 1.20

Sharpe Index Model (Systematic & Unsystematic Risk)

Question 36

Following are risk and return estimates for two stocks

Stock	Expected returns (%)	Beta	Specific SD of expected return (%)
A	14	0.8	35
B	18	1.2	45

The market index has a Standard Deviation (SD) of 25% and risk free rate on Treasury Bills is 6%.

You are required to calculate:

(i) The standard deviation of expected returns on A and B.

(ii) Suppose a portfolio is to be constructed with the proportions of 25%, 40% and 35% in stock A, B and Treasury Bills respectively, what would be the expected return, standard deviation of expected return of the portfolio?

Answer

(i) Total Risk = Systematic Risk + Unsystematic Risk

Stock A

Systematic Risk = $\beta^2\sigma^2_m = (0.8)^2 \times (25)^2 = 400$

Unsystematic Risk = $(35)^2$

Total Risk = $\sigma = \sqrt{400 + (35)^2} = \sqrt{1625} = 40.31\%$

Stock B

Systematic Risk = $\beta^2\sigma^2_m = (1.2)^2 \times (25)^2 = 900$

Unsystematic Risk = $(45)^2$

Total Risk = $\sigma = \sqrt{900 + (45)^2} = \sqrt{2925} = 54.08\%$

(ii) Expected return of the portfolio

$(0.25 \times 14) + (0.40 \times 18) + (0.35 \times 6) = 12.8\%$

Total Risk = Systematic Risk + Unsystematic Risk

Systematic Risk = $\beta^2_p\sigma^2_m$

$\beta_p = 0.25\ (0.8) + 0.4\ (1.2) + 0.35\ (0) = 0.2 + 0.48 + 0 = 0.68$

Systematic Risk of Portfolio = $\sqrt{(0.68)^2 \times (25)^2} = \sqrt{289}$

Unsystematic Risk of Portfolio

$= (0.25)^2\ (35)^2 + (0.40)^2\ (45)^2 + 0 = 76.56 + 324 = \sqrt{400.56}$

Total Risk = $\sqrt{289 + 400.56} = 26.26$

Question 37

A has portfolio having following features:

Security	β	Random Error σ_{ei}	Weight
L	1.60	7	0.25
M	1.15	11	0.30
N	1.40	3	0.25
K	1.00	9	0.20

You are required to find out the risk of the portfolio if the standard deviation of the market index (σ_m) is 18%.

Answer

$$\beta_p = \sum_{i=1}^{4} X_i \beta_i$$

$= 1.60 \times 0.25 + 1.15 \times 0.30 + 1.40 \times 0.25 + 1.00 \times 0.20$

$= 0.4 + 0.345 + 0.35 + 0.20$

$= 1.295$

The Standard Deviation (Risk) of the portfolio is

$= [(1.295)^2\ (18)^2 + (0.25)^2\ (7)^2 + (0.30)^2\ (11)^2 + (0.25)^2\ (3)^2 + (0.20)^2\ (9)^2)]$

$= [543.36 + 3.0625 + 10.89 + 0.5625 + 3.24] = [561.115]^{½} = 23.69\%$

Question 38

The following details are given for X and Y companies' stocks and the Bombay Sensex for a period of one year. Calculate the systematic and unsystematic risk for the companies' stocks. If equal amount of money is allocated for the stocks what would be the portfolio risk?

	X Stock	Y Stock	Sensex
Average return	0.15	0.25	0.06
Variance of return	6.30	5.86	2.25
β	0.71	0.685	

Correlation Co-efficient	0.424		
Co-efficient of determination (r^2)	0.18		

Answer

The co-efficient of determination (r^2) gives the percentage of the variation in the security's return that is explained by the variation of the market index return. In the X company stock return, 18 percent of variation is explained by the variation of the index and 82 percent is not explained by the index.

According to Sharpe, the variance explained by the index is the systematic risk. The unexplained variance or the residual variance is the unsystematic risk.

Company X:

Systematic risk $= \beta_i^2 \times$ Variance of market index

$= (0.71)^2 \times 2.25 = 1.134$

Unsystematic risk ($\in_i^2$) = Total variance of security return – Systematic Risk

$= 6.30 - 1.134$

$= 5.166$

or

= Variance of Security Return $(1 - r^2)$

$= 6.30 \times (1 - 0.18) = 6.3 \times 0.82 = 5.166$

Total risk $= \beta_i^2 \times \sigma_m^2 + \in_i^2$

= Systematic Risk + Unsystematic Risk

$= 1.134 + 5.166 = 6.30$

Company Y:

Systematic risk $= \beta_i^2 \times \sigma_m^2$

$= (0.685)^2 \times 2.25 = 1.056$

Unsystematic risk ($\in_i^2$) = Total variance of the security return – Systematic Risk

$= 5.86 - 1.056 = 4.804$

Portfolio Risk

$$\sigma_p^2 = \left[\left(\sum_{i=1}^{N} X_i \beta_i\right)^2 \sigma_m^2\right] + \left[\sum_{i=1}^{N} X_i^2 e_i^2\right]$$

$= [(0.5 \times 0.71 + 0.5 \times 0.685)^2\ 2.25] + [(0.5)^2\ (5.166) + (0.5)^2\ (4.804)]$

$= [(0.355 + 0.3425)^2\ 2.25] + [(1.292 + 1.201)]$

$= 1.0946 + 2.493$

$= 3.5876$

Question 39

Following are the details of a portfolio consisting of three shares:

Share	Portfolio weight	Beta	Expected return in %	Total variance
A	0.20	0.40	14	0.015
B	0.50	0.50	15	0.025
C	0.30	1.10	21	0.100

Standard Deviation of Market Portfolio Returns = 10%

You are given the following additional data:

Covariance (A, B) = 0.030

Covariance (A, C) = 0.020

Covariance (B, C) = 0.040

Calculate the following:

(i) The Portfolio Beta

(ii) Residual variance of each of the three shares

(iii) Portfolio variance using Sharpe Index Model

(iv) Portfolio variance (on the basis of modern portfolio theory given by Markowitz)

Answer

(i) Portfolio Beta

$= 0.20 \times 0.40 + 0.50 \times 0.50 + 0.30 \times 1.10 = 0.66$

(ii) Residual Variance

To determine Residual Variance first of all we shall compute the Systematic Risk as follows:

$\beta^2_A \times \sigma^2_M = (0.40)^2 (0.01) = 0.0016$

$\beta^2_A \times \sigma^2_M = (0.50)^2 (0.01) = 0.0025$

$\beta^2_A \times \sigma^2_M = (1.10)^2 (0.01) = 0.0121$

Residual Variance

A $0.015 - 0.0016 = 0.0134$

B $0.025 - 0.0025 = 0.0225$

C $0.100 - 0.0121 = 0.0879$

(iii) Portfolio variance using Sharpe Index Model

Systematic Variance of Portfolio $= (0.10)^2 \times (0.66)^2 = 0.004356$

Unsystematic Variance of Portfolio $= 0.0134 \times (0.20)^2 + 0.0225 \times (0.50)^2 + 0.0879 \times (0.30)^2$

$= 0.014072$

Total Variance $= 0.004356 + 0.014072 = 0.018428$

(iv) Portfolio variance on the basis of Markowitz Theory

$= (W_A \times W_A \times \sigma^2_A) + (W_A \times W_B \times Cov_{AB}) + (W_A \times W_C \times Cov_{AC}) + (W_B \times W_A \times Cov_{AB}) + (W_B \times W_B \times \sigma^2) + (W_B \times W_C \times Cov_{BC}) + (W_C \times W_A \times Cov_{CA}) + (W_C \times W_B \times Cov_{CB}) + (W_C \times W_C \times \sigma^2_C)$

$= (0.20 \times 0.20 \times 0.015) + (0.20 \times 0.50 \times 0.030) + (0.20 \times 0.30 \times 0.020) + (0.20 \times 0.50 \times 0.030) +$

(0.50 x 0.50 x 0.025) + (0.50 x 0.30 x 0.040) + (0.30 x 0.20 x 0.020) + (0.30 x 0.50 x 0.040) + (0.30 x 0.30 x 0.10)

= 0.0006 + 0.0030 + 0.0012 + 0.0030 + 0.00625 + 0.0060 + 0.0012 + 0.0060 + 0.0090

= 0.0363

Question 40

Following are the details of a portfolio consisting of three shares:

Share	Portfolio weight	Beta	Expected return in %	Total variance
A	0.20	0.40	14	0.015
B	0.50	0.50	15	0.025
C	0.30	1.10	21	0.100

Standard Deviation of Market Portfolio Returns = 10%

You are given the following additional data:

Covariance (A, B) = 0.030

Covariance (A, C) = 0.020

Covariance (B, C) = 0.040

Calculate the Portfolio variance considering:

(i) Correlation between each pair of securities. (Modern Portfolio Theory by Markowitz)

(ii) Co-movement between securities due to change in the market index. (Sharpe Index Model)

Answer

(i) We can compute the Portfolio variance on the basis of Correlation between each pair of securities as follows:

= $(W_A \times W_A \times \sigma^2_A) + (W_A \times W_B \times Cov_{AB}) + (W_A \times W_C \times Cov_{AC}) + (W_B \times W_A \times Cov_{AB}) + (W_B \times W_B \times \sigma^2) + (W_B \times W_C \times Cov_{BC}) + (W_C \times W_A \times Cov_{CA}) + (W_C \times W_B \times Cov_{CB}) + (W_C \times W_C \times \sigma^2_C)$

= (0.20 x 0.20 x 0.015) + (0.20 x 0.50 x 0.030) + (0.20 x 0.30 x 0.020) + (0.20 x 0.50 x 0.030) + (0.50 x 0.50 x 0.025) + (0.50 x 0.30 x 0.040) + (0.30 x 0.20 x 0.020) + (0.30 x 0.50 x 0.040) + (0.30 x 0.30 x 0.10)

= 0.0006 + 0.0030 + 0.0012 + 0.0030 + 0.00625 + 0.0060 + 0.0012 + 0.0060 + 0.0090

= 0.0363

(ii) To compute the Portfolio variance considering the Co-movement between securities due to change in the market index first we shall compute the Beta of the portfolio is as follows:

0.20 x 0.40 + 0.50 x 0.50 + 0.30 x 1.10 = 0.66

Then we shall compute the Residual Variance by separating the Systematic Risk from total risk as follows:

Systematic Risk of each security shall be computed as follows:

$\beta^2_A \times \sigma^2_M = (0.40)^2 (0.01) = 0.0016$

$\beta^2_A \times \sigma^2_M = (0.50)^2 (0.01) = 0.0025$

$\beta^2_A \times \sigma^2_M = (1.10)^2 (0.01) = 0.0121$

The Residual Variance of each security

A 0.015 – 0.0016 = 0.0134

B 0.025 – 0.0025 = 0.0225

C 0.100 – 0.0121 = 0.0879

Then Portfolio variance shall be computed using Sharpe Index Model as follows:

Systematic Variance of Portfolio = $(0.10)^2 \times (0.66)^2 = 0.004356$

Unsystematic Variance of Portfolio = $0.0134 \times (0.20)^2 + 0.0225 \times (0.50)^2 + 0.0879 \times (0.30)^2$

$= 0.014072$

Total Variance = 0.004356 + 0.014072 = 0.018428

Question 41

A study by a Mutual fund has revealed the following data in respect of three securities:

Security	σ (%)	Correlation with Index, Pm
A	20	0.60
B	18	0.95
C	12	0.75

The standard deviation of market portfolio (BSE Sensex) is observed to be 15%.

(i) What is the sensitivity of returns of each stock with respect to the market?

(ii) What are the covariances among the various stocks?

(iii) What would be the risk of portfolio consisting of all the three stocks equally?

(iv) What is the beta of the portfolio consisting of equal investment in each stock?

(v) What is the total, systematic and unsystematic risk of the portfolio in (iv)?

Answer

(i) Sensitivity of each stock with market is given by its beta.

Standard deviation of market Index = 15%

Variance of market Index = 0.0225

Beta of stocks = $\sigma_i r/\sigma_m$

A = 20 x 0.60/15 = 0.80

B = 18 x 0.95/15 = 1.14

C = 12 x 0.75/15 = 0.60

(ii) Covariance between any 2 stocks = $\beta_1\beta_2\sigma^2 m$

Covariance matrix

Stock/Beta	0.80	1.14	0.60
A	400.000	205.200	108.000
B	205.200	324.000	153.900
C	108.000	153.900	144.000

(iii) Total risk of the equally weighted portfolio (Variance)

$= 400\ (1/3)^2 + 324\ (1/3)^2 + 144\ (1/3)^2 + 2\ (205.20)\ (1/3)^2 + 2\ (108.0)\ (1/3)^2 + 2\ (153.90)\ (1/3)^2$

$= 200.244$

(iv) β of equally weighted portfolio $= \beta_p = \sum \beta_i / N = \dfrac{0.80 + 1.14 + 0.60}{3} = 0.8467$

(v) Systematic Risk $\beta_p^2 \sigma_m^2 = (0.8467)^2\ (15)^2 = 161.302$

Unsystematic Risk = Total Risk – Systematic Risk = 200.244 – 161.302 = 38.942

Market Lines

Question 42

Assuming that shares of ABC Ltd. and XYZ Ltd. are correctly priced according to Capital Asset Pricing Model. The expected return from and Beta of these shares are as follows:

Share	Beta	Expected return
ABC	1.2	19.8%
XYZ	0.9	17.1%

You are required to derive Security Market Line.

Answer

CAPM $= R_f + \beta\ (R_m - R_f)$

Accordingly

$R_{ABC} = R_f + 1.2\ (R_m - R_f) = 19.8$

$R_{XYZ} = R_f + 0.9\ (R_m - R_f) = 17.1$

$19.8 = R_f + 1.2\ (R_m - R_f)$ ------(1)

$17.1 = R_f + 0.9\ (R_m - R_f)$ ------(2)

Deduct (2) from (1)

$2.7 = 0.3\ (R_m - R_f)$

$R_m - R_f = 9$

$R_f = R_m - 9$

Substituting in equation (1)

$19.8 = (R_m - 9) + 1.2\ (R_m - R_m + 9)$

$19.8 = R_m - 9 + 10.8$

$19.8 = R_m + 1.8$

Then $R_m = 18\%$ and $R_f = 9\%$

Security Market Line

$= R_f + \beta$ (Market Risk Premium)

$= 9\% + \beta \times 9\%$

Question 43

Expected returns on two stocks for particular market returns are given in the following table:

Market Return	Aggressive	Defensive
7%	4%	9%
25%	40%	18%

You are required to calculate:

(a) The Betas of the two stocks.

(b) Expected return of each stock, if the market return is equally likely to be 7% or 25%.

(c) The Security Market Line (SML), if the risk free rate is 7.5% and market return is equally likely to be 7% or 25%.

(d) The Alphas of the two stocks.

Answer

(a) The Betas of two stocks:

Aggressive stock = (40% – 4%)/(25% – 7%) = 2

Defensive stock = (18% – 9%)/(25% – 7%) = 0.50

(b) Expected returns of the two stocks:

Aggressive stock = 0.5 x 4% + 0.5 x 40% = 22%

Defensive stock = 0.5 x 9% + 0.5 x 18% = 13.5%

(c) Expected return of market portfolio = 0.5 x 7% + 0.5% x 25% = 16%

∴ Market risk premium = 16% – 7.5% = 8.5%

∴ SML is, Required Return = 7.5% + β_i 8.5%

(d) $Rs = \alpha + \beta R_m$

For Aggressive Stock

$22\% = \alpha_A + 2\ (16\%)$

$\alpha_A = -10\%$

For Defensive Stock

$13.5\% = \alpha_D + 0.50\ (16\%)$

$\alpha_D = 5.5\%$

Question 44

The rates of return on the security of Company X and market portfolio for 10 periods are given below:

Period	Return of Security X (%)	Return on Market Portfolio (%)
1	20	22
2	22	20
3	25	18
4	21	16
5	18	20
6	−5	8
7	17	−6
8	19	5
9	−7	6
10	20	11

(i) What is the beta of Security X?

(ii) What is the characteristic line for Security X?

Answer

(i) Calculation of Beta of Security X

Period	R_X	R_M	$R_X - \overline{R_X}$	$R_M - \overline{R_M}$	$(R_X - \overline{R_X})(R_M - \overline{R_M})$	$(R_M - \overline{R_M})^2$
1	20	22	5	10	50	100
2	22	20	7	8	56	64
3	25	18	10	6	60	36
4	21	16	6	4	24	16
5	18	20	3	8	24	64
6	−5	8	−20	−4	80	16
7	17	−6	2	−18	−36	324
8	19	5	4	−7	−28	49
9	−7	6	−22	−6	132	36
10	20	11	5	−1	−5	1
	150	120			357	706
	ΣR_X	ΣR_M			$\sum(R_X - \overline{R_X})(R_M - \overline{R_M})$	$\sum(R_M - \overline{R_M})^2$

$\overline{R_X} = 15$

$\overline{R_M} = 12$

$$\sigma^2_M = \frac{\Sigma (R_M - \overline{R}_M)^2}{n} = \frac{706}{10} = 70.60$$

$$Cov_{XM} = \frac{\sum (R_X - \overline{R_X})(R_M - \overline{R_M})}{n} = \frac{357}{10} = 35.70$$

$$Beta_X = \frac{Cov_{XM}}{\sigma^2_M} = \frac{35.70}{70.60} = 0.505$$

(ii) Characteristic line for Security X

$\overline{R_X} = 15$

$\overline{R_M} = 12$

$y = \alpha + \beta x$

$15 = \alpha + 0.505 \times 12$

Alpha (α) = 15 – (0.505 x 12) = 8.94%

Characteristic line for security X = $\alpha + \beta \times R_M$

Where, R_M = Expected return on Market Index

∴ Characteristic line for security X = 8.94 + 0.505 R_M

Question 45

The returns on stock A and market portfolio for a period of 6 years are as follows:

Year	Return on A (%)	Return on market portfolio (%)
1	12	8
2	15	12
3	11	11
4	2	–4
5	10	9.5
6	–12	–2

You are required to determine:

(i) Characteristic line for stock A

(ii) The systematic and unsystematic risk of stock A

Answer

Characteristic line is given by $\alpha_i + \beta_i R_m$

$$\beta_i = \frac{\Sigma XY - n\,\overline{X}\,\overline{Y}}{\Sigma X^2 - n\,(\overline{X})^2}$$

$\alpha_i = \overline{Y} - \beta\,\overline{X}$

Return on A (Y)	Return on Market (X)	XY	X^2	$(X - \overline{X})$	$(X - \overline{X})^2$	$(Y - \overline{Y})$	$(Y - \overline{Y})^2$

12	8	96	64	2.25	5.06	5.67	32.15
15	12	180	144	6.25	39.06	8.67	75.17
11	11	121	121	5.25	27.56	4.67	21.81
2	–4	–8	16	–9.75	95.06	–4.33	18.75
10	9.5	95	90.25	3.75	14.06	3.67	13.47
–12	–2	24	4	–7.75	60.06	–18.33	335.99
38	34.5	508	439.25		240.86		497.34

$\overline{Y} = 38/6 = 6.33$

$\overline{X} = 34.5/6 = 5.75$

$$\beta = \frac{\Sigma XY - n\overline{X}\,\overline{Y}}{\Sigma X^2 - n(\overline{X})^2} = \frac{508 - 6(5.75)(6.33)}{439.25 - 6(5.75)^2} = \frac{508 - 218.385}{439.25 - 198.375} = \frac{289.615}{240.875} = 1.202$$

$\alpha = \overline{Y} - \beta\,\overline{X} = 6.33 - 1.202\,(5.75) = -0.58$

Hence the characteristic line is $-0.58 + 1.202\,(R_m)$

$$\text{Total Risk of Market} = \sigma^2_M = \frac{\Sigma(X - \overline{X})^2}{n} = \frac{240.86}{6} = 40.14(\%)^2$$

$$\text{Total Risk of Stock} = \frac{497.34}{6} = 82.89(\%)^2$$

Systematic Risk $= \beta_i^2 \times \sigma^2_M = (1.202)^2 \times 40.14 = 57.99(\%)^2$

Unsystematic Risk is = Total Risk – Systematic Risk

$= 82.89 - 57.99 = 24.90(\%)^2$

Sharpe Optimum Portfolio

Question 46

Ramesh wants to invest in stock market. He has got the following information about individual securities:

Security	Expected Return	Beta	σ^2_{ei}
A	15	1.5	40
B	12	2	20
C	10	2.5	30
D	09	1	10
E	08	1.2	20
F	14	1.5	30

Market index variance is 10% and the risk free rate of return is 7%. What should be the optimum portfolio assuming no short sales?

Answer

Securities need to be ranked on the basis of excess return to beta ratio from highest to the lowest.

Security	R_i	β_i	$R_i - R_f$	$(R_i - R_f)/\beta_i$
A	15	1.5	8	5.33
B	12	2	5	2.5
C	10	2.5	3	1.2
D	9	1	2	2
E	8	1.2	1	0.83
F	14	1.5	7	4.67

Ranked Table:

Security	$R_i - R_f$	β_i	σ^2_{ei}	$\frac{(R_i - R_f) \times \beta}{\sigma^2_{ei}}$	$\sum_{e=i}^{N} \frac{(R_i - R_f) \times \beta}{\sigma^2_{ei}}$	$\frac{\beta_i^2}{\sigma^2_{ei}}$	$\sum_{e=i}^{N} \frac{\beta_i^2}{\sigma^2_{ei}}$	C_i
A	8	1.5	40	0.30	0.30	0.056	0.056	1.923
F	7	1.5	30	0.35	0.65	0.075	0.131	2.814
B	5	2	20	0.50	1.15	0.20	0.331	2.668
D	2	1	10	0.20	1.35	0.10	0.431	2.542
C	3	2.5	30	0.25	1.60	0.208	0.639	2.165
E	1	1.2	20	0.06	1.66	0.072	0.711	2.047

$C_A = (10 \times 0.30)/[1 + (10 \times 0.056)] = 1.923$

$C_F = (10 \times 0.65)/[1 + (10 \times 0.131)] = 2.814$

$C_B = (10 \times 1.15)/[1 + (10 \times 0.331)] = 2.668$

$C_D = (10 \times 1.35)/[1 + (10 \times 0.431)] = 2.542$

$C_C = (10 \times 1.60)/[1 + (10 \times 0.639)] = 2.165$

$C_E = (10 \times 1.66)/[1 + (10 \times 0.7111)] = 2.047$

Cut off point is 2.814

$$Z_i = \frac{\beta_i}{\sigma^2_{ei}} \times \left[\frac{R_i - R_f}{\beta_i} - c\right]$$

$$Z_A = \frac{1.5}{40}(5.33 - 2.814) = 0.09435$$

$$Z_F = \frac{1.5}{30}(4.67 - 2.814) = 0.0928$$

$$X_A = \frac{0.09435}{0.09435 + 0.0928} \times 100 = 50.41\%$$

$$X_F = \frac{0.0928}{0.09435 + 0.0928} \times 100 = 49.59\%$$

Funds to be invested in security A & F are 50.41% and 49.59% respectively.

Arbitrage Pricing Theory Model (APT)

Question 47

With the help of following data determine the return on the security X.

Factor	Risk Premium associated with the Factor	β_i
Market	4%	1.3
Growth Rate of GDP	1%	0.3
Inflation	–4%	0.2

Risk Free Rate of Return is 8%.

Answer

Expected Return = $R_f + \lambda_1\beta_1 + \lambda_2\beta_2 + \lambda_3\beta_3$

= 8% + 1.3 x 4% + 0.3 x 1% + 0.2 x (–4%)

= 8% + 5.2% + 0.3% – 0.8%

= 12.7%

Question 48

Mr. Tamarind intends to invest in equity shares of a company the value of which depends upon various parameters as mentioned below:

Factor	Beta	Expected value in %	Actual value in %
GNP	1.20	7.70	7.70
Inflation	1.75	5.50	7.00
Interest rate	1.30	7.75	9.00
Stock market index	1.70	10.00	12.00
Industrial production	1.00	7.00	7.50

If the risk free rate of interest be 9.25%, how much is the return of the share under Arbitrage Pricing Theory?

Answer

Return of the stock under APT

Factor	Actual value in %	Expected value in %	Difference	Beta	Diff. x Beta
GNP	7.70	7.70	0.00	1.20	0.00
Inflation	7.00	5.50	1.50	1.75	2.63
Interest rate	9.00	7.75	1.25	1.30	1.63
Stock index	12.00	10.00	2.00	1.70	3.40
Ind. Production	7.50	7.00	0.50	1.00	0.50

	8.16
Add: Risk free rate in %	9.25
Return under APT	**17.41**

Question 49

Mr. Nirmal Kumar has categorized all the available stock in the market into the following types:

(i) Small cap growth stocks

(ii) Small cap value stocks

(iii) Large cap growth stocks

(iv) Large cap value stocks

Mr. Nirmal Kumar also estimated the weights of the above categories of stocks in the market index. Further, the sensitivity of returns on these categories of stocks to the three important factor are estimated to be:

Category of Stocks	Weight in the Market Index	Factor I (Beta)	Factor II (Book Price)	Factor III (Inflation)
Small cap growth	25%	0.80	1.39	1.35
Small cap value	10%	0.90	0.75	1.25
Large cap growth	50%	1.165	2.75	8.65
Large cap value	15%	0.85	2.05	6.75
Risk Premium		6.85%	–3.5%	0.65%

The rate of return on treasury bonds is 4.5%

Required:

(a) Using Arbitrage Pricing Theory, determine the expected return on the market index.

(b) Using Capital Asset Pricing Model (CAPM), determine the expected return on the market index.

(c) Mr. Nirmal Kumar wants to construct a portfolio constituting only the 'small cap value' and 'large cap growth' stocks. If the target beta for the desired portfolio is 1, determine the composition of his portfolio.

Answer

(a) Method I

Stock's return

Small cap growth = 4.5 + 0.80 x 6.85 + 1.39 x (–3.5) + 1.35 x 0.65 = 5.9925%

Small cap value = 4.5 + 0.90 x 6.85 + 0.75 x (–3.5) + 1.25 x 0.65 = 8.8525%

Large cap growth = 4.5 + 1.165 x 6.85 + 2.75 x (–3.5) + 8.65 x 0.65 = 8.478%

Large cap value = 4.5 + 0.85 x 6.85 + 2.05 x (–3.5) + 6.75 x 0.65 = 7.535%

Expected return on market index

= 0.25 x 5.9925 + 0.10 x 8.8525 + 0.50 x 8.478 + 0.15 x 7.535 = 7.7526%

Method II

Expected return on the market index

= 4.5% + [0.1 x 0.9 + 0.25 x 0.8 + 0.15 x 0.85 + 0.50 x 1.165] x 6.85 + [(0.75 x 0.10 + 1.39 x 0.25 + 2.05 x 0.15 + 2.75 x 0.5)] x (–3.5) + [{1.25 x 0.10 + 1.35 x 0.25 + 6.75 x 0.15 + 8.65 x 0.50)] x 0.65

= 4.5 + 6.85 + (–7.3675) + 3.77 = 7.7525%.

(b) Using CAPM,

Small cap growth = 4.5 + 6.85 x 0.80 = 9.98%

Small cap value = 4.5 + 6.85 x 0.90 = 10.665%

Large cap growth = 4.5 + 6.85 x 1.165 = 12.48%

Large cap value = 4.5 + 6.85 x 0.85 = 10.3225%

Expected return on market index

= 0.25 x 9.98 + 0.10 x 10.665 + 0.50 x 12.45 + 0.15 x 10.3225 = 11.33%

(c) Let us assume that Mr. Nirmal will invest X_1% in small cap value stock and X_2% in large cap growth stock

$0.90 X_1 + 1.165 X_2 = 1$

$0.90 X_1 + 1.165 (1 - X_1) = 1$

$0.90 X_1 + 1.165 - 1.165 X_1 = 1$

$0.165 = 0.265 X_1$

$X_1 = 0.165/0.265$

$X_1 = 0.623, X_2 = 0.377$

62.3% in small cap value

37.7% in large cap growth

Question 50

Mr. X owns a portfolio with the following characteristics:

	Security A	Security B	Risk Free security
Factor 1 sensitivity	0.80	1.50	0
Factor 2 sensitivity	0.60	1.20	0
Expected Return	15%	20%	10%

It is assumed that security returns are generated by a two factor model.

(i) If Mr. X has ₹ 1,00,000 to invest and sells short ₹ 50,000 of security B and purchases ₹ 1,50,000 of security A what is the sensitivity of Mr. X's portfolio to the two factors?

(ii) If Mr. X borrows ₹ 1,00,000 at the risk free rate and invests the amount he borrows along with the original amount of ₹ 1,00,000 in security A and B in the same proportion as described in part (i), what is the sensitivity of the portfolio to the two factors?

(iii) What is the expected return premium of factor 2?

Answer

(i) Mr. X's position in the two securities are +1.50 in security A and –0.5 in security B. Hence the portfolio sensitivities to the two factors:

Portfolio Factor 1 Sensitivity = 1.50 x 0.80 + (–0.50 x 1.50) = 0.45

Portfolio Factor 2 Sensitivity = 1.50 x 0.60 + (–0.50 x 1.20) = 0.30

(ii) Mr. X's current position:

Security A = ₹ 3,00,000/₹ 1,00,000 = 3

Security B = –₹ 1,00,000/₹ 1,00,000 = –1

Risk free asset = –₹ 1,00,000/₹ 1,00,000 = –1

Portfolio Factor 1 Sensitivity = 3.0 x 0.80 + (–1 x 1.50) + (–1 x 0) = 0.90

Portfolio Factor 2 Sensitivity = 3.0 x 0.60 + (–1 x 1.20) + (–1 x 0) = 0.60

(iii) Expected Return = Risk Free Rate of Return + Risk Premium

Let λ_1 and λ_2 are the Value Factor 1 and Factor 2 respectively.

Accordingly

$15 = 10 + 0.80\ \lambda_1 + 0.60\ \lambda_2$

$20 = 10 + 1.50\ \lambda_1 + 1.20\ \lambda_2$

On solving equation, the value of $\lambda_1 = 0$, and risk premium of factor 2 for Securities A & B shall be as follows:

Using Security A's Return

Total Return = 15% = 10% + 0.60 λ_2

Risk Premium (λ_2) = 5%/0.60 = 8.33%

Alternatively Using Security B's Return

Total Return = 20% = 10% + 1.20 λ_2

Risk Premium (λ_2) = 10%/1.20 = 8.33%

Portfolio Evaluation

Question 51

Five portfolios experienced the following results during a 7 year period:

Portfolio	Average Annual Return (R_p) (%)	Standard Deviation (S_p)	Correlation with the market returns (r)
A	19.0	2.5	0.840
B	15.0	2.0	0.540
C	15.0	0.8	0.975
D	17.5	2.0	0.750
E	17.1	1.8	0.600

Market Risk (σ_m)		1.2	
Market rate of Return (R_m)	14.0		
Risk-free Rate (R_f)	9.0		

Rank the portfolios using (a) Sharpe's method, (b) Treynor's method and (c) Jensen's Alpha

Answer

Let portfolio standard deviation be σ_p

Market Standard Deviation = σ_m

Coefficient of correlation = r

Portfolio Beta (β_p) = $\frac{\sigma_p r}{\sigma_m}$

Required portfolio return (R_p) = $R_f + \beta_p (R_m - R_f)$

Portfolio	Beta	Return from the portfolio (R_p) (%)
A	1.75	17.75
B	0.90	13.50
C	0.65	12.25
D	1.25	15.25
E	0.90	13.50

Portfolio	Sharpe Method		Treynor Method		Jensen's Alpha	
	Ratio	Rank	Ratio	Rank	Ratio	Rank
A	4.00	IV	5.71	V	1.25	V
B	3.00	V	6.67	IV	1.50	IV
C	7.50	I	9.23	I	2.75	II
D	4.25	III	6.80	III	2.25	III
E	4.50	II	9.00	II	3.60	I

Question 52

The following are the data on five mutual funds:

Fund	Return	Standard Deviation	Beta
A	15	7	1.25
B	18	10	0.75
C	14	5	1.40
D	12	6	0.98
E	16	9	1.50

You are required to compute Reward to Volatility Ratio and rank these portfolios using:

- Sharpe method and
- Treynor's method

assuming the risk free rate is 6%.

Answer

Sharpe Ratio $S = (R_p - R_f)/\sigma_p$

Treynor Ratio $T = (R_p - R_f)/\beta_p$

Where,

R_p = Return on Fund

R_f = Risk-free rate

σ_p = Standard deviation of Fund

β_p = Beta of Fund

Reward to Variability (Sharpe Ratio)

Mutual Fund	R_p	R_f	$R_p - R_f$	σ_p	Reward to Variability	Ranking
A	15	6	9	7	1.285	2
B	18	6	12	10	1.20	3
C	14	6	8	5	1.60	1
D	12	6	6	6	1.00	5
E	16	6	10	9	1.11	4

Reward to Volatility (Treynor Ratio)

Mutual Fund	R_p	R_f	$R_p - R_f$	β_p	Reward to Volatility	Ranking
A	15	6	9	1.25	7.2	2
B	18	6	12	0.75	16	1
C	14	6	8	1.40	5.71	5
D	12	6	6	0.98	6.12	4
E	16	6	10	1.50	6.67	3

Question 53

The following are the details of three mutual funds of MFL:

	Growth Fund	Balanced Fund	Regular Fund	Market
Average Return (%)	7	6	5	9
Variance	92.16	54.76	40.96	57.76
Coefficient of Determination	0.3025	0.6561	0.9604	

The yield on 182 days Treasury Bill is 9 percent per annum.

You are required to:

(i) Rank the funds as per Sharpe's measure.

(ii) Rank the funds as per Treynor's measure.

(iii) Compare the performance with the market.

Answer

	Growth Fund	Balanced Fund	Regular Fund	Market
Average Return (%)	7	6	5	9
Variance	92.16	54.76	40.96	57.76
Std. Deviation	9.60	7.40	6.40	7.60
Coefficient of Determination	0.3025	0.6561	0.9604	
Coefficient of Correlation	0.55	0.81	0.98	
Beta (β)	$\frac{9.60}{7.60}$ x 0.55 = 0.695	$\frac{7.40}{7.60}$ x 0.81 = 0.789	$\frac{6.40}{7.60}$ x 0.98 = 0.825	

(i) Ranking of Funds as per Sharpe Ratio

Sharpe Ratio = (Expected Return – Risk Free Rate of Return)/Standard Deviation

	Growth Fund	Balanced Fund	Regular Fund
Sharpe Ratio	(7 – 9)/9.60 = –0.208	(6 – 9)/7.40 = –0.405	(5 – 9)/6.40 = –0.625
Ranking	1	2	3

(ii) Ranking of Funds as per Treynor Ratio

Treynor Ratio = (Expected Return – Risk Free Rate of Return)/Beta

	Growth Fund	Balanced Fund	Regular Fund
Treynor Ratio	(7 – 9)/0.695 = –2.878	(6 – 9)/0.789 = –3.802	(5 – 9)/0.825 = –4.84
Ranking	1	2	3

(iii) Comparison of performance with the Market

Sharpe Ratio	(9 – 9)/7.60 = 0
Treynor Ratio	(9 – 9)/1 = 0

Thus, the performance of funds is very poor since all values are negative as compared to market performance.

Question 54

Mr. Abhishek is interested in investing ₹ 2,00,000 for which he is considering following three alternatives:

(i) Invest ₹ 2,00,000 in Mutual Fund X (MFX)

(ii) Invest ₹ 2,00,000 in Mutual Fund Y (MFY)

(iii) Invest ₹ 1,20,000 in Mutual Fund X (MFX) and ₹ 80,000 in Mutual Fund Y (MFY)

Average annual return earned by MFX and MFY is 15% and 14% respectively. Risk free rate of return is 10% and market rate of return is 12%.

Covariance of returns of MFX, MFY and market portfolio Mix are as follow:

	MFX	MFY	Mix
MFX	4.800	4.300	3.370
MFY	4.300	4.250	2.800
Mix	3.370	2.800	3.100

You are required to calculate:

(i) variance of return from MFX, MFY and market return,

(ii) portfolio return, beta, portfolio variance and portfolio standard deviation,

(iii) expected return, systematic risk and unsystematic risk; and

(iv) Sharpe ratio, Treynor ratio and Alpha of MFX, MFY and Portfolio Mix

Answer

(i) Variance of Returns

By referring diagonally the given table, these values can be identified as follows:

$Variance_{MFX} = 4.800$

$Variance_{MFY} = 4.250$

$Variance_{Market} = 3.100$

(ii) Portfolio return, beta, variance and standard deviation

$$\text{Weight of MFX in portfolio} = \frac{1,20,000}{2,00,000} = 0.60$$

$$\text{Weight of MFY in portfolio} = \frac{80,000}{2,00,000} = 0.40$$

Accordingly Portfolio Return

$= 0.60 \times 15\% + 0.40 \times 14\%$

$= 14.60\%$

Beta of each Fund

$$\beta = \frac{\text{Cov (Fund, Market)}}{\text{Variance of Market}}$$

$$\beta_X = \frac{3.370}{3.100} = 1.087$$

$$B_Y = \frac{2.800}{3.100} = 0.903$$

Portfolio Beta

= 0.60 x 1.087 + 0.40 x 0.903 = 1.013

Portfolio Variance

$\sigma^2_{XY} = W_X^2 \sigma_X^2 + W_Y^2 \sigma_Y^2 + 2 W_X W_Y Cov_{X,Y}$

$= (0.60)^2 (4.800) + (0.40)^2 (4.250) + 2 (0.60) (0.40) (4.300)$

$= 4.472$

Or Portfolio Standard Deviation

$\sigma_{XY} = \sqrt{4.472} = 2.115$

(iii) Expected Return, Systematic and Unsystematic Risk of Portfolio

Portfolio Return = 10% + 1.0134 (12% – 10%) = 12.03%

MF X Return = 10% + 1.087 (12% – 10%) = 12.17%

MF Y Return = 10% + 0.903 (12% – 10%) = 11.81%

Systematic Risk = $\beta_i^2 \sigma_m^2$

Accordingly,

Systematic Risk of MFX = $(1.087)^2$ x 3.10 = 3.663

Systematic Risk of MFY = $(0.903)^2$ x 3.10 = 2.528

Systematic Risk of Portfolio = $(1.013)^2$ x 3.10 = 3.181

Unsystematic Risk = Total Risk – Systematic Risk

Accordingly,

Unsystematic Risk of MFX = 4.80 – 3.663 = 1.137

Unsystematic Risk of MFY = 4.250 – 2.528 = 1.722

Unsystematic Risk of Portfolio = 4.472 – 3.181 = 1.291

(iv) Sharpe and Treynor Ratios and Alpha

Sharpe Ratio

$$MFX = \frac{15\% - 10\%}{\sqrt{4.800}} = 2.282$$

$$MFY = \frac{14\% - 10\%}{\sqrt{4.250}} = 1.94$$

$$Portfolio = \frac{14.60\% - 10\%}{2.115} = 2.175$$

Treynor Ratio

$$MFX = \frac{15\% - 10\%}{1.087} = 4.60$$

$$MFY = \frac{14\% - 10\%}{0.903} = 4.43$$

$$Portfolio = \frac{14.60\% - 10\%}{1.0134} = 4.54$$

Alpha

MFX = 15% – 12.17% = 2.83%

MFY = 14% – 11.81% = 2.19%

Portfolio = 14.6% – 12.03% = 2.57%

Question 55

Suppose that economy A is growing rapidly and you are managing a global equity fund and so far you have invested only in developed-country stocks only. Now you have decided to add stocks of economy A to your portfolio. The table below shows the expected rates of return, standard deviations, and correlation coefficients (all estimates are for aggregate stock market of developed countries and stock market of Economy A).

	Developed Country Stocks	**Stocks of Economy A**
Expected rate of return (annualized percentage)	10	15
Risk [Annualized Standard Deviation (%)]	16	30
Correlation Coefficient (ρ)	0.30	

Assuming the risk-free interest rate to be 3%, you are required to determine:

(a) What percentage of your portfolio should you allocate to stocks of Economy A if you want to increase the expected rate of return on your portfolio by 0.5%?

(b) What will be the standard deviation of your portfolio assuming that stocks of Economy A are included in the portfolio as calculated above?

(c) Also show how well the Fund will be compensated for the risk undertaken due to inclusion of stocks of Economy A in the portfolio by using Sharpe Ratio?

Answer

(a) Let the weight of stocks of Economy A is expressed as w, then

$(1 - w) \times 10 + w \times 15 = 10.5$

i.e. w = 0.1 or 10%

(b) Variance of portfolio shall be:

$(0.9)^2 (0.16)^2 + (0.1)^2 (0.30)^2 + 2 (0.9) (0.1) (0.16) (0.30) (0.30) = 0.02423$

Standard deviation is $(0.02423)^{½} = 0.15565$ or 15.56%

(c) The Sharpe ratio will improve by approximately 0.04, as shown below:

$$\text{Sharpe Ratio} = \frac{\text{Expected Return} - \text{Risk Free Rate of Return}}{\text{Standard Deviation}}$$

Investment only in developed countries: $\frac{10 - 3}{16} = 0.437$

With inclusion of stocks of Economy A: $\frac{10.5 - 3}{15.56} = 0.482$

Portfolio Rebalancing

Question 56

Ms. Sunidhi is working with an MNC at Mumbai. She is well versant with the portfolio management techniques and wants to test one of the techniques on an equity fund she has constructed and compare the gains and losses from the technique with those from a passive buy and hold strategy. The fund consists of equities only and the ending NAVs of the fund she constructed for the last 10 months are given below:

Month Ending	NAV (₹/unit)	Month Ending	NAV (₹/unit)
December 2023	40.00	May 2024	37.00
January 2024	25.00	June 2024	42.00
February 2024	36.00	July 2024	43.00
March 2024	32.00	August 2024	50.00
April 2024	38.00	September 2024	52.00

Assume Sunidhi had invested a notional amount of ₹ 2 lakhs equally in the equity fund and a conservative portfolio (of bonds) in the beginning of December 2023 and the total portfolio was being rebalanced each time the NAV of the fund increased or decreased by 15%.

You are required to determine the value of the portfolio for each level of NAV following the Constant Ratio Plan.

Answer

Constant Ratio Plan:

Stock Portfolio NAV (₹)	Value of Conservative Portfolio (₹)	Value of aggressive Portfolio (₹)	Total value of Constant Ratio Plan (₹)	Revaluation Action	Total No. of units in aggressive portfolio
40.00	1,00,000	1,00,000	2,00,000	–	2,500
25.00	1,00,000	62,500	1,62,500	–	2,500
	81,250	81,250	1,62,500	Buy 750 units	3,250
36.00	81,250	1,17,000	1,98,250	–	3,250
	99,125	99,125	1,98,250	Sell 496.53 units	2,753.47
32.00	99,125	88,111.04	1,87,236.04	–	2,753.47
38.00	99,125	1,04,631.86	2,03,756.86	–	2,753.47
	1,01,878.43	1,01,878.43	2,03,756.86	Sell 72.46 units	2,681.01
37.00	1,01,878.50	99,197.37	2,01,075.87	–	2,681.01
42.00	1,01,878.50	1,12,602.42	2,14,480.92	–	2,681.01
43.00	1,01,878.50	1,15,283.43	2,17,161.93	–	2,681.01
50.00	1,01,878.50	1,34,050.50	2,35,929	–	2,681.01
	1,17,964.50	1,17,964.50	2,35,929	Sell 321.72 units	2,359.29

52.00	1,17,964.50	1,22,683.08	2,40,647.58	–	2,359.29

Hence, the ending value of the mechanical strategy is ₹ 2,40,647.58 and buy & hold strategy is ₹ 2,60,000.

Question 57

Indira has a fund of ₹ 3 lacs 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 present NIFTY is 5326. The minimum NIFTY within a month can at most be 4793.4. 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 1st day of rebalancing if NIFTY falls to 5122.96.

(3) 10 days further from the above date if the NIFTY touches 5539.04.

For the sake of simplicity, assume that the value of her equity component will change in tandem with that of the NIFTY and the risk free securities in which she is going to invest will have no Beta.

Answer

Maximum decline in one month = $\frac{5326 - 4793.40}{5326} \times 100 = 10\%$

(1) Immediately to start with

Investment in equity = Multiplier x (Portfolio value – Floor value)

= 2 (3,00,000 – 2,70,000) = ₹ 60,000

Indira may invest ₹ 60,000 in equity and balance in risk free securities.

(2) After 10 days

Value of equity = 60,000 x 5122.96/5326 = ₹ 57,713

Value of risk free investment = ₹ 2,40,000

Total value of portfolio = ₹ 2,97,713

Investment in equity = Multiplier x (Portfolio value – Floor value)

= 2 (2,97,713 – 2,70,000) = ₹ 55,426

Revised Portfolio:

Equity = ₹ 55,426

Risk free Securities = ₹ 2,97,713 – ₹ 55,426 = ₹ 2,42,287

(3) After another 10 days

Value of equity = 55,426 x 5539.04/5122.96 = ₹ 59,928

Value of risk free investment = ₹ 2,42,287

Total value of portfolio = ₹ 3,02,215

Investment in equity = Multiplier x (Portfolio value – Floor value)

= 2 (3,02,215 – 2,70,000) = ₹ 64,430

Revised Portfolio:

Equity = ₹ 64,430

Risk Free Securities = ₹ 3,02,215 – ₹ 64,430 = ₹ 2,37,785

The investor should off-load ₹ 4502 of risk free securities and divert to Equity.

Stock Lending Scheme (SLS)

Question 58

Mr. A is holding 1,000 shares of face value of ₹ 100 each of M/s. ABC Ltd. He wants to hold these shares for long term and have no intention to sell.

On 1st January 2023, M/s XYZ Ltd. has made short sales of M/s. ABC Ltd.'s shares and approached Mr. A to lend his shares under Stock Lending Scheme with following terms:

(i) Shares to be borrowed for 3 months from 01-01-2023 to 31-03-2023,

(ii) Lending Charges/Fees of 1% to be paid every month on the closing price of the stock quoted in Stock Exchange and

(iii) Bank Guarantee will be provided as collateral for the value as on 01-01-2023.

Other Information:

(a) Cost of Bank Guarantee is 8% per annum,

(b) On 28-02-2023 M/s. ABC Ltd., declared dividend of 25%,

(c) Closing Price of M/s. ABC Ltd.'s share quoted in Stock Exchange on various dates are as follows:

Date	Share Price in Scenario-1 Bullish	Share Price in Scenario-2 Bearish
01-01-2023	1,000	1,000
31-01-2023	1,020	980
28-02-2023	1,040	960
31-03-2023	1,050	940

You are required to find out:

(i) Earning of Mr. A through Stock Lending Scheme (Lending Charges) in both the scenarios,

(ii) Total Earnings of Mr. A during 01-01-2023 to 31-03-2023 in both the scenarios,

(iii) What is the Profit or loss to M/s. XYZ by shorting the shares using through Stock Lending Scheme in both the scenarios?

Note: Calculations to be done on per share basis and total basis both.

Answer

		Scenario 1	Scenario 2
(i)	**Earnings of Mr. A through stock lending scheme**		

	Lending fee		
	31-01-23 (1,020 x 1%) and (980 x 1%)	10.20	9.80
	28-02-23 (1,040 x 1%) and (960 x 1%)	10.40	9.60
	31-03-23 (1,050 x 1%) and (940 x 1%)	10.50	9.40
	Earnings from lending per Share (A)	31.10	28.80
	Total No. of Shares	1,000	1,000
	Total Earning from Lending	31,100	28,800
(ii)	**Total Earnings of Mr. A during 01-01-2023 to 31-01-2023**		
	Dividend income per Share (B)	25.00	25.00
	Total earnings per share (A) + (B)	56.10	53.80
	Total No. of Shares	1,000	1,000
	Total Earning	56,100	53,800
(iii)	**Profit or loss to M/s. XYZ**		
	Gain on shortening the shares (1,000 – 1,050) and (1,000 – 940)	(50.00)	60.00
	Lending fees paid	(31.10)	(28.80)
	Bank guarantee charges @ 8%	(20.00)	(20.00)
	Gain Per Share	(101.10)	11.20
	Total No. of Shares	1,000	1,000
	Total Gain/(Loss) on shortening the shares	(1,01,100)	11,200

Section B – Theory Questions

Question 1

Briefly explain the objectives of Portfolio Management.

Answer

Some of the important objectives of portfolio management are:

(i) **Security/Safety of Principal Amount:** Security not only involves keeping the principal sum intact but also its purchasing power.

(ii) **Stability of Income:** To facilitate planning more accurately and systematically the reinvestment or consumption of income.

(iii) **Capital Growth:** It can be attained by reinvesting in growth securities or through purchase of growth securities.

(iv) **Marketability** i.e. the case with which a security can be bought or sold: This is essential for providing flexibility to investment portfolio.

(v) **Liquidity** i.e. nearness to money: It is desirable for the investor so as to take advantage of attractive opportunities upcoming in the market.

(vi) **Diversification:** The basic objective of building a portfolio is to reduce the risk of loss of capital and/or income by investing in various types of securities and over a wide range of industries.

(vii) **Favourable Tax Status:** The effective yield an investor gets from his investment depends on tax to which it is subjected to. By minimising the tax burden, yield can be effectively improved.

Question 2

Discuss the Capital Asset Pricing Model (CAPM) and its relevant assumptions.

Answer

CAPM provides a conceptual **framework for evaluating any investment decision** where capital is committed with a goal of producing future returns.

CAPM is based on certain **assumptions** as follows:

(i) **Efficient market**

(ii) **Rational investment goals**

(iii) Risk aversion in efficient market is adhered to.

(iv) CAPM assumes that **all assets are** divisible and **liquid** assets.

(v) Investors are **able to borrow freely at a risk less rate of interest**.

(vi) Securities can be exchanged without any transaction cost.

(vii) Securities or capital assets face no bankruptcy or insolvency.

CAPM is developed with the main goal **to formulate the return required by investors** from a single investment or a portfolio of assets. The **required rate of return is** defined as the **minimum expected return** needed so that investors will purchase and hold an asset.

Question 3

Write short note on factors affecting decision of investment in fixed income securities.

Answer

The following factors have to be evaluated in selecting fixed income avenues:

(i) **Yield to maturity:** The yield to maturity for a fixed income avenue represent the rate of return earned by the investor, if he invests in the fixed income avenues and holds it till its maturity.

(ii) **Risk of Default:** To assess such risk on a bond, one has to look at the credit rating of the bond. If no credit rating is available relevant financial ratios of the firm have to be examined such as debt equity, interest coverage, earning power etc and the general prospect of the industry to which the firm belongs have to be assessed.

(iii) **Tax Shield:** In the past, several fixed income avenues offers tax shields but at present only a few of them do so.

(iv) **Liquidity:** If the fixed income avenues can be converted wholly or substantially into cash at a fairly short notice it possesses a liquidity of a high order.

CHAPTER - 7
Securitization

Section B – Theory Questions

Question 1

What are the features of Securitization?

OR

"The process of securitization can be viewed as process of creation of additional financial product of securities in the market backed by collaterals." What are the other features? Describe.

OR

Not only Bundling and Unbundling is only feature of Securitization, there are other features too of the same. Explain.

OR

"Securitization is the process of repackaging of illiquid assets into marketable securities". Explain.

Answer

The securitization has the following features:

(i) **Creation of Financial Instruments:** The process of securities can be viewed as process of creation of additional financial product of securities in market backed by collaterals.

(ii) **Bundling and Unbundling:** When all the assets are combined in one pool it is bundling and when these are broken into instruments of fixed denomination it is unbundling.

(iii) **Tool of Risk Management:** In case of assets are securitized on non-recourse basis, then securitization process acts as risk management as the risk of default is shifted.

(iv) **Structured Finance:** In the process of securitization, financial instruments are tailor structured to meet the risk return trade of profile of investor, and hence, these securitized instruments are considered as best examples of structured finance.

(v) **Trenching:** Portfolio of different receivable or loan or asset are split into several parts based on risk and return they carry called 'Trenche'. Each Trench carries different level of risk and return.

(vi) **Homogeneity:** Under each trenche the securities are issued of homogenous nature and even meant for small investors the who can afford to invest in small amounts.

Question 2

What are the benefits of Securitization?

OR

Explain the benefits of Securitization from the perspective of both originator as well as the investor.

OR

"Securitization is beneficial from the angle of various parties involved in it". Explain.

OR

Explain various benefits that accrues to an investor by investing money in the Securitized Instruments.

Answer

The benefits of securitization can be viewed from angle of various parties involved as follows:

A. **From the angle of originator:** Originator (entity which sells assets collectively to Special Purpose Vehicle) achieves the following benefits from securitization.

(i) **Off Balance Sheet Financing:** When loan/receivables are securitized it release a portion of capital tied up in these assets resulting in off Balance Sheet financing leading to improved liquidity position which helps expanding the business of the company.

(ii) **More specialization in main business:** By transferring the assets the entity could concentrate more on core business as servicing of loan is transferred to SPV. Further, in case of non-recourse arrangement even the burden of default is shifted.

(iii) **Helps to improve financial ratios:** Especially in case of Financial Institutions and Banks, it helps to manage Capital-To-Weighted Asset Ratio effectively.

(iv) **Reduced borrowing Cost:** Since securitized papers are rated due to credit enhancement even they can also be issued at reduced rate as of debts and hence the originator earns a spread, resulting in reduced cost of borrowings.

B. **From the angle of investor:** Following benefits accrues to the investors of securitized securities.

(i) **Diversification of Risk:** Purchase of securities backed by different types of assets provides the diversification of portfolio resulting in reduction of risk.

(ii) **Regulatory requirement:** Acquisition of asset backed belonging to a particular industry say micro industry helps banks to meet regulatory requirement of investment of fund in industry specific.

(iii) **Protection against default:** In case of recourse arrangement if there is any default by any third party then originator shall make good the least amount. Moreover, there can be insurance arrangement for compensation for any such default.

Question 3

Different Participants are required for the success of the securitization process. Discuss their roles.

OR

Distinguish between Primary participants and secondary participants in securitization.

OR

"Besides the primary participants other parties are also involved in process of Securitization." Explain.

Answer

Primary Participants: Primary Participants are main parties to this process. The primary participants in the process of securitization are as follows:

(i) **Originator**: It is the initiator of deal or can be termed as securitizer. It is an entity which sells the assets lying in its books and receives the funds generated through the sale of such assets.

(ii) **Special Purpose Vehicle**: Also, called SPV is created for the purpose of executing the deal. Since issuer originator transfers all rights in assets to SPV, it holds the legal title of these assets. It is created especially for the purpose of securitization only and normally could be in form of a

company, a firm, a society or a trust.

(iii) **The Investors**: Investors are the buyers of securitized papers which may be an individual, an institutional investor such as mutual funds, provident funds, insurance companies, mutual funds, Financial Institutions etc.

Secondary Participants

Besides, the primary participants, other parties involved into the securitization process are as follows:

(i) **Obligors**: Actually they are the main source of the whole securitization process. They are the parties who owe money to the firm and are assets in the Balance Sheet of Originator.

(ii) **Rating Agency**: Since the securitization is based on the pools of assets rather than the originators, the assets have to be assessed in terms of its credit quality and credit support available and that is where the credit rating agencies come.

(iii) **Receiving and Paying Agent (RPA)**: Also, called Servicer or Administrator, it collects the payment due from obligor(s) and passes it to SPV. It also follow up with defaulting borrower and if required initiate appropriate legal action against them.

(iv) **Agent or Trustee:** Trustees are appointed to oversee that all parties to the deal perform in the true spirit of terms of agreement. Normally, it takes care of interest of investors who acquires the securities.

(v) **Credit Enhancer:** Since investors in securitized instruments are directly exposed to performance of the underlying and sometime may have limited or no recourse to the originator, they seek additional comfort in the form of credit enhancement. In other words, they require credit rating of issued securities which also empowers marketability of the securities.

Originator itself or a third party say a bank may provide an additional comfort called Credit Enhancer. While originator provides his comfort in the form of over collateralization or cash collateral, the third party provides it in form of letter of credit or surety bonds.

(vi) **Structurer:** It brings together the originator, investors, credit enhancers and other parties to the deal of securitization. Normally, these are investment bankers also called arranger of the deal. It ensures that deal meets all legal, regulatory, accounting and tax laws requirements.

Question 4

Discuss briefly the steps in securitization mechanism.

Answer

The various steps in securitization mechanism are discussed as below:

(i) **Creation of Pool of Assets**

Process of securitization begins with creation of pool of assets by segregation of assets backed by similar type of mortgages in terms of interest rate, risk, maturity and concentration units.

(ii) **Transfer to SPV**

Once assets have been pooled, they are transferred to Special Purpose Vehicle (SPV) especially created for this purpose.

(iii) **Sale of Securitized Papers**

SPV designs the instruments based on nature of interest, risk, tenure etc. based on pool of assets. These instruments can be Pass Through Security or Pay Through Certificates.

(iv) Administration of assets

The administration of assets in subcontracted back to originator which collects principal and interest from underlying assets and transfer it to SPV, which works as a conduct.

(v) Recourse to Originator

Performance of securitized papers depends on the performance of underlying assets and unless specified in case of default they go back to originator from SPV.

(vi) Repayment of funds

SPV will repay the funds in form of interest and principal that arises from the assets pooled.

(vii) Credit Rating to Instruments

Sometime before sale of securitized instruments, credit rating can be done to assess risk of issuer.

Question 5

State the main problems faced in Securitization in India?

OR

State the problems faced in growth of securitization instruments in Indian context.

OR

List out the reasons for dismal growth of Securitization of instruments in India.

OR

"Though in recent period of time the concept of securitization has become popular in India as a source of Off Balance Sheet source of financing but its level of growth is still far behind". Explain.

Answer

Following are main problems faced in growth of Securitization of instruments in Indian context:

(i) Stamp Duty: Stamp Duty is one of the obstacles in India. Under Transfer of Property Act, 1882, a mortgage debt stamp duty which even goes upto 12% in some states of India and this impeded the growth of securitization in India. It should be noted that since pass through certificate does not evidence any debt only able to receivable, they are exempted from stamp duty.

Moreover, in India, recognizing the special nature of securitized instruments in some states has reduced the stamp duty on them.

(ii) Taxation: Taxation is another area of concern in India. In the absence of any specific provision relating to securitized instruments in Income Tax Act, experts' opinion differs a lot. Some are of opinion that SPV as a trustee is liable to be taxed in a representative capacity. While, others are of view that instead of SPV, investors will be taxed on their share of income. Clarity is also required on the issues of capital gain implications on passing payments to the investors.

(iii) Accounting: Accounting and reporting of securitized assets in the books of originator is another area of concern. Although securitization is slated to an off -balance sheet instrument but in true sense receivables are removed from originator's balance sheet. Problem arises especially when

assets are transferred without recourse.

(iv) **Lack of standardization:** Every originator following his own format for documentation and administration having lack of standardization is another obstacle in the growth of securitization.

(v) **Inadequate Debt Market:** Lack of existence of a well-developed debt market in India is another obstacle that hinders the growth of secondary market of securitized or asset backed securities.

(vi) **Ineffective Foreclosure laws:** For many years efforts are on for effective foreclosure but still foreclosure laws are not supportive to lending institutions and this makes securitized instruments especially mortgaged backed securities less attractive as lenders face difficulty in transfer of property in event of default by the borrower.

Question 6

Differentiate between Pay Through Securities (PTS) and Pass Through Certificates (PTCs).

OR

Explain briefly the various types of securitized instruments.

OR

Explain briefly Securitization instruments.

Answer

On the basis of different maturity characteristics, the securitized instruments can be divided into following three categories:

(i) **Pass Through Certificates (PTCs):**

In case of PTCs, the **originator transfers the entire receipt of cash** in the form of interest or principal repayment from the asset sold. Thus, **PTC represent a direct claim of the investors on all assets securitized**. Investors carry a proportional benefit. Skewness of cash flow occurs at an early stage in case of prepayment of principals.

(ii) **Pay Through Security (PTS):**

In PTS, **SPV debt securities are backed by the assets** and hence it can restructure different tranches from varying maturities of receivables. PTS also **permits the SPV to reinvest surplus funds for short term** as per there requirement.

(iii) **Stripped Securities:**

Stripped Securities are created by dividing the cash flows associated with underlying securities **into two or more new securities**. Those two securities are as follows:

(a) **Interest Only (IO) Securities**

(b) **Principle Only (PO) Securities**

Accordingly, **holder of IO securities receives only interest while PO security holder receives only principal**. Being highly volatile in nature these securities are less preferred by investors.

In case **yield to maturity in market rises, PO price tends to fall** as borrower prefers to postpone the payment on cheaper loans. In contrast, **value of IO's securities increases when interest rate goes up** in the market as more interest is calculated on borrowings.

Question 7

'Pay through securities' are in the nature of participation certificates that enable the investors to take a direct exposure on the performance of the securitized assets. 'Pass Through Certificates', on the other hand, gives investors only a charge against the securitized assets. Do you agree with the statement? Justify your stand.

Answer

Not agreed with the statement.

Pass Through Certificates (PTCs)

In case of PTCs, the originator transfers the entire receipt of cash in the form of interest or principal repayment from the asset sold. Thus, PTC represent a direct claim of the investors on all assets securitized. Investors carry a proportional benefit. Skewness of cash flow occurs at an early stage in case of prepayment of principals.

Pay Through Securities (PTS)

In PTS, SPV debt securities are backed by the assets and hence it can restructure different tranches from varying maturities of receivables. PTS also permits the SPV to reinvest surplus funds for short term as per there requirement.

Question 8

Explain the pricing of the securitized Instruments.

OR

"While pricing the securitized instruments, it is important that it should be acceptable to both originators as well as to the investors". Explain.

Answer

Pricing of the securitized Instruments

Pricing of securitized instruments is important aspect of securitization. While pricing the instruments, it is important that **it should be acceptable to both originators as well as to the investors**. On the same basis, **pricing of securities can be divided into following two categories**:

From Originator's Angle

From originator's point of view, the instruments can be **priced at a rate at which originator has to incur an outflow** and if that outflow can be amortized over a period of time by investing the amount raised through securitization.

From Investor's Angle

From an investor's angle, security **price can be determined by discounting best estimate of expected future cash flows using rate of yield to maturity** of a comparable security with respect to credit quality and average life of the securities. This yield can also be estimated by referring the yield curve available for marketable securities, though some adjustments is needed on account of spread points, because of credit quality of the securitized instruments.

CHAPTER - 8
Mutual Funds

Section A – Practical Questions

Net Asset Value of Mutual Fund

Question 1

Cinderella Mutual Fund has following assets in Scheme Rudolf at close of business on 31st March, 2025

Company	No. of Shares	Market Price Per Share
Nairobi Ltd.	25,000	₹ 20
Dakar Ltd.	35,000	₹ 300
Senegal Ltd.	29,000	₹ 380
Cairo Ltd.	40,000	₹ 500

The total number of units of Scheme Rudolf are 10 lacs. The Scheme Rudolf has accrued expenses of ₹ 2,50,000 and other liabilities of ₹ 2,00,000. Calculate the NAV per unit of the Scheme Rudolf.

Answer

Shares	No. of shares	Price	Amount (₹)
Nairobi Ltd.	25,000	20.00	5,00,000
Dakar Ltd.	35,000	300.00	1,05,00,000
Senegal Ltd.	29,000	380.00	1,10,20,000
Cairo Ltd.	40,000	500.00	2,00,00,000
			4,20,20,000
Less: Accrued Expenses			2,50,000
Other Liabilities			2,00,000
Total Value			4,15,70,000
No. of Units			10,00,000
NAV per Unit (4,15,70,000/10,00,000)			41.57

Question 2

A Mutual Fund Co. has the following assets under it on the close of business as on:

Company	No. of Shares	1st February 2025 Market price per share (₹)	2nd February 2025 Market price per share (₹)
L Ltd	20,000	20.00	20.50
M Ltd	30,000	312.40	360.00
N Ltd	20,000	361.20	383.10

P Ltd	60,000	505.10	503.90

Total No. of Units = 6,00,000

(i) Calculate Net Assets Value (NAV) of the Fund as on 1st February 2025.

(ii) Following information is given:

Assuming that on 1st February 2025, Mr. A, submits a cheque of ₹ 30,00,000 to the Mutual Fund and the Fund manager of this company purchases 8,000 shares of M Ltd; and the balance amount is held in Bank. In such a case, what would be the position of the Fund?

(iii) Find new NAV of the Fund as on 2nd February 2025.

Note: Round off units to whole number and NAV upto 4 decimal points.

Answer

(i) NAV of the Fund

$$= \frac{₹\ 4,00,000 + ₹\ 93,72,000 + ₹\ 72,24,000 + ₹\ 3,03,06,000}{6,00,000}$$

$$= \frac{₹\ 4,73,02,000}{6,00,000} = ₹\ 78.8366$$

(ii) The revised position of fund shall be as follows:

Shares	No. of shares	Price	Amount (₹)
L Ltd.	20,000	20.00	4,00,000
M Ltd.	38,000	312.40	1,18,71,200
N Ltd.	20,000	361.20	72,24,000
P Ltd.	60,000	505.10	3,03,06,000
Cash [30,00,000 – 8,000 x 312.40]			5,00,800
			5,03,02,000

No. of units of fund = $6,00,000 + \frac{30,00,000}{78.8366} = 6,38,053$

(iii) On 2nd February 2025, the NAV of fund will be as follows:

Shares	No. of shares	Price	Amount (₹)
L Ltd.	20,000	20.50	4,10,000
M Ltd.	38,000	360.00	1,36,80,000
N Ltd.	20,000	383.10	76,62,000
P Ltd.	60,000	503.90	3,02,34,000
Cash			5,00,800
			5,24,86,800

NAV as on 2nd February 2025 = $\frac{₹\ 5,24,86,800}{6,38,053}$ = ₹ 82.2609 per unit

Question 3

On 1st April 2025, Fair Return Mutual Fund has the following assets and prices at 4.00 p.m.

Shares	No. of Shares	Market Price Per Share (₹)
A Ltd.	10,000	19.70
B Ltd.	50,000	482.60
C Ltd.	10,000	264.40
D Ltd.	1,00,000	674.90
E Ltd.	30,000	25.90
No. of units of funds		8,00,000

Please calculate:

(a) NAV of the Fund on 1st April 2025.

(b) Assuming that on 1st April 2025, Mr. X, a HNI, send a cheque of ₹ 50,00,000 to the Fund and Fund Manager immediately purchases 18,000 shares of C Ltd. and balance is held in bank. Then what will be position of fund.

(c) Now suppose on 2nd April 2025 at 4.00 p.m. the market price of shares is as follows:

Shares	₹
A Ltd.	20.30
B Ltd.	513.70
C Ltd.	290.80
D Ltd.	671.90
E Ltd.	44.20

Then what will be new NAV.

Note: Round off units to whole number and NAV upto 4 decimal points.

Answer

(a) NAV of the Fund:

$$= \frac{₹\ 1,97,000 + ₹\ 2,41,30,000 + ₹\ 26,44,000 + ₹\ 6,74,90,000 + ₹\ 7,77,000}{8,00,000}$$

$$= \frac{₹\ 9,52,38,000}{8,00,000} = ₹\ 119.0475$$

(b) The revised position of fund shall be as follows:

Shares	No. of shares	Price	Amount (₹)
A Ltd.	10,000	19.70	1,97,000
B Ltd.	50,000	482.60	2,41,30,000
C Ltd.	28,000	264.40	74,03,200
D Ltd.	1,00,000	674.90	674,90,000

E Ltd.	30,000	25.90	7,77,000
Cash			2,40,800
			10,02,38,000

No. of units of fund = 8,00,000 + $\frac{50,00,000}{119.0475}$ = 8,42,000

(c) On 2nd April 2025, the NAV of fund will be as follows:

Shares	No. of shares	Price	Amount (₹)
A Ltd.	10,000	20.30	2,03,000
B Ltd.	50,000	513.70	2,56,85,000
C Ltd.	28,000	290.80	81,42,400
D Ltd.	1,00,000	671.90	6,71,90,000
E Ltd.	30,000	44.20	13,26,000
Cash			2,40,800
			10,27,87,200

NAV as on 2nd April 2025 = $\frac{₹\ 10,27,87,200}{8,42,000}$ = ₹ 122.075 per unit

Question 4

A mutual fund made an issue of 10,00,000 units of ₹ 10 each on January 01, 2025. No entry load was charged. It made the following investments:

Particulars	₹
50,000 Equity shares of ₹ 100 each @ ₹ 160	80,00,000
7% Government Securities	8,00,000
9% Debentures (Unlisted)	5,00,000
10% Debentures (Listed)	5,00,000
	98,00,000

During the year, dividends of ₹ 12,00,000 were received on equity shares. Interest on all types of debt securities was received as and when due. At the end of the year equity shares and 10% debentures are quoted at 175% and 90% respectively of face value. Other investments are at par.

Find out the Net Asset Value (NAV) per unit given that operating expenses paid during the year amounted to ₹ 5,00,000. Also find out the NAV, if the Mutual fund had distributed a dividend of ₹ 0.80 per unit during the year to the unit holders.

Answer

In order to find out the NAV, the cash balance at the end of the year is calculated as follows

Particulars	₹

Cash balance in the beginning (₹ 100 lakhs – ₹ 98 lakhs)	2,00,000
Dividend Received	12,00,000
Interest on 7% Govt. Securities	56,000
Interest on 9% Debentures	45,000
Interest on 10% Debentures	50,000
	15,51,000
(–) Operating expenses	5,00,000
Net cash balance at the end	10,51,000
Calculation of NAV	₹
Cash Balance	10,51,000
7% Govt. Securities (at par)	8,00,000
50,000 equity shares @ ₹ 175 each	87,50,000
9% Debentures (Unlisted) at cost	5,00,000
10% Debentures @ 90%	4,50,000
Total Assets	1,15,51000
No. of Units	10,00,000
NAV per Unit	₹ 11.55

Calculation of NAV, if dividend of ₹ 0.80 is paid:

Net Assets (₹ 1,15,51,000 – ₹ 8,00,000)	₹ 1,07,51,000
No. of Units	10,00,000
NAV per unit	₹ 10.75

Question 5

A mutual fund made an issue of New Fund Offer (NFO) on 01/01/2025 of 10.00 Lakh Units of ₹ 10 each. No entry load was charged. It made the following investments:

Particulars	**(₹)**
25,000 Equity Shares of XYZ Ltd., ₹ 100 each @ ₹ 320	80,00,000
5% Government Securities	4,00,000
10% NCDs Unlisted	5,00,000
8% Listed Debentures	10,00,000
	99,00,000

During the year, dividends of ₹ 8.00 lakhs were received on equity shares. Interest on all types of debt securities were received. On 31st December 2025 equity shares were appreciated by 15% while listed debentures were quoted at 20% premium.

XYZ Ltd., on 15th December 2025 in its AGM paid the interim dividend of 10% and bonus shares at 1:10 with the record date of 28th December 2025.

(i) Find out the NAV per unit as on 31st December 2025 given that the operating expenses paid during the year amounting to ₹ 3,00,000.

(ii) Find out the NAV, if the MF had distributed a dividend of, ₹ 0.50 per unit during the year to the investors.

(iii) If you are the investor, find out what is the annualised return you have got in (ii) case.

Answer

(i) In order to find out the NAV, the cash balance at the end of the year is calculated as follows

Particulars	₹
Cash balance in the beginning (₹ 100 lakhs – ₹ 99 lakhs)	1,00,000
Dividend Received	8,00,000
Interest on 5% Govt. Securities	20,000
Interest on 10% NCDs	50,000
Interest on 8% Debentures	80,000
Interim Dividend	2,50,000
	13,00,000
(–) Operating expenses	3,00,000
Net cash balance at the end	10,00,000
Calculation of NAV	₹
Cash Balance	10,00,000
5% Govt. Securities (at par)	4,00,000
27,500 equity shares @ ₹ 368 each	1,01,20,000
10% NCDs (Unlisted) at cost	5,00,000
8% Debentures @ 120%	12,00,000
Total Assets	1,32,20,000
No. of Units	10,00,000
NAV per Unit	₹ 13.22

(ii) Calculation of NAV, if dividend of ₹ 0.50 is paid

Net Assets (₹ 1,32,20,000 – ₹ 5,00,000)	₹ 1,27,20,000
No. of Units	10,00,000
NAV per unit	₹ 12.72

(iii) Annualised Return

$$= \frac{[12.72 - 10.00] + 0.50}{10.00} \times 100$$

= 32.20%

Question 6

On 1-4-2025 ABC Mutual Fund issued 20 lakh units at ₹ 10 per unit. Relevant initial expenses involved were ₹ 12 lakhs. It invested the fund so raised in capital market instruments to build a portfolio of ₹ 185 lakhs. During the month of April 2025, it disposed off some of the instruments costing ₹ 60 lakhs for ₹ 63 lakhs and used the proceeds in purchasing securities for ₹ 56 lakhs. Fund management expenses for the month of April 2025 was ₹ 8 lakhs of which 10% was in arrears. In April 2025 the fund received dividends amounting to ₹ 2 lakhs and it distributed 80% of the realized earnings. On 30-4-2025 the market value of the portfolio was ₹ 198 lakhs.

Mr. Akash, an investor, subscribed to 100 units on 1-4-2025 and disposed off the same at closing NAV on 30-4-2025. What was his annual rate of earning?

Note: Calculate figure in lakh upto 2 decimal points.

Answer

Particulars	**Amount in ₹ lakhs**	**Amount in ₹ lakhs**	**Amount in ₹ lakhs**
Opening Bank (200 – 185 – 12)	3.00		
Add: Proceeds from sale of securities	63.00		
Add: Dividend received	2.00	68.00	
Less: Cost of securities purchased	56.00		
Less: Fund management expenses paid (90% of 8)	7.20		
Less: Capital gains distributed [80% of (63 – 60)]	2.40		
Less: Dividend distributed [80% of 2.00]	1.60	(67.20)	
Closing Bank			0.80
Closing market value of portfolio			198.00
			198.80
Less: Arrears of expenses (10% of 8)			0.80
Closing Net Assets			198.00
Number of units (Lakhs)			20
Closing NAV per unit (198.00/20)			9.90

Rate of Earning (Per Unit)

Particulars	**Amount**
Income received [(₹ 2.40 + ₹ 1.60)/20]	₹ 0.20
Loss: Loss on disposal [(₹ 200 – ₹ 198)/20]	₹ 0.10
Net earning	₹ 0.10
Initial investment	₹ 10.00
Rate of earning (monthly)	1%
Rate of earning (Annual)	12%

Question 7

Based on the following data, determine the NAV on per unit basis of a regular income scheme on per unit basis:

Particulars	₹ Crores
Listed shares at Cost (ex-dividend)	20
Cash in hand	1.23
Bonds and debentures at cost	4.3
Of these, bonds not listed and quoted	1
Other fixed interest securities at cost	4.5
Dividend accrued	0.8
Amount payable on shares	6.32
Expenditure accrued	0.75
Number of units	20 lacs
Current realizable value of fixed income securities of face value of ₹ 100	106.5
The listed shares were purchased when Index was	1,000
Present index is	2,300
Value of listed bonds and debentures at NAV date	8

There has been a diminution of 20% in unlisted bonds and debentures. Other fixed interest securities are valued at cost.

Note: Calculate figure in crore upto 2 decimal points.

Answer

Particulars		₹ crores
Equity Shares		46.00
Cash in hand		1.23
Bonds and debentures not listed		0.80
Bonds and debentures listed		8.00
Dividends accrued		0.80
Fixed income securities		4.50
Sub total assets	**(A)**	**61.33**
Amount payable on shares		6.32
Expenditure accrued		0.75
Sub total liabilities	**(B)**	**7.07**
Net Assets Value	**(A) – (B)**	**54.26**
No. of units		20,00,000
Net Assets Value per unit (₹ 54.26 crore/20,00,000)		₹ 271.30

Question 8

The following particulars relating to S Fund Schemes:

Particulars	Value ₹ in Crores
1. Investment in Shares (at cost)	
a. Pharmaceuticals companies	158
b. Construction Industries	62
c. Service Sector Companies	112
d. IT Companies	68
e. Real Estate Companies	20
2. Investment in Bonds (Fixed Income)	
a. Listed Bonds (16,000, 14% Bonds of ₹ 15,000 each)	24
b. Unlisted Bonds	14
3. No. of Units outstanding (crores)	8.4
4. Expenses Payable	7
5. Cash and Cash equivalents	3
6. Market expectations on listed bonds	8.842%

The fund has incurred the following expenses:

Consultancy and Management fees	₹ 520 Lakhs
Office Expenses	₹ 180 Lakhs
Advertisement Expenses	₹ 48 Lakhs

Particulars relating to each sector are as follows:

Sector	Index on Purchase date	Index on Valuation date
Pharmaceutical companies	300	500
Construction Industries	275	490
Service Sector Companies	285	500
IT Companies	270	515
Real Estate Companies	265	440

Required:

(i) Calculate the Net Asset of the fund.

(ii) Calculate the Net Asset Value per unit.

(iii) Determine the Net return (Annualised), if the period of consideration is 4 years, and the fund has distributed ₹ 2 per unit per year as cash dividend during the same period.

Note: Calculate figure in crore upto 3 decimal points and NAV upto 2 decimal points.

Answer

(i) Calculation of NAV of the Fund

Particulars		(in ₹ Crore)
1. Value of Shares		
a. Pharmaceuticals companies	158 x 500/300	263.333
b. Construction Industries	62 x 490/275	110.473
c. Service Sector Companies	112 x 500/285	196.491
d. IT Companies	68 x 515/270	129.704
e. Real Estate Companies	20 x 440/265	33.208
2. Investment in Bonds		
a. Listed Bonds	(24 x 14%)/8.842%	38.000
b. Unlisted Bonds		14.000
3. Cash and Cash equivalents		3.000
		788.209
Less: Expense Payable		7.000
Net Asset of the Fund		**781.209**

(ii) NAV of the Fund Per Unit

NAV of the Fund	₹ 781.209 crore
Number of Units	8.40 crore
NAV Per Unit (₹ 781.209 crore/8.40 crore)	₹ 93.00

(iii) Net Return

Initial NAV Per Unit		
Investment in Shares	₹ 420 crore	
Bonds	₹ 38 crore	₹ 458 crore
Number of Units		8.40 crore
Initial NAV Per Unit		₹ 54.52
Return		
Capital Gain	(₹ 93.00 – ₹ 54.52)	₹ 38.48
Dividend	₹ 2 x 4 years	₹ 8.00
		₹ 46.48
Annualised Return	$\frac{46.48}{54.52} \times \frac{1}{4}$	21.31%

Question 9

There are two Mutual Funds viz. D Mutual Fund Ltd. and K Mutual Fund Ltd. Each having close ended equity schemes.

NAV as on 31-12-2025 of equity schemes of D Mutual Fund Ltd. is ₹ 70.71 (consisting 99% equity and

remaining cash balance) and that of K Mutual Fund Ltd. is 62.50 (consisting 96% equity and balance in cash).

Following is the other information:

Particular	Equity Schemes	
	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Sharpe Ratio	2	3.3
Treynor Ratio	15	15
Standard deviation	11.25	5

There is no change in portfolios during the next month and annual average cost is ₹ 3 per unit for the schemes of both the Mutual Funds.

If Share Market goes down by 5% within a month, calculate expected NAV after a month for the schemes of both the Mutual Funds.

For calculation, consider 12 months in a year and ignore number of days for particular month.

Answer

Working Notes:

(i) Decomposition of Funds in Equity and Cash Components

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
NAV on 31.12.25	₹ 70.71	₹ 62.50
% of Equity	99%	96%
Equity element in NAV	₹ 70	₹ 60
Cash element in NAV	₹ 0.71	₹ 2.50

(ii) Calculation of Beta

(a) D Mutual Fund Ltd.

$$\text{Sharpe Ratio} = 2 = \frac{E(R) - R_f}{\sigma_D} = \frac{E(R) - R_f}{11.25}$$

$E(R) - R_f = 22.50$

$$\text{Treynor Ratio} = 15 = \frac{E(R) - R_f}{\beta_D} = \frac{22.50}{\beta_D}$$

$\beta_D = 22.50/15 = 1.50$

(b) K Mutual Fund Ltd.

$$\text{Sharpe Ratio} = 3.3 = \frac{E(R) - R_f}{\sigma_K} = \frac{E(R) - R_f}{5}$$

$E(R) - R_f = 16.50$

$$\text{Treynor Ratio} = 15 = \frac{E(R) - R_f}{\beta_K} = \frac{16.50}{\beta_K}$$

$\beta_K = 16.50/15 = 1.10$

(iii) Decrease in the Value of Equity

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Market goes down by	5.00%	5.00%
Beta	1.50	1.10
Equity component goes down	7.50%	5.50%

(iv) Balance of Cash after 1 month

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Cash in hand on 31.12.25	₹ 0.71	₹ 2.50
Less: Expense per month	₹ 0.25	₹ 0.25
Balance after 1 month	₹ 0.46	₹ 2.25

NAV after 1 month

	D Mutual Fund Ltd.	K Mutual Fund Ltd.
Value of Equity after 1 month		
70 x (1 – 0.075)	₹ 64.75	–
60 x (1 – 0.055)	–	₹ 56.70
Cash Balance	0.46	2.25
	65.21	58.95

Question 10

The unit price (NAV) of Equity Linked Savings Scheme (ELSS) of a mutual fund is ₹ 10. The public offer price (POP) of the unit is ₹ 10.204 and the redemption price is ₹ 9.80. Calculate:

(i) Front-end Load (in %)

(ii) Back-end Load (in %)

Answer

(i) Frond End Load = $\frac{10.204 - 10.00}{10.00}$ = 0.0204 or 2.04%

(ii) Back-end Load = $\frac{10.00 - 9.80}{10.00}$ = 0.020 or 2.00%

Question 11

On 1st April, an open ended scheme of mutual fund had 300 lakh units outstanding with Net Assets Value (NAV) of ₹ 18.75. At the end of April, it issued 6 lakh units at opening NAV plus 2% load, adjusted for dividend equalization. At the end of May, 3 Lakh units were repurchased at opening NAV less 2% exit load adjusted for dividend equalization. At the end of June, 70% of its available income was distributed.

In respect of April-June quarter, the following additional information are available:

	₹ in lakh
Portfolio value appreciation	425.47
Income of April	22.950
Income for May	34.425
Income for June	45.450

You are required to calculate

(i) Income available for distribution;

(ii) Issue price at the end of April;

(iii) repurchase price at the end of May; and

(iv) net asset value (NAV) as on 30th June.

Note: Calculate figure in lakh upto 4 decimal points.

Answer

(i) Calculation of Income available for Distribution

	Units (Lakh)	Per Unit (₹)	Total (₹ in lakh)
Income from April	300	0.0765	22.9500
Add: Dividend equalization collected on issue	6	0.0765	0.4590
	306	0.0765	23.4090
Add: Income from May		0.1125	34.4250
	306	0.1890	57.8340
Less: Dividend equalization paid on repurchase	(3)	0.1890	(0.5670)
	303	0.1890	57.2670
Add: Income from June		0.1500	45.4500
	303	0.3390	102.7170
Less: Dividend Paid		0.2373	(71.9019)
	303	0.1017	30.8151

(ii) Calculation of Issue Price at the end of April

	₹
Opening NAV	18.750
Add: Entry Load 2% of ₹ 18.750	0.375
	19.125
Add: Dividend equalization collected on issue	0.0765
	19.2015

(iii) Calculation of Repurchase Price at the end of May

	₹
Opening NAV	18.750
Less: Exit Load 2% of ₹ 18.750	(0.375)
	18.375
Add: Dividend equalization paid on repurchase	0.1890
	18.564

(iv) Closing NAV

		₹ in lakh
Opening Net Asset Value (₹ 18.75 x 300)		5,625.0000
Portfolio Value Appreciation		425.4700
Issue of Fresh Units (6 x 19.2015)		115.2090
Income Received (22.950 + 34.425 + 45.450)		102.8250
		6,268.504
Less: Units repurchased (3 x 18.564)	55.692	
Income Distributed	71.9019	(127.5939)
Closing Net Asset Value		6,140.9101
Closing Units (300 + 6 – 3) lakh		303 lakh
∴ Closing NAV as on 30th June		₹ 20.2670

Question 12

The Asset Management Company of the mutual fund (MF) has declared a dividend of 9.98% on the units under the dividend reinvestment plan for the year ended 31st March, 2025. The investors are issued additional units for the dividend at the rate of closing Net Asset Value (NAV) for the year as per the conditions of the scheme.

The closing NAV was ₹ 24.95 as on 31st March, 2025. An investor Mr. X who is having 20,800 units at the year-end has made an investment in the units before the declaration of the dividend and at the rate of opening NAV plus an entry load of ₹ 0.04. The NAV has appreciated by 25% during the year.

Assume the face value of the unit as ₹ 10.00.

Calculate:

(1) Opening NAV

(2) Number of the units purchased

(3) Original amount of the investment

Answer

(1) Let N be the opening NAV, then

N (1 + 0.25) = ₹ 24.95

N = ₹ 19.96

i.e., beginning NAV = ₹ 19.96

(2) Let X be the number of units purchased

Then ending units = 20,800

Accordingly,

$$20,800 = X + \frac{0.998X}{24.95}$$

$$20,800 = \frac{24.95X + 0.998X}{24.95}$$

X = 20,000

Thus, number of units purchased = 20,000

(3) Original amount of investment

Initial NAV	₹ 19.96
Entry Load	₹ 0.04
	₹ 20.00
Number of funds purchased	20,000
Amount of investment	₹ 4,00,000

Return from Mutual Fund under Dividend Payout Plan

Question 13

A mutual fund that had a net asset value of ₹ 20 at the beginning of month – made income and capital gain distribution of ₹ 0.0375 and ₹ 0.03 per unit respectively during the month, and then ended the month with a net asset value of ₹ 20.06. Calculate monthly return and annualised return.

Answer

Calculation of Monthly Return on the Mutual Funds

$$r = \frac{(NAV_t - NAV_{t-1}) + I_t + G_t}{NAV_{t-1}}$$

Where,

r = Return on the mutual fund

NAV_t = Net assets value at time period t

NAV_{t-1} = Net assets value at time period t-1

I_t = Income at time period t

G_t = Capital gain distribution at time period t

$$r = \frac{(₹\ 20.06 - ₹\ 20.00) + (₹\ 0.0375 + ₹\ 0.03)}{20}$$

$$r = \frac{0.06 + 0.0675}{20}$$

$$r = \frac{0.1275}{20} = 0.006375$$

r = 0.6375% p.m.

Or, r = 7.65% p.a.

Question 14

The following information is extracted from Steady Mutual Fund's Scheme:

- Net Asset Value at the beginning of the month = ₹ 65.78
- Annualised return = 15 %
- Distributions made in the nature of Income & Capital gain (per unit respectively) = ₹ 0.50 and ₹ 0.32

You are required to:

(i) Calculate month end net asset value of mutual fund scheme (limit your answers to 2 decimals).

(ii) Provide a brief comment on the month end NAV.

Answer

(i) Calculation of NAV at the end of month:

Given Annual Return = 15%

Hence Monthly Return = 1.25% (r)

$$r = \frac{(NAV_t - NAV_{t-1}) + I_t + G_t}{NAV_{t-1}}$$

$$0.0125 = \frac{(NAV_t - ₹\ 65.78) + ₹\ 0.50 + ₹\ 0.32}{₹\ 65.78}$$

$0.82 = NAV_t - ₹\ 64.96$

$NAV_t = ₹\ 65.78$

(ii) There is no change in NAV.

Question 15

A has invested in three Mutual Fund Schemes as per details below:

Particulars	MF A	MF B	MF C
Date of investment	01.12.2024	01.01.2025	01.03.2025
Amount of investment	₹ 50,000	₹ 1,00,000	₹ 50,000
Net Asset Value (NAV) at entry date	₹ 10.50	₹ 10	₹ 10

Dividend received upto 31.03.2025	₹ 950	₹ 1,500	Nil
NAV as at 31.03.2025	₹ 10.40	₹ 10.10	₹ 9.80

Required:

What is the effective yield on per annum basis in respect of each of the three schemes to Mr. A upto 31.03.2025, taking the year consisting of 365 days?

(Calculation should be upto three decimal places)

Answer

Scheme	Investment (₹)	Unit Nos. [Investment/NAV at entry date]	NAV as on 31.3.2025 (₹)	Total NAV as on 31.3.2025 [Unit Nos. x NAV as on 31.3.2025] (₹)
MF A	50,000	4,761.905	10.40	49,523.812
MF B	1,00,000	10,000	10.10	1,01,000
MF C	50,000	5,000	9.80	49,000

Scheme	Change in NAV [NAV on 31.3.2025 – Investment] (₹)	Dividend Received (₹)	Total Yield [Change in NAV + Dividend] (₹)	Number of days	Effective Yield (% p.a.) [(Total Yield/Investment) x (365/No. of days) x 100]
MF A	(–) 476.188	950	473.812	121	2.858%
MF B	(+) 1,000	1,500	2,500	90	10.139%
MF C	(–) 1,000	Nil	(–) 1,000	31	(–) 23.548%

Question 16

Mr. Sinha has invested in three Mutual fund schemes as per details below:

	Scheme X	Scheme Y	Scheme Z
Date of Investment	01.12.2024	01.01.2025	01.03.2025
Amount of Investment	₹ 5,00,000	₹ 1,00,000	₹ 50,000
Net Asset Value at entry date	₹ 10.50	₹ 10.00	₹ 10.00
Dividend received upto 31.03.2025	₹ 9,500	₹ 1,500	Nil
NAV as at 31.3.2025	₹ 10.40	₹ 10.10	₹ 9.80

You are required to calculate the effective yield on per annum basis in respect of each of the three schemes to Mr. Sinha upto 31.03.2025, taking the year consisting of 365 days.

Provide a brief comment on the course of action he should take for future period.

(Calculation should be upto three decimal places).

Answer

Calculation of effective yield on per annum basis in respect of three mutual fund schemes to Mr. Sinha up to 31-03-2025:

Particulars		MF X	MF Y	MF Z
(a) Investments		₹ 5,00,000	₹ 1,00,000	₹ 50,000
(b) Opening NAV		₹ 10.50	₹ 10.00	₹ 10.00
(c) No. of units	(a/b)	47,619.05	10,000	5,000
(d) Unit NAV on 31-3-2025		₹ 10.40	₹ 10.10	₹ 9.80
(e) Total NAV on 31-3-2025	(c x d)	₹ 4,95,238.12	₹ 1,01,000	₹ 49,000
(f) Increase/Decrease of NAV	(e – a)	(₹ 4,761.88)	₹ 1,000	(₹ 1,000)
(g) Dividend Received		₹ 9,500	₹ 1,500	Nil
(h) Total yield	(f + g)	₹ 4,738.12	₹ 2,500	(₹ 1,000)
(i) Number of Days		121	90	31
(j) Effective yield p.a.	(h/a x 365/i x 100)	2.858%	10.139%	(–) 23.548%

Comments: Since the Effective Yield in Scheme Z is negative and that of Scheme X is much lower than Scheme Y, it is advised that Mr. Sinha should redeem the investments in Scheme X and Scheme Z and the proceeds should be invested in Scheme Y in the next period.

Question 17

Mr. Y has invested in the three mutual funds (MF) as per the following details:

Particulars	MF 'X'	MF 'Y'	MF 'Z'
Amount of Investment (₹)	2,00,000	4,00,000	2,00,000
Net Assets Value (NAV) at the time of purchase (₹)	10.30	10.10	10
Dividend Received up to 31.03.2025 (₹)	6,000	0	5,000
NAV as on 31.03.2025 (₹)	10.25	10	10.20
Effective Yield per annum as on 31.03.2025 (percent)	9.66	–11.66	24.15

Assume 1 Year = 365 days

Mr. Y has misplaced the documents of his investment. Held him in finding the date of his original investment after ascertaining the following:

(i) Number of units allotted in each scheme

(ii) Total NAV (Value of his investments) as on 31.03.2025

(iii) Total Yield (Total Return) on investments (in %)

(iv) Number of days investment held (Holding period of his investments) as on 31.03.2025

Note: Show your calculations upto 2 decimal points and yield upto 4 decimal points.

Answer

(i) Number of Units in each Scheme

MF 'X'	₹ 2,00,000/₹ 10.30	= 19,417.48
MF 'Y'	₹ 4,00,000/₹ 10.10	= 39,603.96
MF 'Z'	₹ 2,00,000/₹ 10.00	= 20,000.00

(ii) Total NAV on 31.03.2025

MF 'X'	= 19,417.48 x ₹ 10.25	₹ 1,99,029.17
MF 'Y'	= 39,603.96 x ₹ 10.00	₹ 3,96,039.60
MF 'Z'	= 20,000.00 x ₹ 10.20	₹ 2,04,000.00
Total		₹ 7,99,068.77

(iii) Total Yield

	Capital Yield	Dividend Yield	Total Yield
MF 'X'	₹ 1,99,029.17 – ₹ 2,00,000 = – ₹ 970.83	₹ 6,000	₹ 5,029.17
MF 'Y'	₹ 3,96,039.60 – ₹ 4,00,000 = – ₹ 3,960.40	Nil	– ₹ 3,960.40
MF 'Z'	₹ 2,04,000 – ₹ 2,00,000 = ₹ 4,000	₹ 5,000	₹ 9,000.00
Total			₹ 10,068.77

$$\text{Total Yield} = \frac{₹\ 10,068.77}{₹\ 8,00,000} \times 100 = 1.2586\%$$

(iv) No. of Days Investment Held

	MF 'X'	MF 'Y'	MF 'Z'
Initial Investment (₹)	2,00,000	4,00,000	2,00,000
Total Yield (₹)	5,029.17	–3,960.40	9,000.00
Yield (%)	2.5146	–0.9901	4.5
Period of Holding (Days)	(2.5146/9.66) x 365 = 95 Days	(–0.9901/–11.66) x 365 = 31 Days	(4.5/24.15) x 365 = 68 Days
Date of Original Investment	27.12.24	01.03.25	23.01.25

Question 18

Mr. D had invested in three mutual funds (MF) as per the following details:

Particulars	MF 'A'	MF 'B'	MF 'C'
Amount of Investment (₹)	2,00,000	5,00,000	4,00,000
Net Assets Value (NAV) at the time of purchase (₹)	10.00	25.00	20.00
Dividend up to 31.03.2025 on investment amount	3%	5%	4%
NAV as on 31.03.2025 (₹)	10.50	22.80	20.80
Annualized Yield as on 31.03.2025	9.733%	–11.185%	15%

Assume 1 Year = 365 Days

Mr. D has misplaced the documents of his investments.

You are required to help Mr. D to find out the following:

(i) Number of units allotted in each scheme

(ii) Value of his investments as on 31.03.2025

(iii) Total Yield (Total Return) on investments (in %)

(iv) Holding period of his investments in number of days as on 31.03.2025

(v) Dates of original investments

(vi) Assuming past performance of all three schemes will continue for next one year, what action the investor should take? What will be the expected return for the next one year after the above action?

(vii) Will your answer as above point no. (vi) changes if the Mutual fund charges exit load of 5% if the investment is redeemed within one year? If so, advise the investor what and when the action to be taken to optimise the returns.

Answer

(i) Number of Units in each Scheme

MF 'A'	₹ 2,00,000/₹ 10.00	= 20,000
MF 'B'	₹ 5,00,000/₹ 25.00	= 20,000
MF 'C'	₹ 4,00,000/₹ 20.00	= 20,000

(ii) Value of Investment on 31.03.2025

MF 'A'	= 20,000 x ₹ 10.50	₹ 2,10,000
MF 'B'	= 20,000 x ₹ 22.80	₹ 4,56,000
MF 'C'	= 20,000 x ₹ 20.80	₹ 4,16,000
Total		₹ 10,82,000

(iii) Yield on each Fund

	Capital Yield	Dividend Yield	Total Yield	Yield (%)
MF 'A'	₹ 2,10,000 – ₹ 2,00,000 = ₹ 10,000	₹ 6,000	₹ 16,000	8.00
MF 'B'	₹ 4,56,000 – ₹ 5,00,000 = –₹ 44,000	₹ 25,000	–₹ 19,000	–3.80
MF 'C'	₹ 4,16,000 – ₹ 4,00,000 = ₹ 16,000	₹ 16,000	₹ 32,000	8.00
Total			₹ 29,000	

Total Return on investments = $\frac{₹\ 29,000}{₹\ 11,00,000}$ x 100 = 2.64%

(iv) No. of Days Investment Held

	MF 'A'	MF 'B'	MF 'C'
Period of Holding (Days)	(8.00/9.733) x 365 = 300 Days	(–3.80/–11.185) x 365 = 124 Days	(8.00/15.00) x 365 = 195 Days

(v) Date of Original Investment

	MF 'A'	MF 'B'	MF 'C'
Investment Date	05.06.24	28.11.24	18.09.24

(vi) If past of all three schemes will continue for next one year, the investor should redeem the units of MFs 'A' and 'B' and invest the proceeds in MF 'C'. The expected return next will be 15%.

(vii) If the Mutual funds are charging exit load of 5%, if investment is redeemed within one year, then investor should get redeemed units of MF 'B' now and units of MF 'A' after 65 days.

Return from Mutual Fund under Dividend Reinvestment, Bonus and Growth Plan

Question 19

SBI mutual fund has a NAV of ₹ 8.50 at the beginning of the year. At the end of the year NAV increases to ₹ 9.10. Meanwhile fund distributes ₹ 0.90 as dividend and ₹ 0.75 as capital gains.

(i) What is the fund's return during the year?

(ii) Had these distributions been re-invested at an average NAV of ₹ 8.75 assuming 200 units were purchased originally. What is the return?

Answer

(i) Normal Return for the year (all changes on a per year basis)

Particulars	₹/Unit
Change in price (₹ 9.10 – ₹ 8.50)	0.60
Dividend received	0.90
Capital gain distribution	0.75
Total Return	2.25

$$\text{Return on Investment} = \frac{2.25}{8.50} \times 100 = 26.47\%$$

(ii) If all dividends and capital gain are reinvested into additional units at ₹ 8.75 per unit, the position would be:

Total amount reinvested = ₹ 1.65 x 200 = ₹ 330

$$\text{Additional units added} = \frac{₹\ 330}{8.75} = 37.71 \text{ units}$$

Value of 237.71 units at end of year = ₹ 2,163.16

Price paid for 200 units in beginning of the year (200 x ₹ 8.50) = ₹ 1,700

$$\text{Return} = \frac{₹\ 2,163.16 - ₹\ 1,700}{₹\ 1,700} = \frac{₹\ 463.16}{₹\ 1,700} = 27.24\%$$

Question 20

An investor purchased 300 units of a Mutual Fund at ₹ 12.25 per unit on 31st December, 2024. As on 31st December, 2025 he has received ₹ 1.25 as dividend and ₹ 1.00 as capital gains distribution per unit.

Required:

(i) The return on the investment if the NAV as on 31st December, 2025 is ₹ 13.00.

(ii) The return on the investment as on 31st December, 2025 if all dividends and capital gains distributions are reinvested into additional units of the fund at ₹ 12.50 per unit.

Answer

(i) Return for the year (all changes on a per year basis)

Particulars	₹/Unit
Change in price (₹ 13.00 – ₹ 12.25)	0.75
Dividend received	1.25
Capital gain distribution	1.00
Total Return	3.00

Return on Investment = $\frac{3.00}{12.25} \times 100 = 24.49\%$

(ii) If all dividends and capital gain are reinvested into additional units at ₹ 12.50 per unit, the position would be:

Total amount reinvested = ₹ 2.25 x 300 = ₹ 675

Additional units added = $\frac{₹\ 675}{12.50} = 54$ units

Value of 354 units as on 31-12-2025 = ₹ 4,602

Price paid for 300 units on 31-12-2024 (300 x ₹ 12.25) = ₹ 3,675

Return = $\frac{₹\ 4,602 - ₹\ 3,675}{₹\ 3,675} = \frac{₹\ 927}{₹\ 3,675} = 25.22\%$

Question 21

A Mutual Fund having 300 units has shown its NAV of ₹ 8.75 and ₹ 9.45 at the beginning and at the end of the year respectively. The Mutual Fund has given two options:

(i) Pay ₹ 0.75 per unit as dividend and ₹ 0.60 per unit as a capital gain, or

(ii) These distributions are to be reinvested at an average NAV of ₹ 8.65 per unit.

What difference it would make in terms of return available and which option is preferable?

Answer

(i) Return for the year (all changes on a per year basis)

Particulars	₹/Unit

Change in price (₹ 9.45 – ₹ 8.75)	0.70
Dividend received	0.75
Capital gain distribution	0.60
Total reward	2.05

Holding period reward = $\frac{₹\ 2.05}{₹\ 8.75}$ x 100 = 23.43%

(ii) When all dividends and capital gains distributions are re-invested into additional units of the fund @ ₹ 8.65/unit

Dividend + Capital Gains per unit = ₹ 0.75 + ₹ 0.60 = ₹ 1.35

Total received from 300 units = ₹ 1.35 x 300 = ₹ 405

Additional Units Acquired = ₹ 405/₹ 8.65 = 46.82 Units

Total No. of Units = 300 units + 46.82 units = 346.82 units

Value of 346.82 units held at the end of the year = 346.82 units x ₹ 9.45 = ₹ 3,277.45

Price Paid for 300 Units at the beginning of the year = 300 units x ₹ 8.75 = ₹ 2,625.00

Total reward = ₹ (3,277.45 – 2,625.00) = ₹ 652.45

Holding period reward = $\frac{₹\ 652.45}{₹\ 2,625.00}$ x 100 = 24.85%

Conclusion: Since the holding period reward is more in terms of percentage in option (ii) i.e., reinvestment of distributions at an average NAV of ₹ 8.65 per unit, this option is preferable.

Question 22

A mutual fund company introduces two schemes i.e. Dividend reinvestment plan (Plan-D) and Bonus plan (Plan-B). The face value of the unit is ₹ 10. On 1-4-2020 Mr. K invested ₹ 2,00,000 each in Plan-D and Plan-B when the NAV was ₹ 38.20 and ₹ 35.60 respectively. Both the plans matured on 31-3-2025.

Particulars of dividend and bonus declared over the period are as follows:

Date	Dividend %	Bonus Ratio	Net Asset Value (₹)	
			Plan D	Plan B
30-09-2020	10		39.10	35.60
30-06-2021		1:5	41.15	36.25
31-03-2022	15		44.20	33.10
15-09-2023	13		45.05	37.25
30-10-2023		1:8	42.70	38.30
27-03-2024	16		44.80	39.10
11-04-2024		1:10	40.25	38.90
31-03-2025			40.40	39.70

What is the effective yield per annum in respect of the above two plans?

Note: Make calculation on years basis.

Answer

Plan – D

Unit acquired = $\frac{2,00,000}{38.20}$ = 5,235.60

Date	Units held	Dividend		Reinvestment Rate	New Units	Total Units
		%	Amount			
01.04.2020						5,235.60
30.09.2020	5,235.60	10	5,235.60	39.10	133.90	5,369.50
31.03.2022	5,369.50	15	8,054.25	44.20	182.22	5,551.72
15.09.2023	5,551.72	13	7,217.24	45.05	160.20	5,711.92
27.03.2024	5,711.92	16	9,139.07	44.80	204	5,915.92
31.03.2025	Maturity Value [₹ 40.40 x 5,915.92]					₹ 2,39,003.17
	Less: Investment					₹ 2,00,000.00
	Total Gain					₹ 39,003.17

∴ Effective Yield = $\frac{₹\ 39,003.17}{₹\ 2,00,000} \times \frac{1}{5} \times 100 = 3.90\%$

Plan – B

Date	Particulars	Calculation Working	No. of Units	NAV
01.04.2020	Investment	₹ 2,00,000/35.60 =	5,617.98	35.60
30.06.2021	Bonus	5,617.98/5 =	1,123.60	36.25
			6,741.58	
30.10.2023	Bonus	6,741.58/8 =	842.70	38.30
			7,584.28	
11.04.2024	Bonus	7,584.28/10 =	758.43	38.90
			8,342.71	
31.03.2025	Maturity Value [8,342.71 x ₹ 39.70]			₹ 3,31,205.59
	Less: Investment			₹ 2,00,000.00
	Total Gain			₹ 1,31,205.59

∴ Effective Yield = $\frac{₹\ 1,31,205.59}{₹\ 2,00,000} \times \frac{1}{5} \times 100 = 13.12\%$

Question 23

Sun Moon Mutual Fund (Approved Mutual Fund) sponsored open-ended equity oriented scheme "Chanakya Opportunity Fund". There were three plans viz. 'A' – Dividend Re-investment Plan, 'B' –

Bonus Plan & 'C' – Growth Plan.

At the time of Initial Public Offer on 1.4.2015, Mr. Anand, Mr. Bacchan & Mrs. Charu, three investors invested ₹ 1,00,000 each at face value of ₹ 10 per unit & chosen 'B', 'C' & 'A' Plan respectively.

The History of the Fund is as follows:

Date	Dividend %	Bonus Ratio	Net Asset Value per Unit (₹)		
			Plan A	Plan B	Plan C
28.07.2019	20		30.70	31.40	33.42
31.03.2020	70	5:4	58.42	31.05	70.05
31.10.2023	40		42.18	25.02	56.15
15.03.2024	25		46.45	29.10	64.28
31.03.2024		1:3	42.18	20.05	60.12
24.03.2025	40	1:4	48.10	19.95	72.40
31.07.2025			53.75	22.98	82.07

On 31st July, 2025, all three investors redeemed all the balance units.

Consider the following:

1. Long-term capital gain is exempt from Income tax.
2. Short-term capital gain is subject to 10% Income tax.
3. Security Transaction Tax 0.2% only on sale/redemption of units.
4. Ignore Education Cess.

You are required to:

(i) Calculate Effective Yield per annum (annual rate of return) of each of the investors.

(ii) Suggest the name of investor with the highest Effective Yield per annum with the difference to his nearest investor.

Note: Make calculation on months basis.

Answer

(i) Calculation of annual rate of return to each of the investors

Mrs. Charu Plan A – Dividend Reinvestment

Date	Investment	Dividend %	Dividend Reinvested [Closing Units x Face value of ₹ 10 x Div. %]	NAV	Units	Closing Units ∑ Units
01.04.2015	1,00,000.00			10.00	10,000.00	10,000.00
28.07.2019		20	20,000.00	30.70	651.47	10,651.47
31.03.2020		70	74,560.29	58.42	1,276.28	11,927.75
30.10.2023		40	47,711.00	42.18	1,131.13	13,058.88
15.03.2024		25	32,647.20	46.45	702.85	13,761.73
24.03.2025		40	55,046.92	48.10	1,144.43	14,906.16

Particulars	Amount in ₹
Redemption value on 31.07.2025 [14,906.16 x 53.75]	8,01,206.10
Less: Security Transaction Tax (STT) is 0.2%	(1,602.41)
Net amount received	7,99,603.69
Less: Short term capital gain tax @10% on 6,340 [1,144.43 (53.64 – 48.10)]	(634.00)
Net of tax	7,98,969.69
Less: Investment	(1,00,000.00)
Net Gain	6,98,969.69

Annual average return (%) = $\frac{6,98,969.69}{1,00,000} \times \frac{12}{124} \times 100 = 67.64\%$

Mr. Anand Plan B – Bonus

Date	Units	Bonus units	Total Units	NAV
01.04.2015	10,000		10,000	10
31.03.2020		12,500	22,500	31.05
31.03.2024		7,500	30,000	20.05
24.03.2025		7,500	37,500	19.95

Particulars	Amount in ₹
Redemption value on 31.07.2025 [37,500 x 22.98]	8,61,750.00
Less: Security Transaction Tax (STT) is 0.2%	(1,723.50)
Net amount received	8,60,026.50
Less: Short term capital gain tax @10% on 22,350 [7,500 x (22.93 – 19.95)]	(2,235.00)
Net of tax	8,57,791.50
Less: Investment	(1,00,000.00)
Net gain	7,57,791.50

Annual average return (%) = $\frac{7,57,791.50}{1,00,000} \times \frac{12}{124} \times 100 = 73.33\%$

Mr. Bacchan Plan C – Growth

Particulars	Amount in ₹
Redemption value on 31.07.2025 [10,000 x 82.07]	8,20,700.00
Less: Security Transaction Tax (STT) is 0.2%	(1,641.40)
Net amount received	8,19,058.60
Less: Short term capital gain tax @10%	Nil
Net of tax	8,19,058.60

Less: Investment	(1,00,000.00)
Net gain	7,19,058.60

Annual average return (%) = $\frac{7,19,058.60}{1,00,000} \times \frac{12}{124} \times 100 = 69.59\%$

(ii) Mr. Anand (Bonus Plan) earns the highest annual rate of return of 73.33% and the difference to his nearest investor Mr. Bacchan is 3.74% (73.33% – 69.59%).

Question 24

M/S. Corpus an AMC, on 1.04.2020 has floated two schemes viz. Dividend Reinvestment Plan and Bonus Plan. Mr. X, an investor has invested in both the schemes. The following details (except the issue price) are available:

Date	Dividend (%)	Bonus Ratio	NAV	
			Dividend Reinvestment Plan	Bonus Plan
01.04.2020			?	?
31.12.2021		1:4 (One unit on 4 units held)	47	40
31.03.2022	12		48	42
31.03.2023	10		50	39
31.12.2023		1:5 (One unit on 5 units held)	46	43
31.03.2024	15		45	42
31.03.2025			49	44

Additional details	Dividend Reinvestment Plan	Bonus Plan
Investment (₹)	₹ 9,20,000	₹ 10,00,000
Average Profit (₹)	₹ 27,748.60	
Average Yield (%)		6.40

Assume face value of unit as ₹ 10.

You are required to calculate the issue price of both the schemes as on 01.04.2020.

Answer

(i) Dividend Plan

(a) Average Annual gain over a period of 5 Years		27,748.60
(b) Total gain over a period of 5 years	(a x 5)	1,38,743
(c) Initial Investment		9,20,000
(d) Total value of investment	(b + c)	10,58,743
(e) NAV as on 31.3.2025		49

(f) Number of units at the end of the period as on 31.03.2024	(d/e)	21,607

	1	2	3	4 = (2 x 3)	5	6 = [1/(4+5)] x 4	7
Period	**Units held**	**Rate**	**Unit value**	**Dividend**	**NAV**	**New Units***	**Balance Units Pre Dividend**
31.03.2024	21,607	0.15	10	1.5	45	697	20,910
31.03.2023	20,910	0.1	10	1	50	410	20,500
31.03.2022	20,500	0.12	10	1.2	48	500	20,000

Issue Price as on 01.04.2020 = $\frac{\text{Investment}}{\text{Units purchased}} = \frac{9,20,000}{20,000} = ₹ 46$

*Let the units issued be X

X = (Closing Units/NAV + Dividend) x Dividend

(ii) Bonus Plan

(a) Average Yield		0.064
(b) Investment		10,00,000
(c) Gain over a period of 5 years	(a x b x 5)	3,20,000
(d) Market Value as on 31.03.2025	(b + c)	13,20,000
(e) NAV as on 31.03.2025		44
(f) Total units as on 31.03.2025	(d/e)	30,000
(g) No of units as on 31.03.2023 Pre bonus = (30,000 x 5)/(5 + 1)		25,000
(h) No of units as on 31.12.2021 Pre bonus = (25,000 x 4)/(4 + 1)		20,000

Issue Price as on 01.04.2020 = $\frac{\text{Investment}}{\text{Units purchased}} = \frac{10,00,000}{20,000} = ₹ 50$

Question 25

Mr. X on 1.7.2022, during the initial offer of some Mutual Fund invested in 10,000 units at face value of ₹ 10 for each unit. On 31.3.2023, the dividend declared by the MF was 10% and Mr. X found that his annualized yield was 153.33%. On 31.3.2024, 20% dividend was given. On 31.3.2025, Mr. X redeemed all his balance of 11,296.11 units when his annualized yield was 73.52%.

What are the NAVs as on 31.3.2023, 31.3.2024 and 31.3.2025?

Note: For calculations consider a year of 12 months.

Answer

Yield for 9 months = 153.33 x 9/12 = 115%

Market value of Investments as on 31.03.2023 = ₹ 1,00,000 + (₹ 1,00,000 x 115%) = ₹ 2,15,000

Therefore, NAV as on 31.03.2023 = $\frac{₹ 2,15,000 - ₹ 10,000}{10,000} = ₹ 20.50$

[NAV would stand reduced to the extent of dividend payout, being (10,000 x ₹ 10 x 10%) = ₹ 10,000]

Since dividend was reinvested by Mr. X, additional units acquired = $\frac{₹\ 10,000}{₹\ 20.50}$ = 487.80 units

Therefore, units as on 31.03.2023 = 10,000 + 487.80 = 10,487.80

[Alternately, units as on 31.03.2023 = ₹ 2,15,000/₹ 20.50 = 10,487.80]

Dividend as on 31.03.2024 = 10,487.80 x ₹ 10 x 20% = ₹ 20,975.60

Let X be the NAV on 31.03.2024, then number of new units reinvested will be ₹ 20,975.60/X.

Accordingly, 11,296.11 units shall consist of reinvested units and 10,487.80 (as on 31.03.2023).

Thus, by way of equation it can be shown as follows:

$$11,296.11 = \frac{₹\ 20,975.60}{X} + 10,487.80$$

Therefore, NAV as on 31.03.2024 = $\frac{₹\ 20,975.60}{11,296.11 - 10,487.80}$ = ₹ 25.95

NAV as on 31.03.2025 = $\frac{₹\ 1,00,000\ (1 + 0.7352 \times 33/12)}{11,296.11}$ = ₹ 26.75

Question 26

Mr. X on 1.7.2022, during the initial public offer of a Mutual Fund (MF) invested ₹ 1,00,000 at Face Value of ₹ 10 each per unit. On 31.3.2023, the MF declared a dividend of 10% when Mr. X calculated that his holding period return was 115%. On 31.3.2024, MF again declared a dividend of 20%. On 31.3.2025, Mr. X redeemed all his investment which had accumulated to 11,296.11 units when his holding period return was 202.18%.

Calculate the NAVs as on 31.03.2023, 31.03.2024 and 31.03.2025.

Answer

Yield for 9 months = 115%

Market value of Investments as on 31.03.2023 = 1,00,000 + (1,00,000 x 115%) = ₹ 2,15,000

Therefore, NAV as on 31.03.2023 = $\frac{₹\ 2,15,000 - ₹\ 10,000}{10,000}$ = ₹ 20.50

[NAV would stand reduced to the extent of dividend payout, being (₹ 1,00,000 x 10%) = ₹ 10,000]

Since dividend was reinvested by Mr. X, additional units acquired = $\frac{₹\ 10,000}{₹\ 20.50}$ = 487.80 units

Therefore, units as on 31.03.2023 = 10,000 + 487.80 = 10,487.80

[Alternately, units as on 31.03.2023 = ₹ 2,15,000/₹ 20.50 = 10,487.80]

Dividend as on 31.03.2024 = 10,487.80 x ₹ 10 x 20% = ₹ 20,975.60

Let X be the NAV on 31.03.2024, then number of new units reinvested will be ₹ 20,975.60/X.

Accordingly, 11,296.11 units shall consist of reinvested units and 10,487.80 (as on 31.03.2023).

Thus, by way of equation it can be shown as follows:

$$11,296.11 = \frac{₹\ 20,975.60}{X} + 10,487.80$$

$$\text{Therefore, NAV as on } 31.03.2024 = \frac{₹\ 20,975.60}{11,296.11 - 10,487.80} = ₹\ 25.95$$

$$\text{NAV as on } 31.03.2025 = \frac{₹\ 1,00,000\ (1 + 2.0217)}{11,296.11} = ₹\ 26.75$$

Question 27

On 01.07.2022, Mr. X Invested ₹ 50,000 at initial offer in Mutual Funds at a face value of ₹ 10 each per unit. On 31.03.2023, a dividend was declared @ 10% and annualized yield was 120%. On 31.03.2024, 20% dividend and capital gain of ₹ 0.60 per unit was given. On 31.03.2025, Mr. X redeemed all his 6,271.98 units when his annualized yield was 71.50%.

Calculate NAV as on 31.03.2023, 31.03.2024 and 31.03.2025.

Note: For calculations consider a year of 12 months.

Answer

Yield for 9 months = 120% x 9/12 = 90%

Market value of Investments as on 31.03.2023 = ₹ 50,000 + (₹ 50,000 x 90%) = ₹ 95,000

$$\text{Therefore, NAV as on } 31.03.2023 = \frac{₹\ 95,000 - ₹\ 5,000}{5,000} = ₹\ 18.00$$

[NAV would stand reduced to the extent of dividend payout, being (₹ 50,000 x 10%) = ₹ 5,000]

$$\text{Since dividend was reinvested by Mr. X, additional units acquired} = \frac{₹\ 5,000}{₹\ 18} = 277.78 \text{ units}$$

Therefore, units as on 31.03.2023 = 5,000 + 277.78 = 5,277.78

[Alternatively, units as on 31.03.2023 = ₹ 95,000/₹ 18 = 5,277.78]

Dividend as on 31.03.2024 = 5,277.78 x ₹ 10 x 20% =	₹ 10,555.56
Capital Gain (5,277.78 x ₹ 0.60) =	₹ 3,166.67
	₹ 13,722.23

Let X be the NAV on 31.03.2024, then number of new units reinvested will be ₹ 13,722.23/X.

Accordingly, 6,271.98 units shall consist of reinvested units and 5,277.78 (as on 31.03.2023).

Thus, by way of equation it can be shown as follows:

$$6,271.98 = \frac{₹\ 13,722.23}{X} + 5,277.78$$

$$\text{Therefore, NAV as on } 31.03.2024 = \frac{₹\ 13,722.23}{6,271.98 - 5,277.78} = ₹\ 13.80$$

$$\text{NAV as on } 31.03.2025 = \frac{₹\ 50,000\ (1 + 0.715 \times 33/12)}{6,271.98} = ₹\ 23.65$$

Other Topics

Question 28

Mr. A can earn a return of 16% by investing in equity shares on his own. Now he is considering a recently announced equity based mutual fund scheme in which initial expenses are 5.5% and annual recurring expenses are 1.5%. How much should the mutual fund earn to provide Mr. A return of 16%?

Answer

Personal earnings of Mr. A = R_1 = 16%

Mutual Fund earnings = R_2

$$R_2 = \frac{1}{1 - \text{Initial expenses (\%)}} \times R_1 + \text{Recurring expenses (\%)}$$

$$R_2 = \frac{1}{1 - 0.055} \times 16\% + 1.5\% = 18.43\%$$

Mutual Fund earnings = 18.43%

Question 29

Mr. X earns 10% on his investments in equity shares. He is considering a recently floated scheme of a Mutual Fund where the initial expenses are 6% and annual recurring expenses are expected to be 2%. How much the Mutual Fund scheme should earn to provide a return of 10% to Mr. X?

Answer

$$R_2 = \frac{1}{1 - \text{Initial expenses (\%)}} \times R_1 + \text{Recurring expenses (\%)}$$

The rate of return the mutual fund should earn;

$$R_2 = \frac{1}{1 - 0.06} \times 10\% + 2\% = 12.64\%$$

Question 30

ANP Plan, a hedge fund currently has assets of ₹ 20 crore. CA. X, the manager of fund charges fee of 0.10% of portfolio asset. In addition to it, he charges incentive fee of 2%. The incentive will be linked to gross return each year in excess of the portfolio maximum value since the inception of fund. The maximum value the fund achieved so far since inception of fund about one and half year ago was ₹ 21 crores.

You are required to compute the fee payable to CA. X, if return on the fund this year turns out to be

(a) 29%

(b) 4.5%

(c) -1.8%

Answer

(a) If return is 29%

		₹
Fixed fee [0.10% of ₹ 20 crore]	(A)	2,00,000
New Fund Value [1.29 x ₹ 20 crore]		25.80 crore
Excess Value of best achieved [25.8 crore – 21.0 crore]		4.80 crore
Incentive Fee [2% of 4.80 crores]	(B)	9,60,000
Total Fee	(A) + (B)	11,60,000

(b) If return is 4.5%

		₹
Fixed fee [0.10% of ₹ 20 crore]	(A)	2,00,000
New Fund Value [1.045 x ₹ 20 crore]		20.90 crore
Excess Value of best achieved [20.90 crore – 21.00 crore]		(₹ 0.10 crore)
Incentive Fee [as does not exceed best achieved]	(B)	Nil
Total Fee	(A) + (B)	2,00,000

(c) If return is (–1.8%)

No incentive only fixed fee of ₹ 2,00,000 will be paid.

Section B – Theory Questions

Question 1

What are the advantages of investing in Mutual Funds?

Answer

Advantages of Mutual Fund are as follows:

(a) **Professional Management:** The funds are managed by skilled and professionally experienced managers backed by a team of Research Analysts.

(b) **Diversification:** Mutual Funds invest into many securities and offer diversification which reduces the concentration risk.

(c) **Convenient Administration:** There are no administrative risks of share transfer, as many of the Mutual Funds offer services in a demat form which saves investor's time and prevents delay.

(d) **Higher Returns:** Over a medium to long-term investment horizon, investors get higher returns in Mutual Funds as compared to other avenues of investment. However, investors are cautioned that such very high returns during the exceptional bull phase of the market like IT boom or Infrastructure boom should not be considered as regular returns and therefore one should look at the average returns provided by the Mutual Funds particularly in the equity schemes over a long period of time.

(e) **Low Cost of Management:** SEBI has prescribed maximum limit of charging 2.50% for Equity Mutual Funds. No Mutual Fund can increase the cost beyond prescribed limits of 2.5% maximum and any extra cost of management is to be borne by the AMC.

(f) **Liquidity:** In all the open ended funds, liquidity is provided by direct sales/repurchase by Mutual Fund and in case of close ended funds, liquidity is provided by listing the units on Stock Exchange.

(g) **Transparency:** The SEBI Regulations now compel all the Mutual Funds to disclose their portfolios on a half-yearly basis. However, many Mutual Funds disclose their Scheme Portfolio on a quarterly or monthly basis to their investors. The NAVs are calculated on a daily basis in case of open ended funds and are published through AMFI in the newspapers.

(h) **Highly Regulated:** Mutual Funds all over the world are highly regulated and in India all Mutual Funds are registered with SEBI and are strictly regulated as per the Mutual Fund Regulations which provide high level of investor protection.

(i) **Economies of scale:** The way mutual funds are structured gives it a natural advantage. The "pooled" money from numerous investors ensures that mutual funds enjoy economies of scale; it is cheaper compared to investing directly in the capital markets which involves higher charges. This also allows retail investors access to participation in the Capital Market which otherwise is difficult for them go directly.

(j) **Flexibility:** One of the biggest advantages of a Mutual Fund Scheme is its flexibility. An investor can opt for Systematic Investment Plan (SIP), Systematic Withdrawal Plan etc. to plan his cash flow requirements as per his convenience. The wide range of schemes being launched in India by different mutual funds also provides added flexibility to investor to plan his portfolio accordingly.

(k) **Convenience:** It is very convenient & easy to invest & disinvest from Mutual Fund Schemes specially through digital transaction portals.

Question 2

Index Funds is one of the Special Funds. What are other funds in Special Funds category?

Answer

The other funds in Special Fund category are as follows:

(a) **International Funds:** Mutual fund located in India to raise money in India for investing globally.

(b) **Offshore Funds:** A mutual fund located in India to raise money globally for investing in India.

(c) **Sector Funds:** They invest their entire fund in a particular industry e.g. utility fund for utility industry like power, gas, public works.

(d) **Money Market Funds:** These are predominantly debt-oriented schemes, whose main objective is preservation of capital, easy liquidity and moderate income. To achieve this objective, liquid funds invest predominantly in safer short-term instruments like Commercial Papers, Certificate of Deposits, Treasury Bills, G-Secs etc.

(e) **Fund of Funds:** Fund of Funds (FoF) as the name suggests are schemes which invest in other mutual fund schemes. The concept is popular in markets where there are number of mutual fund offerings and choosing a suitable scheme according to one's objective is tough. Just as a mutual fund scheme invests in a portfolio of securities such as equity, debt etc., the underlying investments for a FoF is the units of other mutual fund schemes, either from the same fund family or from other fund houses.

(f) **Capital Protection Oriented Fund:** The term 'capital protection oriented scheme' means a mutual fund scheme which is designated as such and which endeavours to protect the capital invested therein through suitable orientation of its portfolio structure. The orientation towards protection of capital originates from the portfolio structure of the scheme and not from any bank guarantee, insurance cover etc.

(g) **Gold Funds:** The objective of these funds is to track the performance of Gold. The units represent the value of gold or gold related instruments held in the scheme. Gold Funds which are generally in the form of an Exchange Traded Fund (ETF) are listed on stock exchange and offers investors an opportunity to participate in bullion market without having to take physical delivery of gold.

(h) **Quant Funds:** Quant Fund works on a data-driven approach for stock selection and investment decisions based on a pre-determined rules or parameters using statistics or mathematics-based models.

Question 3

Side Pocketing enhances value of Mutual Fund. Do you agree? Briefly explain process of side pocketing.

Answer

Side Pocketing:

In simple words, a side pocketing in mutual fund leads to **separation of risky assets from other investments and cash holdings**. The purpose is **to make sure that money invested in** a mutual fund, which is linked to **stressed assets, gets locked, until the fund recovers the money** from the company or could avoid distress selling of illiquid securities.

Process of Side Pocketing:

The modus operandi is simple. **Whenever, the rating of a mutual fund decreases, the fund shifts the illiquid assets into a side pocket so that current shareholders can be benefitted from the liquid assets.** Consequently, the Net Asset Value (NAV) of the fund will then reflect the actual value of the liquid assets. Therefore, the process of side pocketing ensures that liquidity is not the problem even in the circumstances of frequent allotments and redemptions.

Thus, from the above it can be said that Side Pocketing **helps to enhance the value of fund for the investors** to some extent.

Question 4

Describe Tracking error. List the reasons for it.

OR

Explain how to measure divergence or deviation of return of a Mutual Fund Scheme that replicates any benchmark Index.

Answer

Tracking error can be defined as divergence or **deviation of a fund's return from the benchmarks return it is following.**

The passive fund managers closely follow or track the benchmark index. Although they design their investment strategy on the same index but often it may not exactly replicate the index return. In such situation, there is possibility of deviation between the returns.

The tracking error can be **calculated on the basis of corresponding benchmark return vis a vis** quarterly or monthly **average NAVs.**

Reasons of Tracking Error:

Higher the tracking error, higher is the risk profile of the fund. Whether the funds outperform or underperform their benchmark indices; it clearly indicates that fund managers are not following the benchmark indices properly. In addition to the same other **reasons for tracking error are as follows:**

- Transaction cost
- Fees charged by AMCs
- Fund expenses
- Cash holdings
- Sampling biasness

Thus, from above it can be said that, **to replicate the return to any benchmark index, the tracking error should be near to zero.**

CHAPTER - 9
Derivatives Analysis and Valuation

Section A – Practical Questions

Pricing of Futures

Question 1

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

Answer

Calculation of spot price

The formula for calculating future price is:

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Where,

A = Future price

P = Spot Price

r = rate of interest

n = no. of compounding

t = time

Using the above formula,

$208.18 = P\ (1 + 0.08/12)^{6}$

$208.18 = P \times 1.0409$

$P = 208.18/1.0409 = 200$

Hence, the spot price should be ₹ 200.

Question 2

On 31-8-2025, the value of stock index was 2200. The risk free rate of return has been 8% per annum. The dividend yield on this Stock Index is as under:

Month	Dividend Yield p.a.
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 price of futures deliverable on 31-12-2025. (Given $e^{0.01583} = 1.01593$)

Answer

The duration of future contract is 4 months. The average yield during this period will be:

$$\frac{3\% + 3\% + 4\% + 3\%}{4} = 3.25\%$$

As per Cost to carry model the future price will be

$F = Se^{(rf - D)t}$

Where,

S = Spot Price

rf = Risk Free Interest

D = Dividend Yield

t = Time Period

Accordingly, future price will be

$= ₹ 2,200 \times e^{(0.08 - 0.0325) \times 4/12} = ₹ 2,200 \times e^{0.01583} = ₹ 2,200 \times 1.01593$

= ₹ 2,235.05

Gain/Loss [Pay off] on Future Contracts

Question 3

Mr. SG sold five 4 Months Nifty Futures on 1st February 2025 for ₹ 9,00,000. At the time of closing of trading on the last Thursday of May 2025 (expiry), Nifty Future turned out to be ₹ 2,100. The contract multiplier is 75.

Based on the above information calculate:

(i) The price of one Future Contract on 1st February 2025.

(ii) Nifty Index on 1st February 2025 if the Future Value 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 on the transaction.

Note: Carry out calculation on month basis.

Answer

(i) The price of one Future Contract

Let X be the Price of Future Contract.

Accordingly,

$$5 = \frac{₹\ 9,00,000}{X}$$

X (Price of One Future Contract) = ₹ 1,80,000

(ii) Current Future price of the index = $\frac{₹\ 1,80,000}{75}$ = ₹ 2,400

Let Y be the current Nifty Index (on 1st February 2025) then

Accordingly, $Y + Y\ (0.09 - 0.06)\ \frac{4}{12}$ = ₹ 2,400

and $Y = \frac{₹\ 2,400}{1.01}$ = ₹ 2,376.24

Hence Nifty Index on 1st February 2025 shall be ₹ 2,376.24.

(iii) To determine whether the market is in Contango/Backwardation, first we shall compute Basis as follows:

Basis = Spot Price – Future Price

If Basis is negative the market is said to be in Contango and when it is positive the market is said to be Backwardation.

Since current Spot Price of Nifty Index is ₹ 2,376.24 and Future price of Nifty index is ₹ 2,400, the Basis is negative and hence there is Contango Market and maximum Contango shall be 23.76 (₹ 2,376.24 – ₹ 2,400)

(iv) Pay off on the Future transaction shall be [₹ (2,400 – 2,100) x 75 x 5] = ₹ 1,12,500

The Future seller gains if the Spot Price is less than Futures Contract price as position shall be reversed at same Spot price. Therefore, Mr. SG has gained ₹ 1,12,500 on the Short position taken.

Question 4

A future contract is available on R Ltd. that pays an annual dividend of ₹ 4 and whose stock is currently priced at ₹ 125. Each future contract calls for delivery of 1,000 shares to stock in one year, daily marking to market. The corporate treasury bill (Risk Free Interest) rate is 8%.

Required:

(i) Using the above information, calculate theoretical price of one future contract.

(ii) Determine the price of one futures contract, if the company stock price decreases by 6%.

(iii) Determine the amount of gain or loss as a result of the company stock price decrease for an investor who has a long position in one futures contract of R Ltd.

Answer

(i) Future Price = Spot + Cost of Carry – Dividend

= ₹ 125 + (₹ 125 x 0.08) – ₹ 4 = ₹ 131

Price of one future contract = 1,000 shares x ₹ 131 = ₹ 1,31,000

(ii) Price decrease by 6%

Market Price = 125 x 94% = 117.50

Then, price of one future contract

= ₹ 117.50 + (₹ 117.50 x 0.08) – ₹ 4 = ₹ 122.90

= ₹ 122.90 x 1,000 shares = ₹ 1,22,900

(iii) If the investor has taken a long position, decrease in price will result in loss for the investor.

Amount of loss will be = ₹ 1,31,000 – ₹ 1,22,900 = ₹ 8,100

Margins in Future Contracts

Question 5

On 31/08/2025 Mr. R has taken a Long position of 2 lots of Nifty Futures at ₹ 17,300. One lot of Nifty future is 50 units.

Initial Margin required is 10% of Contract Value.

Maintenance Margin required is 80% of Initial Margin.

The closing price of 5 days are given below:

Date	Closing Price of Nifty Future (₹)
01/09/2025	17,340
02/09/2025	17,180
03/09/2025	16,990
06/09/2025	16,900
07/09/2025	17,120

You are required to

(i) Prepare a statement showing the daily balances in the margin account & payment on margin calls, if any.

(ii) Compute the Gain or Loss of Mr. R, if contract squared off on 07/09/2025.

(iii) What would be the Gain or Loss of Mr. R, if he had taken the short position? Also Prepare a statement showing the daily balances in the margin account in this case.

Answer

(i) Contract Value (₹ 17,300 x 50 x 2) = ₹ 17,30,000

Initial Margin (10% of 17,30,000) = ₹ 1,73,000

Maintenance Margin (80% of 1,73,000) = ₹ 1,38,400

Statement showing the daily balances in Margin A/c and margin call, if any:

Day	Change in Future value (₹)	Margin A/c (₹)	Call Money (₹)
31/08/2025	–	1,73,000	–
01/09/2025	(₹ 17,340 – ₹ 17,300) x 50 x 2 = 4,000	1,77,000	–
02/09/2025	(₹ 17,180 – ₹ 17,340) x 50 x 2 = –16,000	1,61,000	–
03/09/2025	(₹ 16,990 – ₹ 17,180) x 50 x 2 = –19,000	1,42,000	–
06/09/2025	(₹ 16,900 – ₹ 16,990) x 50 x 2 = –9,000	1,73,000	40,000
07/09/2025	(₹ 17,120 – ₹ 16,900) x 50 x 2 = 22,000	1,95,000	–

(ii) Gain or Loss of Mr. R squared off position on 07/09/25

	(₹)
Ending margin	1,95,000
Less: Initial Margin	(1,73,000)
	22,000
Less: Margin Call	(40,000)
Loss	(18,000)

OR, Loss = ₹ (17,120 – 17,300) x 50 x 2 = (₹ 18,000)

(iii) Statement showing the daily balances in Margin A/c, if Mr. R had taken the short position:

Day	Change in Future value (₹)	Margin A/c (₹)	Call Money (₹)
31/08/2025	–	1,73,000	–
01/09/2025	(₹ 17,300 – ₹ 17,340) x 50 x 2 = –4,000	1,69,000	–
02/09/2025	(₹ 17,340 – ₹ 17,180) x 50 x 2 = 16,000	1,85,000	–
03/09/2025	(₹ 17,180 – ₹ 16,990) x 50 x 2 = 19,000	2,04,000	–
06/09/2025	(₹ 16,990 – ₹ 16,900) x 50 x 2 = 9,000	2,13,000	–
07/09/2025	(₹ 16,900 – ₹ 17,120) x 50 x 2 = –22,000	1,91,000	–

Gain or Loss on Short Position

	(₹)
Ending margin	1,91,000
Less: Initial Margin	(1,73,000)
Gain	18,000

OR, Gain = ₹ (17,300 – 17,120) x 50 x 2 = ₹ 18,000

Question 6

The price of March Nifty Futures on a particular day was ₹ 9,170. The minimum trading lot on Nifty Futures is 50. The initial margin is 8% of Contract Value and the maintenance margin is 6% of Contract

Value. The Nifty Future closed at the following levels on next five days:

Day	1	2	3	4	5
Closing Price of Nifty Future (₹)	9,380	9,520	9,100	8,960	9,140

You are required to calculate:

(i) Mark to market cash flows and daily closing balances on account of

(a) An investor who has taken a long position at ₹ 9,170

(b) An investor who has taken a short position at ₹ 9,170

(ii) Net profit/loss on each of the contracts

Answer

(i) Contract Value (₹ 9,170 x 50) = ₹ 4,58,500

Initial Margin (8% of 4,58,500) = ₹ 36,680

Maintenance Margin (6% of 4,58,500) = ₹ 27,510

(a) For investor taken Long position:

Day	Change in Future value (₹)	Margin A/c (₹)	Call Money (₹)
0	–	36,680	
1	(₹ 9,380 – ₹ 9,170) x 50 = 10,500	47,180	
2	(₹ 9,520 – ₹ 9,380) x 50 = 7,000	54,180	
3	(₹ 9,100 – ₹ 9,520) x 50 = –21,000	33,180	
4	(₹ 8,960 – ₹ 9,100) x 50 = –7,000	36,680	10,500
5	(₹ 9,140 – ₹ 8,960) x 50 = 9,000	45,680	

(b) For investor taken Short position:

Day	Change in Future value (₹)	Margin A/c (₹)	Call Money (₹)
0	–	36,680	
1	(₹ 9,170 – ₹ 9,380) x 50 = –10,500	36,680	10,500
2	(₹ 9,380 – ₹ 9,520) x 50 = –7,000	29,680	
3	(₹ 9,520 – ₹ 9,100) x 50 = 21,000	50,680	
4	(₹ 9,100 – ₹ 8,960) x 50 = 7,000	57,680	
5	(₹ 8,960 – ₹ 9,140) x 50 = –9,000	48,680	

(ii) Calculation of Net Profit/Loss

(a) Long Position

	(₹)
Ending margin	45,680
Less: Initial Margin	(36,680)
	9,000

Less: Margin Call	(10,500)
Loss	**(1,500)**

OR, Loss = ₹ (9,140 – 9,170) x 50 = (₹ 1,500)

(b) Short Position

	(₹)
Ending margin	48,680
Less: Initial Margin	(36,680)
	12,000
Less: Margin Call	(10,500)
Profit	**1,500**

OR, Profit = ₹ (9,170 – 9,140) x 50 = ₹ 1,500

Question 7

Sensex futures are traded at a multiple of 50. Consider the following quotations of Sensex futures in the 10 trading days during February, 2025:

Day	High	Low	Closing
4-2-25	3,306.40	3,290.00	3,296.50
5-2-25	3,298.00	3,262.50	3,294.40
6-2-25	3,256.20	3,227.00	3,230.40
7-2-25	3,233.00	3,201.50	3,212.30
10-2-25	3,281.50	3,256.00	3,267.50
11-2-25	3,283.50	3,260.00	3,263.80
12-2-25	3,315.00	3,286.30	3,292.00
14-2-25	3,315.00	3,257.10	3,309.30
17-2-25	3,278.00	3,249.50	3,257.80
18-2-25	3,118.00	3,091.40	3,102.60

Abhishek bought one Sensex futures contract on 4th February. 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.

Answer

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 x 0.75 = ₹ 12,000

Day	Changes in future Values (₹)	Margin A/c (₹)	Call Money (₹)
4-2-25	–	16,000	–
5-2-25	50 x (₹ 3,294.40 – ₹ 3,296.50) = –105	15,895	–
6-2-25	50 x (₹ 3,230.40 – ₹ 3,294.40) = –3,200	12,695	–
7-2-25	50 x (₹ 3,212.30 – ₹ 3,230.40) = –905	16,000	4,210
10-2-25	50 x (₹ 3,267.50 – ₹ 3,212.30) = 2,760	18,760	–
11-2-25	50 x (₹ 3,263.80 – ₹ 3,267.50) = –185	18,575	–
12-2-25	50 x (₹ 3,292 – ₹ 3,263.80) = 1,410	19,985	–
14-2-25	50 x (₹ 3,309.30 – ₹ 3,292) = 865	20,850	–
17-2-25	50 x (₹ 3,257.80 – ₹ 3,309.30) = –2,575	18,275	–
18-2-25	50 x (₹ 3,102.60 – ₹ 3,257.80) = –7,760	16,000	5,485

Hedging Using Futures

Question 8

On 1st January 2025 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 9.98% p.a. continuously compounded. 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.

You are required to calculate:

(i) The beta of his portfolio.

(ii) The theoretical value of the NIFTY futures for February 2025. (Given $e^{(0.015858)} = 1.01598$)

(iii) The number of future contracts of NIFTY the investor needs to sell to get a full hedge until February for his portfolio.

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

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

Answer

(i) Calculation of Portfolio Beta

Security	Price of the Stock	No. of shares	Value	Weightage (W_i)	Beta (B_i)	Weighted Beta
A	349.30	5,000	17,46,500	0.093	1.15	0.107
B	480.50	7,000	33,63,500	0.178	0.40	0.071
C	593.52	8,000	47,48,160	0.252	0.90	0.227
D	734.70	10,000	73,47,000	0.390	0.95	0.370
E	824.85	2,000	16,49,700	0.087	0.85	0.074
			1,88,54,860			0.849

Portfolio Beta = 0.849

(ii) Calculation of Theoretical Value of NIFTY Futures

Cost of Capital = 9.98% p.a.

For February 2025 contract, t = 58/365 = 0.1589

Further $F = Se^{rt}$

$F = ₹ 5,900 \times e^{(0.0998)(0.1589)}$

$F = ₹ 5,900 \times e^{0.015858}$

$F = ₹ 5,900 \times 1.01598 = ₹ 5,994.28$

(iii) When total portfolio is to be hedged:

$$= \frac{\text{Value of Spot Position requiring hedging}}{\text{Value of Future Contract}} \times \text{Portfolio Beta}$$

$$= \frac{₹ 1,88,54,860}{₹ 5,994.28 \times 200} \times 0.849 = 13.35 \text{ contracts say 14 contracts}$$

(iv) When total portfolio beta is to be reduced to 0.6:

$$\text{Number of Contracts to be sold} = \frac{P(\beta_P - \beta_P)}{F}$$

$$= \frac{₹ 1,88,54,860 (0.849 - 0.600)}{₹ 5,994.28 \times 200} = 3.92 \text{ contracts say 4 contracts}$$

Question 9

On April 1, 2025, 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:

(i) The current NIFTY value is 8500.

(ii) NIFTY Futures can be traded in units of 25 only.

(iii) Futures for May are currently quoted at ₹ 8,700 and Futures for June are being quoted at ₹ 8,850.

You are required to calculate:

(i) The beta of his portfolio.

(ii) The theoretical value of futures 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 future 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

Answer

(i) Beta of the Portfolio

Security	Market Price	No. of Shares	Market Value	β	Value x β
A	29.40	400	11,760	0.59	6,938.40
B	318.70	800	2,54,960	1.32	3,36,547.20
C	660.20	150	99,030	0.87	86,156.10
D	5.20	300	1,560	0.35	546.00
E	281.90	400	1,12,760	1.16	1,30,801.60
F	275.40	750	2,06,550	1.24	2,56,122.00
G	514.60	300	1,54,380	1.05	1,62,099.00
H	170.50	900	1,53,450	0.76	1,16,622.00
			9,94,450		10,95,832.30

$$\text{Portfolio Beta} = \frac{10,95,832.30}{9,94,450} = 1.102$$

(ii) Theoretical Value of Futures Expiring in May and June

$F = Se^{rt}$

$F_{May} = ₹ 8,500 \times e^{0.20 \times (2/12)} = ₹ 8,500 \times e^{0.0333}$

$e^{0.0333}$ shall be computed using Interpolation Formula as follows:

$e^{0.03}$	= 1.03045
$e^{0.04}$	= 1.04081
$e^{0.01}$	= 0.01036
$e^{0.0033}$	= 0.00342
$e^{0.0067}$	= 0.00694

$e^{0.0333}$ = 1.03045 + 0.00342 = 1.03387 or 1.04081 – 0.00694 = 1.03387

Accordingly, the price of the May Futures

F_{May} = ₹ 8,500 x 1.03387 = ₹ 8,787.90

Price of the June Futures

$F_{June} = ₹ 8,500 \times e^{0.20 \times (3/12)} = ₹ 8,500 \times e^{0.05} = ₹ 8,500 \times 1.05127 = ₹ 8,935.80$

(iii) No. of NIFTY Contracts required to sell to hedge until June

$$= \frac{\text{Value of Position to be hedged}}{\text{Value of Future Contract}} \times \beta$$

(A) Total Portfolio

$$\frac{₹ 9,94,450}{₹ 8,850 \times 25} \times 1.102 = 4.953 \text{ say } 5 \text{ contracts}$$

(B) 50% of Portfolio

$$\frac{₹ 9,94,450 \times 0.50}{₹ 8,850 \times 25} \times 1.102 = 2.47 \text{ say } 3 \text{ contracts}$$

(C) 120% of Portfolio

$$\frac{₹ 9,94,450 \times 1.20}{₹ 8,850 \times 25} \times 1.102 = 5.94 \text{ say } 6 \text{ contracts}$$

Question 10

On 1st July 2025 Mr. P has made the following investment:

Name of Company	No. of Equity Share	Beta Value	Purchase Price per Equity Share
ML Ltd	1,000	1.25	₹ 700

He wants to hold the investment till end of September 2025 with an expectation of huge dividends to be announced in the AGM.

On the date of investment, September Nifty Futures are quoting at ₹ 17,500 and tradeable with lot size of 50 for each contract.

You are the Investment advisor to Mr. P,

(i) Please advise Mr. P how to hedge his market exposure and calculate the number of future contracts to be bought/sold using the available data.

(ii) Calculate profit or loss of Mr. P on expiry of September 2025 futures in following situations:

(a) Nifty future rise by 10%

(b) Share of ML Ltd. falls by 5%

(iii) Is it possible stock as well as nifty to raise or fall at the same percentage? Please state the reason.

Answer

(i) To hedge his market exposure, Mr. P should take short position in the Nifty Futures.

$$\text{No. of Contract of Nifty Future to be Short} = \frac{1.25 \times ₹\ 700 \times 1,000}{₹\ 17,500 \times 50} = 1$$

(ii) (a) Profit or loss of Mr. P during the expiry of September 2025 Futures:

Particulars	If Nifty rises by 10%
Loss on Nifty Futures [₹ 17,500 x 50 x 10%]	(₹ 87,500)
Gain on Stock of ML Ltd. [1.25 x 10% x ₹ 7,00,000]	₹ 87,500
Net Gain/(Loss)	Nil

(b) Profit or loss of Mr. P during the expiry of September 2025 Futures:

Particulars	If ML Ltd. falls by 5%
Gain on Nifty Futures [₹ 17,500 x 50 x (5%/1.25)]	₹ 35,000
Loss on Stock of ML Ltd. [₹ 7,00,000 x 5%]	(₹ 35,000)
Net Gain/(Loss)	Nil

(iii) Normally it is not possible that stock as well as nifty to rise or fall by same percentage because of systematic risk i.e. Beta may not be the same as of market.

Question 11

A Mutual Fund is holding the following assets in ₹ Crores:

Investments in diversified equity shares	90.00
Cash and Bank Balances	10.00
	100.00

The Beta of the equity shares portfolio is 1.1. The index future is selling at ₹ 4,300 level. One index future consists of 50 units. How many index futures he should short for perfect hedging?

The Fund Manager apprehends that the index will fall at the most by 10%. Substantiate your answer assuming the Fund Manager's apprehension will materialize.

Note: Calculations to be done in ₹ Crore

Answer

Number of index future to be sold by the Fund Manager is:

$$\frac{₹\ 90\ Crore \times 1.1}{₹\ 4,300 \times 50} = 4,605$$

Justification of the answer:

Loss in the value of portfolio if the index falls by 10% is = ₹ 90 Crore x 1.1 x 10% = ₹ 9.90 Crore

Gain by short covering of index future is = ₹ 4,300 x 50 x 4,605 x 10% = ₹ 9.90 Crore

This justifies the answer. Further, cash is not considered as a part of portfolio for purpose of hedging.

Question 12

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

We 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.

Based on the above information, calculate:

(i) Price of future contract.

(ii) The gain on short futures position if index turns out to be 4500 in three months.

Answer

(i) Current future price of the index = 5,000 + 5,000 (0.09 – 0.06) x 4/12 = 5,000 + 50 = ₹ 5,050

∴ Price of the future contract = ₹ 5,050 x 50 = ₹ 2,52,500

(ii) No. of Future Contract to be short = $\frac{₹\ 10,10,000}{₹\ 2,52,500} \times 1.5 = 6$ contracts

Index after three months turns out to be 4500

Future price will be = 4,500 + 4,500 (0.09 – 0.06) x 1/12 = ₹ 4,511.25

Therefore, Gain from the short futures position is = 6 x (5,050 – 4,511.25) x 50 = ₹ 1,61,625

Question 13

Which position on the index future gives a complete hedge against the following transactions:

(i) The share of Right Limited is going to rise. He has a long position on the cash market of ₹ 50 lakhs on the Right Limited. The beta of the Right Limited is 1.25.

(ii) The share of Wrong Limited is going to depreciate. He has a short position on the cash market of ₹ 25 lakhs on the Wrong Limited. The beta of the Wrong Limited is 0.90.

(iii) The share of Fair Limited is going to stagnant. He has a short position on the cash market of ₹ 20 lakhs of the Fair Limited. The beta of the Fair Limited is 0.75.

Answer

S. No. (1)	Company Name (2)	Trend (3)	Amount (₹) (4)	Beta (5)	(₹) (6) = [(4) x (5)]	Position (7)
(i)	Right Ltd.	Rise	50 lakh	1.25	62,50,000	Short
(ii)	Wrong Ltd.	Depreciate	25 lakh	0.90	22,50,000	Long
(iii)	Fair Ltd.	Stagnant	20 lakh	0.75	15,00,000	Long
					25,00,000	Short

Question 14

Ram buys 10,000 shares of X Ltd. at a price of ₹ 22 per share whose beta value is 1.5 and sells 5,000 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 ₹ 1,000 each. He closes out his 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?

Answer

No. of the Future Contract to be obtained to get a complete hedge

$$= \frac{10,000 \times ₹\ 22 \times 1.5 - 5,000 \times ₹\ 40 \times 2}{₹\ 1,000}$$

$$= \frac{₹\ 3,30,000 - ₹\ 4,00,000}{₹\ 1,000} = 70 \text{ contracts}$$

Thus, 70 Nifty future contracts to be long to obtain a complete hedge.

Cash Outlay

= 10,000 x ₹ 22 – 5,000 x ₹ 40 + 70 x ₹ 1,000

= ₹ 2,20,000 – ₹ 2,00,000 + ₹ 70,000 = ₹ 90,000

Cash Inflow at Close Out

= 10,000 x ₹ 22 x 0.98 – 5,000 x ₹ 40 x 1.03 + 70 x ₹ 1,000 x 0.985

= ₹ 2,15,600 – ₹ 2,06,000 + ₹ 68,950 = ₹ 78,550

Gain/Loss = ₹ 78,550 – ₹ 90,000 = – ₹ 11,450 (Loss)

Question 15

Details about portfolio of shares of an investor is as below:

Shares	No. of shares (lakh)	Price per share	Beta
A Ltd.	3.00	₹ 500	1.40
B Ltd.	4.00	₹ 750	1.20
C Ltd.	2.00	₹ 250	1.60

The investor thinks that the risk of portfolio is very high and wants to reduce the portfolio beta to 0.91. He is considering 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 which are currently traded at ₹ 8,125 and each Nifty futures contract is traded at a multiple of 200.

You are required to determine:

(1) portfolio beta.

(2) the value of risk free securities to be acquired.

(3) the number of shares of each company to be disposed off.

(4) the number of Nifty future contracts to be bought/sold.

(5) the value of portfolio beta for 2% rise in Nifty.

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

Answer

Shares (a)	No. of shares (lakhs) (b)	Market Price per share (c)	Value of Portfolio (₹ lakhs) (d) = (b) x (c)	% to total (e)	Beta (f)	Portfolio Beta (g) = (e) x (f)
A Ltd.	3.00	500.00	1,500.00	0.30	1.40	0.42
B Ltd.	4.00	750.00	3,000.00	0.60	1.20	0.72
C Ltd.	2.00	250.00	500.00	0.10	1.60	0.16
			5,000.00	1.00		1.30

(1) Portfolio beta = 1.30

(2) Required Beta = 0.91

Let the proportion of risk free securities for target beta 0.91 = p

$0.91 = 0 \times p + 1.30 (1 - p)$

$p = 0.30$ i.e. 30%

Shares to be disposed off & risk free securities to be acquired = ₹ 5,000 x 30% = ₹ 1,500 lakh

(3) Number of shares of each company to be disposed off

Shares	% to total	Proportionate amount (₹ lakhs)	MPS	No. of shares (lakhs)
A Ltd.	0.30	450.00	500.00	0.90
B Ltd.	0.60	900.00	750.00	1.20
C Ltd.	0.10	150.00	250.00	0.60

(4) Number of Nifty Contract to be sold

$$\frac{(1.30 - 0.91) \times ₹\ 5,000 \text{ lakh}}{₹\ 8,125 \times 200} = 120 \text{ contracts}$$

(5) 2% rise in Nifty is accompanied by 2% x 1.30 i.e. 2.6% rise for portfolio of shares

	₹ Lakh
Current Value of Portfolio of Shares	5,000
Value of Portfolio after rise [5,000 x 1.026]	5,130
Mark to Market Margin paid [₹ 8,125 x 200 x 120 x 2%]	(39)
Value of the portfolio after rise of Nifty	5,091
% change in value of portfolio [(5,091 – 5,000)/5,000]	1.82%
% rise in the value of Nifty	2%
Beta	0.91

Question 16

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

Determine:

(i) Current portfolio beta.

(ii) Portfolio beta after 3 months if the trader on current date goes for long position on ₹ 100 lakhs Nifty futures.

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

Answer

(i) Current Portfolio Beta

Current Beta for share portfolio = 1.6

Beta for cash = 0

Current portfolio beta = 0.85 x 1.6 + 0 x 0.15 = 1.36

(ii) Portfolio beta after 3 months:

$$\text{Beta for portfolio of shares} = \frac{\text{Change in value of portfolio of share}}{\text{Change in value of market portfolio (Index)}}$$

$$1.6 = \frac{0.032}{\text{Change in value of market portfolio (Index)}}$$

Change in value of market portfolio (Index) = (0.032/1.6) x 100 = 2%

Position taken on 100 lakh Nifty futures: Long

Value of index after 3 months = ₹ 100 lakh x (1.00 – 0.02) = ₹ 98 lakh

Mark to market paid = ₹ 2 lakh

Cash balance after payment of mark to market = ₹ 13 lakh

Value of portfolio after 3 months = ₹ 85 lakh x (1 – 0.032) + ₹ 13 lakh = ₹ 95.28 lakh

$$\text{Change in value of portfolio} = \frac{₹\ 100\ \text{lakh} - ₹\ 95.28\ \text{lakh}}{₹\ 100\ \text{lakh}} = 4.72\%$$

Portfolio beta = 0.0472/0.02 = 2.36

Arbitrage Using Futures

Question 17

The following data relate to Anand Ltd.'s share price:

Current price per share	₹ 1,800
6 months futures price	₹ 1,950

Assuming it is possible to borrow money in the market for transactions in securities at 12% per annum, you are required:

(i) to calculate the theoretical minimum price of a 6 months future.

(ii) to explain arbitrage opportunity.

Answer

(i) Calculation of theoretical minimum price of a 6 months futures contract:

Theoretical minimum price = ₹ 1,800 + (₹ 1,800 x 12/100 x 6/12) = ₹ 1,908

(ii) Arbitrage Opportunity:

The arbitrageur can borrow money @ 12% for 6 months and buy shares at ₹ 1,800. At the same time, he can sell shares in futures market at ₹ 1,950. On the expiry date 6 months later, he could deliver the share and collect ₹ 1,950, pay ₹ 1,908 and record a profit of ₹ 42 (₹ 1,950 – ₹ 1,908).

Question 18

The share of X Ltd. is currently selling for ₹ 300. Risk free interest rate is 0.8% per month. A three months futures contract is selling for ₹ 312. Develop an arbitrage strategy and show what your riskless profit will be 3 months hence, assuming that X Ltd. will not pay any dividend in the next three months.

Answer

The appropriate value of the 3 months futures contract is

F_o = ₹ 300 $(1.008)^3$ = ₹ 307.26

Since the futures price exceeds its appropriate value it pays to do the following:

Action	Initial Cash flow	Cash flow after 3 months
Borrow now and repay with interest after 3 months	₹ 300	–₹ 300 $(1.008)^3$ = –₹ 307.26
Buy a share	–₹ 300	
Sell a futures contract (F_o = 312)		₹ 312
Total	₹ 0	₹ 4.74

Such an action would produce a risk less profit of ₹ 4.74.

Question 19

Calculate the price of 3 months PQR futures, if PQR (Face Value ₹ 10) quotes ₹ 220 on NSE and the three

months future price quotes at ₹ 230 and the borrowing rate is given as 15% per annum and the expected annual dividend is 25%, payable before expiry. Also examine arbitrage opportunities.

Answer

Future Price = Spot + cost of carry – Dividend

F = 220 + (220 x 15% x 3/12) – (10 x 25%) = ₹ 225.75

Thus, we see that fair futures price is ₹ 225.75 which is quoted at ₹ 230 in the exchange.

Analysis of Arbitrage Opportunities:

Since, Fair value of futures is less than the Actual futures Price, Futures is overvalued.

Hence, it is advised to sell it and buying stock in the cash market.

Arbitrageur will buy PQR Stock at ₹ 220 by borrowing at 15% for 3 months. Therefore, his outflows are:

Cost of Stock	₹ 220.00
Add: Interest @ 15% for 3 months i.e. 0.25 years (220 x 0.15 x 0.25)	₹ 8.25
Total Outflows (A)	₹ 228.25

Arbitrageur will settle PQR futures at ₹ 230. Meanwhile he would receive dividend for his stock. Hence, his inflows are:

Sale proceeds of PQR futures	₹ 230.00
Dividend	₹ 2.50
Total inflows (B)	₹ 232.50

Profit earned by Arbitrageur = Inflow – Outflow = ₹ 232.50 – ₹ 228.25 = ₹ 4.25

Gain/Loss [Pay off] on Options

Question 20

Mr. A purchased a 3 months call option for 100 shares in XYZ Ltd. at a premium of ₹ 30 per share, with an exercise price of ₹ 550. He also purchased a 3 months put option for 100 shares of the same company at a premium of ₹ 5 per share with an exercise price of ₹ 450. The market price of the share on the date of Mr. A's purchase of options, is ₹ 500. Calculate the profit or loss that Mr. A would make assuming that the market price falls to ₹ 350 at the end of 3 months.

Answer

Since the market price at the end of 3 months falls to ₹ 350 which is below the exercise price under the call option, the call option will not be exercised. Only put option becomes viable. The gain will be:

	₹
Gain per share (₹ 450 – ₹ 350)	100
Total gain per 100 shares	10,000
Less: Cost or premium paid (₹ 30 x 100) + (₹ 5 x 100)	(3,500)
Net gain	6,500

Question 21

The market received rumour about ABC corporation's tie-up with a multinational company. This has induced the market price to move up. If the rumour is false, the ABC corporation stock price will probably fall dramatically. To protect from this, an investor has bought the call and put options.

He purchased one 3 months call with a striking price of ₹ 42 for ₹ 2 premium, and paid ₹ 1 per share premium for a 3 months put with a striking price of ₹ 40.

(i) Determine the Investor's position if the tie up offer bids the price of ABC Corporation's stock up to ₹ 43 in 3 months.

(ii) Determine the Investor's ending position, if the tie up programme fails and the price of the stocks falls to ₹ 36 in 3 months.

Assume the option size is 100 shares of ABC corporation.

Answer

Cost of Call and Put Options

= (₹ 2 per share x 100 share call) + (₹ 1 per share x 100 share put) = ₹ 2 x 100 + ₹ 1 x 100 = ₹ 300

(i) Price increases to ₹43. Since the market price is higher than the strike price of the call, the investor will exercise it.

Ending position = (–₹ 300 cost of 2 option) + (₹ 1 per share gain on call x 100) = –₹ 300 + ₹ 100

Net Loss = –₹ 200

(ii) The price of the stock falls to ₹ 36. Since the market price is lower than the strike price, the investor may not exercise the call option.

Ending Position = (–₹ 300 cost of 2 options) + (₹ 4 per stock gain on put x 100) = –₹ 300 + 400

Net Gain = ₹ 100

Question 22

Mr. X established the following strategy on the Delta Corporation's stock:

(i) Purchased one 3 months call option with a premium of ₹ 30 and an exercise price of ₹ 550.

(ii) Purchased one 3 months put option with a premium of ₹ 5 and an exercise price of ₹ 450.

Delta Corporation's stock is currently selling at ₹ 500. Determine profit or loss, if the price of Delta Corporation's stock:

(i) remains at ₹ 500 after 3 months.

(ii) falls at ₹ 350 after 3 months.

(iii) rises to ₹ 600.

Assume the option size is 100 shares of Delta Corporation.

Answer

(i) Total premium paid on purchasing a call and put option

= (₹ 30 per share x 100) + (₹ 5 per share x 100) = 3,000 + 500 = ₹ 3,500

In this case, X exercises neither call option nor put option as both will result in a loss for him.

Ending value = –₹ 3,500 + zero gain

Net loss = ₹ 3,500

(ii) Since the price of the stock is below the exercise price of the call, the call will not be exercised. Only put is valuable and is exercised.

Total premium paid = ₹ 3,500

Ending value = –₹ 3,500 + ₹ [(450 – 350) x 100] = –₹ 3,500 + ₹ 10,000

Net gain = ₹ 6,500

(iii) In this situation, the put is worthless, since the price of the stock exceeds the put's exercise price. Only call option is valuable and is exercised.

Total premium paid = ₹ 3,500

Ending value = –3,500 + [(600 – 550) x 100] = –3,500 + 5,000

Net Gain = ₹ 1,500

Question 23

The equity share of VCC Ltd. is quoted at ₹ 210. A 3 months call option is available at a premium of ₹ 6 per share and a 3 months put option is available at a premium of ₹ 5 per share. Ascertain the net payoffs to the option holder of a call option and a put option separately.

(i) the strike price in both cases is ₹ 220; and

(ii) the share price on the exercise day is ₹ 200, 210, 220, 230, 240.

Also indicate the price range at which the call and the put options may be gainfully exercised.

Answer

Net payoff for the holder of the call option **(₹)**

Share price on exercise day	200	210	220	230	240
Option exercise	No	No	No	Yes	Yes
Outflow (Strike price)	Nil	Nil	Nil	220	220
Outflow (premium)	6	6	6	6	6
Total Outflow	6	6	6	226	226
Less: Inflow (Sales proceeds)	–	–	–	230	240
Net payoff	–6	–6	–6	4	14

Net payoff for the holder of the put option **(₹)**

Share price on exercise day	200	210	220	230	240
Option exercise	Yes	Yes	No	No	No
Inflow (strike price)	220	220	Nil	Nil	Nil
Less: Outflow (purchase price)	200	210	–	–	–

Less: Outflow (premium)	5	5	5	5	5
Net Payoff	15	5	–5	–5	–5

The call option can be exercised gainfully for any price above ₹ 226 (₹ 220 + ₹ 6) and put option for any price below ₹ 215 (₹ 220 – ₹ 5).

Expected Value of Option at Maturity

Question 24

You as an investor had purchased a 4 months call option on the equity shares of X Ltd. for a premium of ₹ 10 each, the current market price of the share is ₹ 132 and the exercise price ₹ 150. You expect the price to range between ₹ 120 to ₹ 190.

The expected share price of X Ltd. and related probability is given below:

Expected Price (₹)	120	140	160	180	190
Probability	0.05	0.20	0.50	0.10	0.15

Compute the following:

(i) Expected Share price at the end of 4 months.

(ii) Value of Call Option at the end of 4 months, if the exercise price prevails.

(iii) In case the option is held to its maturity, what will be the expected value of the call option?

Answer

(i) Expected Share Price

= ₹ 120 x 0.05 + ₹ 140 x 0.20 + ₹ 160 x 0.50 + ₹ 180 x 0.10 + ₹ 190 x 0.15

= ₹ 6 + ₹ 28 + ₹ 80 + ₹ 18 + ₹ 28.50 = ₹ 160.50

(ii) Value of Call Option

= ₹ 150 – ₹ 150 = Nil

(iii) If the option is held till maturity, the expected Value of Call Option

Expected price	Value of call (a)	Probability (b)	(a) x (b)
₹ 120	0*	0.05	0
₹ 140	0*	0.20	0
₹ 160	₹ 10	0.50	₹ 5
₹ 180	₹ 30	0.10	₹ 3
₹ 190	₹ 40	0.15	₹ 6
Total			₹ 14

*If the Market price goes below ₹ 150, option is not exercised at all.

Question 25

Equity share of PQR Ltd. is presently quoted at ₹ 320. The Market Price of the share after 6 months has the following probability distribution:

Market Price	₹ 180	₹ 260	₹ 280	₹ 320	₹ 400
Probability	0.1	0.2	0.5	0.1	0.1

A put option with a strike price of ₹ 300 is available.

You are required to find out expected value of option at maturity (i.e. 6 months).

Answer

Expected Value of Option

Expected price	Value of put (a)	Probability (b)	(a) x (b)
₹ 180	₹ 120	0.1	₹ 12
₹ 260	₹ 40	0.2	₹ 8
₹ 280	₹ 20	0.5	₹ 10
₹ 320	0*	0.1	0
₹ 400	0*	0.1	0
Total			₹ 30

*If the Market price goes above ₹ 300, option is not exercised at all. In case of Put option, since Share price is greater than strike price, Option Value would be zero.

Value of Option at Beginning (Binomial Model & Black Scholes Model)

Question 26

The current market price of an equity share of Penchant Ltd is ₹ 420. Within a period of 3 months, the maximum and minimum price of it is expected to be ₹ 500 and ₹ 400 respectively. If the risk free rate of interest be 8% p.a. with continuous compounding, what should be the value of a 3 months Call option under the "Risk Neutral" method at the strike rate of ₹ 450? (Given $e^{0.02} = 1.0202$)

Answer

Let the probability of attaining the maximum price be p

$500 \times p + 400 (1 - p) = 420 \times e^{0.02}$

$500p + 400 - 400p = 420 \times 1.0202$

$100p + 400 = 428.48$

$100p = 28.48$

$p = 0.2848$

The value of Call Option = $\frac{[0.2848 \times (500 - 450)] + 0.7152 \times 0}{1.0202} = \frac{0.2848 \times 50 + 0.7152 \times 0}{1.0202} = ₹ 13.96$

Question 27

Sumana wanted to buy shares of EIL which has a range of ₹ 411 to ₹ 592 a month later. The present price per share is ₹ 421. Her broker informs her that the price of this share can sore up to ₹ 522 within a month or so, so that she should buy a one month CALL of EIL. In order to be prudent in buying the call, the share price should be more than or at least ₹ 522, the assurance of which could not be given by her broker.

Though she understands the uncertainty of the market, she wants to know the probability of attaining the share price ₹ 592 so that buying of a one month CALL of EIL at the execution price of ₹ 522 is justified. Advise her.

Take the risk free interest to be 3.60% p.m. with a continuous compounding. (Given $e^{0.036} = 1.037$)

Answer

$$p = \frac{e^{rt} - d}{u - d}$$

$e^{rt} = e^{0.036} = 1.037$

$d = 411/421 = 0.9762$

$u = 592/421 = 1.4062$

$$p = \frac{e^{0.036} - 0.9762}{1.4062 - 0.9762} = \frac{1.037 - 0.9762}{0.43} = \frac{0.0608}{0.43} = 0.1414$$

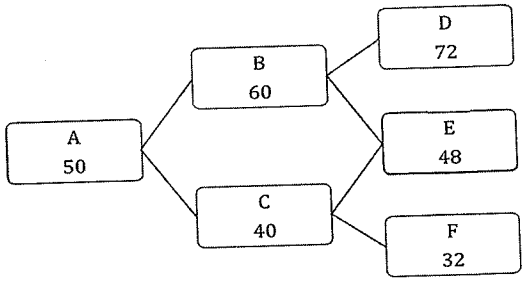
Thus probability of rise in price 0.1414

Question 28

Consider a two year call option with a strike price of ₹ 50 on a stock the current price of which is also ₹ 50. Assume that there are two time periods of one year and in each year the stock price can move up or down by equal percentage of 20%. The risk free interest rate is 6% p.a. Using binominal option model, calculate the probability of price moving up and down. Also draw a two step binomial tree showing prices and payoffs at each node.

Answer

Stock prices in the two step Binominal tree

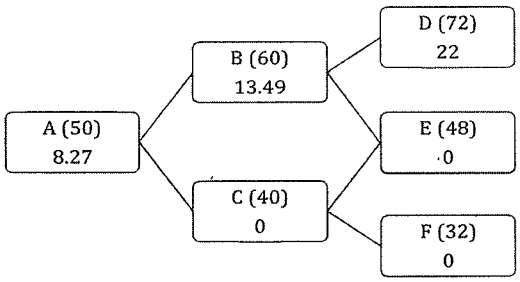


Using the single period model, the probability of price increase is

$$P = \frac{R - d}{u - d} = \frac{1.06 - 0.80}{1.20 - 0.80} = \frac{0.26}{0.40} = 0.65$$

therefore, the probability of price decrease = 1 – 0.65 = 0.35

The two step Binominal tree showing price and pay off



The value of an American call option at nodes D, E and F will be equal to the value of European option at these nodes and accordingly the call values at nodes D, E and F will be ₹ 22, ₹ 0 and ₹ 0. Using the single period binomial model, the value of call option at node 'B' is

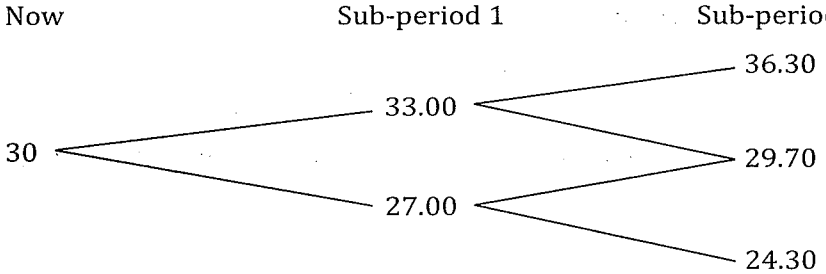
$$C_u = \frac{C_{uu} \times p + C_{ud} (1 - p)}{R} = \frac{22 \times 0.65 + 0 \times 0.35}{1.06} = ₹ 13.49$$

The value of option at node 'A' is

$$C_0 = \frac{13.49 \times 0.65 + 0 \times 0.35}{1.06} = ₹ 8.27$$

Question 29

Following is a two sub-periods tree of 6 months each for the share of CAB Ltd.:



Using the binomial model, calculate the current fair value of a regular call option on CAB Stock with the following characteristics: Strike Price = ₹ 28, Risk Free Rate = 5% p.a.

You should also indicate the composition of the implied riskless hedge portfolio at the valuation date.

Answer

u = 33.00/30.00 = 36.30/33.00 = 1.10

d = 27.00/30.00 = 24.30/27.00 = 0.90

$$r = 1 + \frac{0.05}{2} = 1.025$$

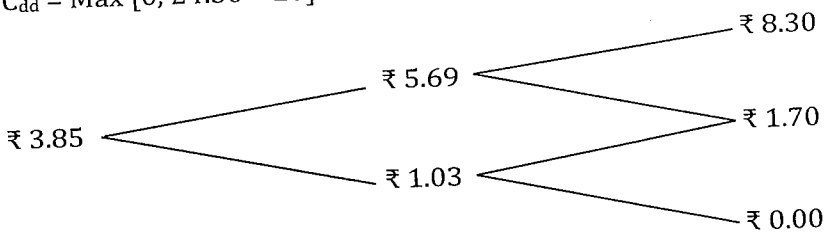
$$p = \frac{r - d}{u - d} = \frac{1.025 - 0.90}{1.10 - 0.90} = 0.125/0.20 = 0.625$$ (Probability of increase in Price of Share)

Prob. of decrease in Price of Share = 1 – 0.625 = 0.375

C_{uu} = Max [0, 36.30 – 28] = 8.30

C_{ud} = Max [0, 29.70 – 28] = 1.70

C_{dd} = Max [0, 24.30 – 28] = 0



$$C_u = \frac{(0.625)\,(8.30) + (0.375)\,(1.70)}{1.025} = \frac{5.19 + 0.64}{1.025} = \frac{5.83}{1.025} = ₹\,5.69$$

$$C_d = \frac{(0.625)\,(1.70) + (0.375)\,(0.00)}{1.025} = \frac{1.06}{1.025} = ₹\,1.03$$

$$C_0 = \frac{(0.625)\,(5.69) + (0.375)\,(1.03)}{1.025} = \frac{3.56 + 0.39}{1.025} = ₹\,3.85$$

The composition of the implied risk-less hedge portfolio at valuation date is called Delta (Δ) and it is calculated as follows:

$$\frac{C_u - C_d}{S_u - S_d}$$

Where,

C_u = Pay-off from Call Option if price of Stock goes up

C_d = Pay-off from Call Option if price of Stock goes down

S_u = Upward price of the Stock

S_d = Downward price of the Stock

Accordingly, the Risk-less Portfolio shall require Δ Share shall be required for writing off one Call Option. The Δ shall be computed as follows:

$$\Delta = \frac{5 - 0}{33 - 27} = \frac{5}{6}$$

Thus, $\frac{5}{6}$ shares shall be held or purchased for writing one Call Option.

Question 30

Mr. Dayal is interested in purchasing equity shares of ABC Ltd. which are currently selling at ₹ 600 each. He expects that price of share may go upto ₹ 780 or may go down to ₹ 480 in three months. The chances of occurring such variations are 60% and 40% respectively. A call option on the shares of ABC Ltd. can be exercised at the end of three months with a strike price of ₹ 630.

(i) What combination of share and option should Mr. Dayal select if he wants a perfect hedge?

(ii) What should be the value of option today (the risk free rate is 10% p.a.)?

(iii) What is the expected rate of return on the option?

Answer

(i) To compute perfect hedge, we shall compute Hedge Ratio (Δ) as follows:

$$\Delta = \frac{C_1 - C_2}{S_1 - S_2} = \frac{150 - 0}{780 - 480} = \frac{150}{300} = 0.50$$

Mr. Dayal should purchase 0.50 share for every 1 call option.

(ii) Value of Option today

If price of share comes out to be ₹ 780 then value of purchased share will be:

Sale Proceeds of Investment (0.50 x ₹ 780)	₹ 390
Loss on account of Short Position (₹ 780 – ₹ 630)	₹ 150
	₹ 240

If price of share comes out to be ₹ 480 then value of purchased share will be:

Sale Proceeds of Investment (0.50 x ₹ 480)	₹ 240

Accordingly, Premium say P shall be computed as follows:

(₹ 300 – P) 1.025 = ₹ 240

P = ₹ 65.85

(iii) Expected Return on the Option

Expected Option Value = (₹ 780 – ₹ 630) x 0.60 + ₹ 0 x 0.40 = ₹ 90

$$\text{Expected Rate of Return} = \frac{90 - 65.85}{65.85} \times 100 = 36.67\%$$

Question 31

The shares of TIC Ltd. are currently priced at ₹ 415 and call option exercisable in three months' time has an exercise rate of ₹ 400. Risk free interest rate is 5% p.a. and standard deviation (volatility) of share price is 22%. TIC Ltd. is not going to declare any dividend over the next three months.

(i) Decide whether the option is worth buying for ₹ 25.

(ii) Calculate value of aforesaid call option based on Black Scholes valuation model, if the current price of share is considered as ₹ 380.

(iii) What would be the worth of put option, if current price of share is considered as ₹ 380?

(iv) Calculate the value of aforesaid call option, if TIC Ltd.'s share price at present is taken as ₹ 408 and a dividend of ₹ 10 is expected to be paid in the two months' time.

Note: Round off z value upto 4 decimal points and all other calculations upto 2 decimal points.

Given:

ln(1.0375) = 0.03681, ln(0.95) = –0.05129, ln(0.9952) = –0.00481

$e^{0.0125} = 1.0126$, $e^{0.00833} = 1.0084$

Cumulative Area of Number of S.D. from Mean:

z	0.0150	0.1250	0.3933	0.5033	–0.2976	–0.4076
Area	0.5060	0.5497	0.6530	0.6926	0.3830	0.3418

Answer

(i) Current Price of share of TIC Ltd. = ₹ 415

Exercise rate = ₹ 400

Risk free interest rate is = 5% p.a.

SD (Volatility) = 22%

Based on the above, Calculation of value of an option based on Black Scholes Model:

$$d_1 = \frac{\ln (415/400) + [0.05 + 0.5\ (0.22)^2]\ 0.25}{0.22\ \sqrt{0.25}} = \frac{0.03681 + 0.01855}{0.11} = 0.5033$$

$$d_2 = \frac{\ln (415/400) + [0.05 - 0.5\ (0.22)^2]\ 0.25}{0.22\ \sqrt{0.25}} = \frac{0.03681 + 0.00645}{0.11} = 0.3933$$

$$V_0 = V_S\ N(d_1) - \frac{E}{e^{rt}} N(d_2)$$

$N(d_1) = N\ (0.5033) = 0.6926$

$N(d_2) = N\ (0.3933) = 0.6530$

$$\text{Value of Option} = 415 \times (0.6926) - \frac{400}{e^{(0.05)(0.25)}} \times (0.6530)$$

$$= 287.43 - \frac{400}{1.0126} \times (0.6530) = 287.43 - 257.95 = ₹\ 29.48$$

Since market price of ₹ 25 is less than ₹ 29.48 (Block Scholes Valuation model) indicate that option is underpriced, hence worth buying.

(ii) If the current price is taken as ₹ 380, the computations are as follows:

$$d_1 = \frac{\ln (380/400) + [0.05 + 0.5\ (0.22)^2]\ 0.25}{0.22\ \sqrt{0.25}} = \frac{-0.05129 + 0.01855}{0.11} = -0.2976$$

$$d_2 = \frac{\ln (380/400) + [0.05 - 0.5\ (0.22)^2]\ 0.25}{0.22\ \sqrt{0.25}} = \frac{-0.05129 + 0.00645}{0.11} = -0.4076$$

$N(d_1) = N\ (-0.2976) = 0.3830$

$N(d_2) = N\ (-0.4076) = 0.3418$

$$\text{Value of Option} = 380 \times (0.3830) - \frac{400}{e^{(0.05)(0.25)}} \times (0.3418)$$

$$= 145.54 - \frac{400}{1.0126} \times (0.3418) = 145.54 - 135.02 = ₹\ 10.52$$

(iii) Value of call option = ₹ 10.52

Current Price of share of TIC Ltd. = ₹ 380

$$\text{Present Value of Exercise Price} = \frac{400}{1.0126} = 395.02$$

Value of Put Option can be found by using Put Call Parity relationship as follows:

$V_p = -V_s + V_c + PV\ (E)$

$V_p = -380 + 10.52 + 395.02 = ₹\ 25.54$

(iv) Since dividend is expected to be paid in two months' time, we have to adjust the share price and then use Black Scholes model to value the option:

$$\text{Present Value of Dividend (using continuous discounting)} = \frac{\text{Dividend}}{e^{rt}}$$

$$= \frac{₹\ 10}{e^{0.05 \times 0.1666}} = \frac{₹\ 10}{e^{0.00833}} = \frac{₹\ 10}{1.0084} = ₹\ 9.92$$

Adjusted price of shares is ₹ 408 – 9.92 = ₹ 398.08

This can be used in Block Scholes model

$$d_1 = \frac{\ln (398.08/400) + [0.05 + 0.5\ (0.22)^2]\ 0.25}{0.22\ \sqrt{0.25}} = \frac{-0.00481 + 0.01855}{0.11} = 0.1250$$

$$d_2 = \frac{\ln (398.08/400) + [0.05 - 0.5\ (0.22)^2]\ 0.25}{0.22\ \sqrt{0.25}} = \frac{-0.00481 + 0.00645}{0.11} = 0.0150$$

$N(d_1) = N\ (0.1250) = 0.5497$

$N(d_2) = N\ (0.0150) = 0.5060$

$$\text{Value of Option} = 398.08 \times (0.5497) - \frac{400}{e^{(0.05)(0.25)}} \times (0.5060)$$

$$= 218.82 - \frac{400}{1.0126} \times (0.5060) = 218.82 - 199.88 = ₹\ 18.94$$

Question 32

From the following data for certain stock, find the value of a call option:

Price of stock now	₹ 80
Exercise price	₹ 75
Standard deviation of continuously compounded annual return	0.40
Maturity period	6 months
Annual interest rate	12%

Note: Round off z value upto 4 decimal points and all other calculations upto 2 decimal points.

Given:

$\ln(1.0667) = 0.0646$

$e^{0.06} = 1.062$

Area of the left or right (one tail) of Number of S.D. from Mean:

Number of S.D. from Mean, (z)	Area of the left or right (one tail)
0.25	0.4013
0.30	0.3821
0.55	0.2912
0.60	0.2743

Answer

Applying the Black Scholes Formula, Value of the Call option now:

$C = S\,N(d_1) - K\,e^{(-rt)}\,N(d_2)$

$$d_1 = \frac{\ln (S/K) + (r + \sigma^2/2)\,t}{\sigma \sqrt{t}}$$

$d_2 = d_1 - \sigma \sqrt{t}$

Where,

C = Theoretical call premium

S = Current stock price

t = time until option expiration

K = option striking price

r = risk free interest rate

N = Cumulative standard normal distribution

e = exponential term

σ = Standard deviation of continuously compounded annual return

ln = natural logarithm

$$d_1 = \frac{\ln(1.0667) + (0.12 + 0.08)\,0.5}{0.40\,\sqrt{0.5}}$$

$$= \frac{0.0646 + (0.2)\,0.5}{0.40 \times 0.7071}$$

$$= \frac{0.1646}{0.2828}$$

$= 0.5820$

$d_2 = 0.5820 - 0.2828 = 0.2992$

$N(d_1) = N\,(0.5820)$

$N(d_2) = N\,(0.2992)$

Value of option $= S\,N\,(d_1) - K\,e^{(-rt)}\,N(d_2)$

$$= 80 \times N(d_1) - \frac{75}{1.062} \times N\,(d_2)$$

$N(d_1) = N\,(0.5820) = 0.7196$

$N(d_2) = N\,(0.2992) = 0.6176$

$$\text{Value of option} = 80 \times 0.7196 - \frac{75}{1.062} \times 0.6176$$

$= 57.57 - 70.62 \times 0.6176$

$= 57.57 - 43.61$

$= ₹\ 13.96$

Note: Values of $N(d_1)$ and $N(d_2)$ have been computed by interpolating the values of cumulative areas

under respective numbers of SD from Mean (z) given in the question.

Cumulative Areas under respective numbers of SD from Mean (z) are as follows:

Number of S.D. from Mean, (z)	Cumulative Area
0.25	0.5987
0.30	0.6179
0.55	0.7088
0.60	0.7257

Equity Swap

Question 33

CMT Pension Fund has a portfolio of shares of diversified companies valued at ₹ 800 crore enters into a swap arrangement with Boom Bank on the terms that it will get 1.15% quarterly on notional principal of ₹ 800 crore in exchange of return on portfolio which is exactly tracking the Sensex which is presently 43200.

You are required to determine the net payment to be received/paid if Sensex turns out to be 43720, 43560, 44160 and 43920 at the end of each quarter.

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

Answer

Qtrs. (1)	Sensex (2)	Sensex Return (%) (3)	Amount Payable (₹ Crore) (4)	Fixed Return (Receivable) (₹ Crore) (5)	Net (₹ Crore) (6) = (5) – (4)
0	43200	–	–	–	–
1	43720	1.2037	9.6296	9.2000	–0.4296
2	43560	–0.3660	–2.9280	9.2000	12.1280
3	44160	1.3774	11.0192	9.2000	–1.8192
4	43920	–0.5435	–4.3480	9.2000	13.5480

Commodity Derivatives

Question 34

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(%)^2 and 36(%)^2 respectively, having correlation coefficient of 0.75. The 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.

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

Note: 1 MT = 1,000 kg.

Answer

(i) The optimal hedge ratio to minimize the variance of Hedger's position is given by:

$$H = \rho \frac{\sigma_S}{\sigma_F}$$

Where,

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

σ_F = 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 $\Delta S = \sqrt{16(\%)^2} = 4\%$ and

Standard deviation of $\Delta F = \sqrt{36(\%)^2} = 6\%$ and

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

(ii) Since the company has long position in Spot (Cash) Market, it shall take Short Position in Future Market.

(iii) Since contact size of one contract is 1,000 Kg,

$$\text{No. of contract to be short} = \frac{10{,}000 \text{ Kgs}}{1{,}000 \text{ Kgs}} \times 0.50 = 5 \text{ Contracts}$$

Amount = 10,000 x ₹ 534 x 0.50 = ₹ 26,70,000

Question 35

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	₹ 70 per kg.
3 month's future is trading at	₹ 68 per kg.
Expected Lower price after 3 months	₹ 64 per kg.
Contract size	500 kg. per 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 per kg. and the 3 months future contract price for closing the contract is

(A) ₹ 72 per kg.

(B) ₹ 67 per kg.

Answer

(i) In order to hedge its position, Mr. V (trader) should use Future Contracts.

Particulars	
(a) Quantity of Rice to be hedged	24,000 kg.
(b) Contract Size	500 kg.
(c) No. of Contracts (a/b)	48
(d) Future Price	₹ 68 per kg.
(e) Exposure in the future market (a x d)	₹ 16,32,000

(ii) Mr. V should short 48 Future contracts at the price ₹ 68 per kg. and cancel its position after 3 months by buying Future contract at prevailing Future price.

(iii) After 3 months, trader would cancel its position in the future by buying a future contract of same quantity and will sell Rice in the spot market and position shall be as follows:

Particulars		**(A)**	**(B)**
(a) Price of Future Contract		₹ 72 per kg.	₹ 67 per kg.
(b) Amount bought		₹ 17,28,000	₹ 16,08,000
(c) Exposure		₹ 16,32,000	₹ 16,32,000
(d) Gain/(Loss) on future position	(b – c)	(₹ 96,000)	₹ 24,000
(e) Spot Price		₹ 69 per kg.	₹ 69 per kg.
(f) Amount realized by selling in the spot market		₹ 16,56,000	₹ 16,56,000
(g) Effective Selling Amount	(f + d)	₹ 15,60,000	₹ 16,80,000
(g) Effective Selling Price		₹ 65 per kg.	₹ 70 per kg.

Section B – Theory Questions

Question 1

Write short note on Marking to market.

Answer

It implies the **process of recording the investments** in traded securities (shares, debt-instruments, etc.) **at** a value, which reflects the **market value** of securities on the reporting date. In the context of derivatives trading, the **futures contracts are marked to market on** periodic (or **daily**) **basis**. Marking to market essentially means that **at the end of a trading session, all outstanding contracts are repriced at the settlement price** of that session. Unlike the forward contracts, the future contracts are repriced every day. Any **loss or profit resulting from repricing would be debited or credited to the margin account** of the broker. It, therefore, provides an opportunity to calculate the extent of liability on the basis of repricing. Thus, the futures contracts provide better risk management measure as compared to forward contracts.

Question 2

What are the reasons for stock index futures becoming more popular financial derivatives over stock futures segment in India?

Answer

Advantages of Stock Index Futures Trading Vs Stock Futures Trading

Stock index futures is most popular financial derivatives over stock futures due to following reasons:

(i) It **adds flexibility** to one's investment portfolio. Institutional investors and other large equity holders prefer this instrument the most in terms of portfolio hedging purpose. The stock systems do not provide this flexibility and hedging.

(ii) It **creates the possibility of speculative gains** using leverage. Because a relatively small amount of margin money controls a large amount of capital represented in a stock index contract, a small change in the index level might produce a profitable return on one's investment, if one is right about the direction of the market. Speculative gains in stock futures are limited but liabilities are greater.

(iii) Stock index futures are the most **cost-efficient hedging device** whereas hedging through individual stock futures is costlier.

(iv) Stock index futures **cannot be easily manipulated** whereas individual stock price can be exploited more easily.

(v) In case of individual stocks, the outstanding positions are settled normally against physical delivery of shares. In case of stock index futures, they are **settled in cash** all over the world on the premise that index value is safely accepted as the settlement price.

(vi) It is also seen that **regulatory complexity is much less** in the case of stock index futures in comparison to stock futures.

(vii) It **provides hedging** or insurance protection **for a stock portfolio** in a falling market.

Question 3

State any four assumptions of Black Scholes Model.

Answer

The following assumptions accompany the model:

(i) **European Options** are considered.

(ii) **No transaction costs**.

(iii) **Short term interest rates are** known and are **constant**.

(iv) Stocks do not pay dividend.

(v) Stock price movement is similar to a random walk.

(vi) Stock returns are normally distributed over a period of time.

(vii) The **variance of the return is constant** over the life of an Option.

Question 4

Define the term Greeks with respect to options.

Answer

The Greeks are a **collection of statistical values** (expressed as percentages) **that give** the investor a **better overall view of how a stock has been performing**. These statistical values can be **helpful in deciding** what **options strategies** are best to use. The investor should remember that **statistics show trends based on past performance**. It is not guaranteed that future performance of stock will behave according to historical numbers. These trends can change drastically based on new stock performance.

Question 5

Explain necessary conditions of Commodity Derivatives.

OR

"The commodity characteristic approach defines feasible commodities for derivatives trading based on an extensive list of required commodity attributes." What are the required attributes?

Answer

The following attributes are considered crucial for qualifying for the derivatives trade:

(i) A **commodity should be durable** and it should be possible to store it.

(ii) **Units must be homogeneous**.

(iii) The **commodity must be subject to frequent price fluctuations** with wide amplitude; supply and demand must be large.

(iv) **Supply must flow naturally to market** and there must be breakdowns in an existing pattern of forward contracting.

CHAPTER - 10
Foreign Exchange Exposure and Risk Management

Section A – Practical Questions

Basics

Question 1

On April 1, 3 months interest rate in the UK£ and US$ are 7.5% and 3.5% per annum respectively. The UK£/US$ spot rate is 0.7570. What would be the forward rate for US$ for delivery on 30th June?

Answer

As per interest rate parity

$$S_1 = S_0 \times \frac{1 + Int_{UK}}{1 + Int_{US}}$$

$$S_1 = £\ 0.7570 \times \frac{1 + (0.075 \times 3/12)}{1 + (0.035 \times 3/12)}$$

$$S_1 = £\ 0.7570 \times \frac{1.01875}{1.00875}$$

$= £\ 0.7570 \times 1.0099 = £\ 0.7645$

$=$ UK£ 0.7645/US$

Question 2

The rate of inflation in India is 8% per annum and in the U.S.A. it is 4%. The current spot rate for USD in India is ₹ 46. What will be the expected rate after 1 year and after 4 years applying the Purchasing Power Parity Theory?

Answer

End of Year	₹	₹/USD
1	₹ 46.00 x (1+0.08)/(1+0.04)	47.77
2	₹ 47.77 x (1+0.08)/(1+0.04)	49.61
3	₹ 49.61 x (1+0.08)/(1+0.04)	51.52
4	₹ 51.52 x (1+0.08)/(1+0.04)	53.50

Question 3

The US dollar is selling in India at ₹ 55.50. If the interest rate for 6 months borrowing in India is 10% per annum and the corresponding rate in USA is 4%.

(i) Do you expect that US dollar will be at a premium or at discount in the Indian Forex Market?

(ii) What will be the expected 6-months forward rate for US dollar in India? and

(iii) What will be the rate of forward premium or discount?

Answer

(i) Under the given circumstances, the USD is expected to quote at a premium in India as the interest rate is higher in India.

(ii) Calculation of the forward rate:

$$\frac{1 + R_h}{1 + R_f} = \frac{F_1}{F_0}$$

Where: R_h is home currency interest rate, R_f is foreign currency interest rate, F_1 is end of the period forward rate, and F_o is the spot rate.

Therefore,

$$\frac{1 + (0.10/2)}{1 + (0.04/2)} = \frac{F_1}{55.50}$$

$$\frac{1 + (0.05)}{1 + (0.02)} = \frac{F_1}{55.50}$$

$$\frac{1.05}{1.02} \times 55.50 = F_1$$

$$\frac{58.275}{1.02} = F_1$$

F_1 = ₹ 57.13

(iii) Rate of premium:

$$\frac{57.13 - 55.50}{55.50} \times \frac{12}{6} \times 100 = 5.87\%$$

Question 4

On April 3, 2022, a Bank quotes the following:

Spot exchange Rate (US $1)	INR 66.2525	INR 67.5945
2 months' swap points	70	90
3 months' swap points	160	186

In a spot transaction, delivery is made after two days.

Assume spot date as April 5, 2022.

Assume 1 swap point = 0.0001

You are required to:

(i) ascertain swap points for 2 months and 15 days. (For June 20, 2022),

(ii) determine foreign exchange rate for June 20, 2022, and

(iii) compute the annual rate of premium/discount of US$ on INR, on an average rate.

Answer

(i) Swap Points for 2 months and 15 days

	Bid	Ask
Swap Points for 2 months (a)	70	90
Swap Points for 3 months (b)	160	186
Swap Points for 30 days (c) = (b) – (a)	90	96
Swap Points for 15 days (d) = (c)/2	45	48
Swap Points for 2 months & 15 days (e) = (a) + (d)	115	138

(ii) Foreign Exchange Rates for 20th June 2022

	Bid	Ask
Spot Rate (a)	66.2525	67.5945
Swap Points for 2 months & 15 days (b)	0.0115	0.0138
	66.2640	67.6083

(iii) Annual Rate of Premium

	Bid	Ask
Spot Rate (a)	66.2525	67.5945
Foreign Exchange Rates for 20th June 2022 (b)	66.2640	67.6083
Premium (c)	0.0115	0.0138
Total (d) = (a) + (b)	132.5165	135.2028
Average (d)/2	66.2583	67.6014
Premium	$\frac{0.0115}{66.2583} \times \frac{12}{2.5} \times 100$ = 0.0833%	$\frac{0.0138}{67.6014} \times \frac{12}{2.5} \times 100$ = 0.0980%

Fate of Forward Contract

Question 5

A customer entered into a two month forward contract for Buying 10,000 $ on 1.01.2022 with a Bank. The exchange rates in the interbank market on following dates were:

1.01.2022	Spot	1 $ = ₹ 40/40.50
	2 Month Forward	0.50/0.60

1.02.2022	Spot	1 $ = ₹ 40.10/40.65
	1 Month Forward	0.45/0.75
	2 Month Forward	0.65/0.80
1.03.2022	Spot	1 $ = ₹ 40.80/40.95
	1 Month Forward	0.25/0.50
3.03.2022	Spot	1 $ = ₹ 40.85/41.00
	1 Month Forward	0.30/0.40
4.03.2022	Spot	1 $ = ₹ 40.90/41.05

Exchange Margin is 0.10%.

Interest Rate on Deposit (Inflow of Funds) is 8% and on Advance (Outflow of Funds) is 12%.

Rates rounded to 4 decimals in multiples of 0.0025. Assume 365 days in a year.

Calculate the consequence if:

(i) Customer wants the delivery on due date

(ii) Customer wants delivery on 1.02.2022

(iii) Customer cancels the contract on Due Date

(iv) Customer cancels the contract on 1.02.2022

(v) Customer cancels the contract on 3.03.2022

(vi) Customer does not approach the bank

(vii) Customer wants delivery on 3.03.2022

(viii) Customer extends the contract for one month on due date

(ix) Customer extends the contract for two months on 1.02.2022

(x) Customer extends the contract for one month on 3.03.2022

Answer

(i) Customer wants delivery on due date (i.e. 1.03.2022)

Dealer (Local Bank)						
Contract with Customer				**Contract with Inter-Bank Market**		
Date	Transaction			Date	Transaction	
1.1.22	2 Month Forward Sale			1.1.22	2 Month Forward Buy	
	Spot (High)	1$ =	₹ 40.50		Spot (High)	1$ = ₹ 40.50
	(+) Prm. (High)		₹ 0.60		(+) Prm. (High)	₹ 0.60
		1$ =	₹ 41.10			1$ = ₹ 41.10
	(+) E.M. @0.10$		₹ 0.0411			
		1$ =	₹ 41.1411			
	Rounding Off	1$ =	₹ 41.1400			

Customer will take delivery by paying @ 1$ = ₹ 41.14

(ii) Customer wants delivery on 1.02.2022 (i.e. Early Delivery)

Dealer (Local Bank)	
Contract with Customer	**Contract with Inter-Bank Market**
Date Transaction	Date Transaction
1.1.22 2 Month Forward Sale	1.1.22 2 Month Forward Buy
Spot (High) 1$ = ₹ 40.50	Spot (High) 1$ = ₹ 40.50
(+) Prm. (High) ₹ 0.60	(+) Prm. (High) ₹ 0.60
1$ = ₹ 41.10	1$ = ₹ 41.10
(+) E.M. @0.10$ ₹ 0.0411	
1$ = ₹ 41.1411	
Rounding Off 1$ = ₹ 41.1400	
1.2.22 Request for delivery	1.2.22 Spot Buy (High) @ 1$ = ₹ 40.65
	1.2.22 1 Month Forward Sale
	Spot (Low) 1$ = ₹ 40.10
	(+) Prm. (Low) ₹ 0.45
	1$ = ₹ 40.55

Calculation of profit/loss:

1. Swap Loss

Spot Buy @	1$ = ₹ 40.65
1 Month Forward Sale @	1$ = ₹ 40.55
Swap Loss @	1$ = ₹ 0.10
Total Swap Loss = ₹ 0.10 x 10,000 $ = ₹ 1,000	

2. Interest

Inflow	1$ = ₹ 41.14
Outflow	1$ = ₹ 40.65
Net Inflow @	1$ = ₹ 0.49
Total Inflow = ₹ 0.49 x 10,000 $ = ₹ 4,900	
Interest Inflow = ₹ 4,900 x 8% x 28/365 = ₹ 30	

3. Net Loss = ₹ 1,000 – ₹ 30 = ₹ 970

After paying ₹ 970 customer can take delivery @ 1$ = ₹ 41.14

(iii) Customer cancel the contract on due date (i.e. 1.03.2022)

Dealer (Local Bank)	
Contract with Customer	**Contract with Inter-Bank Market**

Date	Transaction		
1.1.22	2 Month Forward Sale		
	Spot (High)	1$ =	₹ 40.50
	(+) Prm. (High)		₹ 0.60
		1$ =	₹ 41.10
	(+) E.M. @0.10$		₹ 0.0411
		1$ =	₹ 41.1411
	Rounding Off	1$ =	₹ 41.1400
1.3.22	Request for Cancellation		

Date	Transaction		
1.1.22	2 Month Forward Buy		
	Spot (High)	1$ =	₹ 40.50
	(+) Prm. (High)		₹ 0.60
		1$ =	₹ 41.10
1.3.22	Cancellation		
	Spot Sale (Low) @	1$ =	₹ 40.80
	(-) E.M. @0.10%		₹ 0.0408
		1$ =	₹ 40.7592
	Rounding Off	1$ =	₹ 40.7600

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Sale @	1$ =	₹ 41.14
Spot Sale @	1$ =	₹ 40.76
Exchange Difference (Cancellation Loss) @	1$ =	₹ 0.38
Total Exchange Difference (Cancellation Loss) = ₹ 0.38 x 10,000 $ = ₹ 3,800		

2. Net Loss = ₹ 3,800

Customer have to pay ₹ 3,800 for cancellation charges

(iv) Customer cancel the contract on 1.02.2022 (i.e. Early Cancellation)

Dealer (Local Bank)

Contract with Customer

Date	Transaction		
1.1.22	2 Month Forward Sale		
	Spot (High)	1$ =	₹ 40.50
	(+) Prm. (High)		₹ 0.60
		1$ =	₹ 41.10
	(+) E.M. @0.10$		₹ 0.0411
		1$ =	₹ 41.1411
	Rounding Off	1$ =	₹ 41.1400
1.2.22	Request for Cancellation		

Contract with Inter-Bank Market

Date	Transaction		
1.1.22	2 Month Forward Buy		
	Spot (High)	1$ =	₹ 40.50
	(+) Prm. (High)		₹ 0.60
		1$ =	₹ 41.10
1.2.22	Cancellation (1 Month Forward Sale)		

	Spot (Low)	1$ = ₹ 40.10
	(+) Prm. (Low)	₹ 0.45
		1$ = ₹ 40.55
	(-) E.M. @0.10%	₹ 0.0406
		1$ = ₹ 40.5094
	Rounding Off	1$ = ₹ 40.5100

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Sale @	1$ = ₹ 41.14
1 Month Forward Sale @	1$ = ₹ 40.51
Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.63
Total Exchange Difference (Cancellation Loss) = ₹ 0.63 x 10,000 $ = ₹ 6,300	

2. Net Loss = ₹ 6,300

Customer have to pay ₹ 6,300 for cancellation charges

(v) Customer cancel the contract on 3.03.2022 (i.e. Late Cancellation)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Sale		1.1.22	2 Month Forward Buy	
	Spot (High)	1$ = ₹ 40.50		Spot (High)	1$ = ₹ 40.50
	(+) Prm. (High)	₹ 0.60		(+) Prm. (High)	₹ 0.60
		1$ = ₹ 41.10			1$ = ₹ 41.10
	(+) E.M. @0.10$	₹ 0.0411			
		1$ = ₹ 41.1411			
	Rounding Off	1$ = ₹ 41.1400			
1.3.22	Does not approach		1.3.22	Spot Sale (Low) @	1$ = ₹ 40.80
			1.3.22	Nearest Forward (1 Month) Open Buy	
				Spot (High)	1$ = ₹ 40.95
				(+) Prm. (High)	₹ 0.50
					1$ = ₹ 41.45
3.3.22	Request for Cancellation		3.3.22	Cancellation	
				Spot Sale (Low) @	1$ = ₹ 40.85
				(-) E.M. @0.10%	₹ 0.0409

		₹ 40.8091
	Rounding Off	1$ = ₹ 40.8100

Calculation of profit/loss:

1. Swap Loss

Spot Sale @	1$ =	₹ 40.80
Nearest Forward (1 Month) Open Buy @	1$ =	₹ 41.45
Swap Loss @	1$ =	₹ 0.65
Total Swap Loss = ₹ 0.65 x 10,000 $ = ₹ 6,500		

2. Interest

Inflow	1$ =	₹ 40.80
Outflow	1$ =	₹ 41.10
Net Outflow @	1$ =	₹ 0.30
Total Outflow = ₹ 0.30 x 10,000 $ = ₹ 3,000		
Interest Outflow = ₹ 3,000 x 12% x 2/365 = ₹ 2		

3. Exchange Difference (Cancellation Loss)

2 Month Forward Sale @	1$ =	₹ 41.14
Spot Sale @	1$ =	₹ 40.81
Exchange Difference (Cancellation Loss) @	1$ =	₹ 0.33
Total Exchange Difference (Cancellation Loss) = ₹ 0.33 x 10,000 $ = ₹ 3,300		

4. Net Loss = ₹ 6,500 + ₹ 2 + ₹ 3,300 = ₹ 9,802

Customer have to pay ₹ 9,802 for cancellation charges

(vi) Customer does not approach the bank (i.e. Automatic Cancellation)

Dealer (Local Bank)					
Contract with Customer				**Contract with Inter-Bank Market**	
Date	Transaction			Date	Transaction
1.1.22	2 Month Forward Sale			1.1.22	2 Month Forward Buy
	Spot (High)	1$ =	₹ 40.50		Spot (High) 1$ = ₹ 40.50
	(+) Prm. (High)		₹ 0.60		(+) Prm. (High) ₹ 0.60
		1$ =	₹ 41.10		1$ = ₹ 41.10
	(+) E.M. @0.10$		₹ 0.0411		
		1$ =	₹ 41.1411		
	Rounding Off	1$ =	₹ 41.1400		
1.3.22	Does not approach			1.3.22	Spot Sale (Low) @ 1$ = ₹ 40.80

	1.3.22 Nearest Forward (1 Month) Open Buy Spot (High) 1$ = ₹ 40.95 (+) Prm. (High) ₹ 0.50 1$ = ₹ 41.45
4.3.22 Does not approach	4.3.22 Cancellation Spot Sale (Low) @ 1$ = ₹ 40.90 (-) E.M. @0.10% ₹ 0.0409 1$ = ₹ 40.8591 Rounding Off 1$ = ₹ 40.8600

Calculation of profit/loss:

1. Swap Loss

Spot Sale @	1$ = ₹ 40.80
Nearest Forward (1 Month) Open Buy @	1$ = ₹ 41.45
Swap Loss @	1$ = ₹ 0.65
Total Swap Loss = ₹ 0.65 x 10,000 $ = ₹ 6,500	

2. Interest

Inflow	1$ = ₹ 40.80
Outflow	1$ = ₹ 41.10
Net Outflow @	1$ = ₹ 0.30
Total Outflow = ₹ 0.30 x 10,000 $ = ₹ 3,000	
Interest Outflow = ₹ 3,000 x 12% x 3/365 = ₹ 3	

3. Exchange Difference (Cancellation Loss)

2 Month Forward Sale @	1$ = ₹ 41.14
Spot Sale @	1$ = ₹ 40.86
Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.28
Total Exchange Difference (Cancellation Loss) = ₹ 0.28 x 10,000 $ = ₹ 2,800	

4. Net Loss = ₹ 6,500 + ₹ 3 + ₹ 2,800 = ₹ 9,303

Customer have to pay ₹ 9,303 for cancellation charges

(vii) Customer wants delivery on 3.03.2022 (i.e. Late Delivery)

Dealer (Local Bank)	
Contract with Customer	**Contract with Inter-Bank Market**
Date Transaction	Date Transaction
1.1.22 2 Month Forward Sale	1.1.22 2 Month Forward Buy

	Spot (High)	1$ =	₹ 40.50		Spot (High)	1$ =	₹ 40.50
	(+) Prm. (High)		₹ 0.60		(+) Prm. (High)		₹ 0.60
		1$ =	₹ 41.10			1$ =	₹ 41.10
	(+) E.M. @0.10$		₹ 0.0411				
		1$ =	₹ 41.1411				
	Rounding Off	1$ =	₹ 41.1400				
1.3.22	Does not approach			1.3.22	Spot Sale (Low) @	1$ =	₹ 40.80
				1.3.22	Nearest Forward (1 Month) Open Buy		
					Spot (High)	1$ =	₹ 40.95
					(+) Prm. (High)		₹ 0.50
						1$ =	₹ 41.45
3.3.22	Request for Delivery			3.3.22	Cancellation		
3.3.22	New Contract for Spot Sale				Spot Sale (Low) @	1$ =	₹ 40.85
	Spot (High)	1$ =	₹ 41		(-) E.M. @0.10%		₹ 0.0409
	(+) E.M. @0.10$		₹ 0.0410				₹ 40.8091
		1$ =	₹ 41.0410		Rounding Off	1$ =	₹ 40.8100
	Rounding Off	1$ =	₹ 41.0400				

Calculation of profit/loss:

1. Swap Loss

Spot Sale @	1$ =	₹ 40.80
Nearest Forward (1 Month) Open Buy @	1$ =	₹ 41.45
Swap Loss @	1$ =	₹ 0.65
Total Swap Loss = ₹ 0.65 x 10,000 $ = ₹ 6,500		

2. Interest

Inflow	1$ =	₹ 40.80
Outflow	1$ =	₹ 41.10
Net Outflow @	1$ =	₹ 0.30
Total Outflow = ₹ 0.30 x 10,000 $ = ₹ 3,000		
Interest Outflow = ₹ 3,000 x 12% x 2/365 = ₹ 2		

3. Exchange Difference (Cancellation Loss)

2 Month Forward Sale @	1$ =	₹ 41.14
Spot Sale @	1$ =	₹ 40.81

Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.33
Total Exchange Difference (Cancellation Loss) = ₹ 0.33 x 10,000 $ = ₹ 3,300	

4. Net Loss = ₹ 6,500 + ₹ 2 + ₹ 3,300 = ₹ 9,802

After paying ₹ 9,802 customer can take delivery @ 1$ = ₹ 41.04

(viii) Customer extends the contract for 1 Month on due date (i.e. 1.03.2022)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Sale		1.1.22	2 Month Forward Buy	
	Spot (High)	1$ = ₹ 40.50		Spot (High)	1$ = ₹ 40.50
	(+) Prm. (High)	₹ 0.60		(+) Prm. (High)	₹ 0.60
		1$ = ₹ 41.10			1$ = ₹ 41.10
	(+) E.M. @0.10$	₹ 0.0411			
		1$ = ₹ 41.1411			
	Rounding Off	1$ = ₹ 41.1400			
1.3.22	Request for Extension		1.3.22	Cancellation	
1.3.22	New Contract for 1 M Forward Sale			Spot Sale (Low) @	1$ = ₹ 40.80
	Spot (High)	1$ = ₹ 40.95		(-) E.M. @0.10%	₹ 0.0408
	(+) Prm. (High)	₹ 0.50			1$ = ₹ 40.7592
		1$ = ₹ 41.45		Rounding Off	1$ = ₹ 40.7600
	(+) E.M. @0.10$	₹ 0.0415			
		1$ = ₹ 41.4915			
	Rounding Off	1$ = ₹ 41.4925			

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Sale @	1$ = ₹ 41.14
Spot Sale @	1$ = ₹ 40.76
Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.38
Total Exchange Difference (Cancellation Loss) = ₹ 0.38 x 10,000 $ = ₹ 3,800	

2. Net Loss = ₹ 3,800

Customer have to pay ₹ 3,800 for extension @ 1$ = ₹ 41.4925

(ix) Customer extends the contract for 2 Months on 1.02.2022 (i.e. Early Extension)

Dealer (Local Bank)

Contract with Customer			Contract with Inter-Bank Market		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Sale		1.1.22	2 Month Forward Buy	
	Spot (High)	1$ = ₹ 40.50		Spot (High)	1$ = ₹ 40.50
	(+) Prm. (High)	₹ 0.60		(+) Prm. (High)	₹ 0.60
		1$ = ₹ 41.10			1$ = ₹ 41.10
	(+) E.M. @0.10$	₹ 0.0411			
		1$ = ₹ 41.1411			
	Rounding Off	1$ = ₹ 41.1400			
1.2.22	Request for Extension		1.2.22	Cancellation (1 Month Forward Sale)	
1.2.22	New Contract for 2 M Forward Sale			Spot (Low)	1$ = ₹ 40.10
	Spot (High)	1$ = ₹ 40.65		(+) Prm. (Low)	₹ 0.45
	(+) Prm. (High)	₹ 0.80			1$ = ₹ 40.55
		1$ = ₹ 41.45		(-) E.M. @0.10%	₹ 0.0406
	(+) E.M. @0.10$	₹ 0.0415			1$ = ₹ 40.5094
		1$ = ₹ 41.4915		Rounding Off	1$ = ₹ 40.5100
	Rounding Off	1$ = ₹ 41.4925			

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Sale @	1$ = ₹ 41.14
1 Month Forward Sale @	1$ = ₹ 40.51
Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.63
Total Exchange Difference (Cancellation Loss) = ₹ 0.63 x 10,000 $ = ₹ 6,300	

2. Net Loss = ₹ 6,300

Customer have to pay ₹ 6,300 for extension @ 1$ = ₹ 41.4925

(x) Customer extends the contract for 1 Month on 3.3.2022 (i.e. Late Extension)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Sale		1.1.22	2 Month Forward Buy	
	Spot (High)	1$ = ₹ 40.50		Spot (High)	1$ = ₹ 40.50
	(+) Prm. (High)	₹ 0.60		(+) Prm. (High)	₹ 0.60
		1$ = ₹ 41.10			1$ = ₹ 41.10
	(+) E.M. @0.10$	₹ 0.0411			

		1$ = ₹ 41.1411
	Rounding Off	1$ = ₹ 41.1400
1.3.22	Does not approach	
3.3.22	Request for Extension	
3.3.22	New Contract for 1 M Forward Sale	
	Spot (High)	1$ = ₹ 41
	(+) Prm. (High)	₹ 0.40
		1$ = ₹ 41.40
	(+) E.M. @0.10$	₹ 0.0414
		1$ = ₹ 41.4414
	Rounding Off	1$ = ₹ 41.4425

1.3.22	Spot Sale (Low) @	1$ = ₹ 40.80
1.3.22	Nearest Forward (1 Month) Open Buy	
	Spot (High)	1$ = ₹ 40.95
	(+) Prm. (High)	₹ 0.50
		1$ = ₹ 41.45
3.3.22	Cancellation	
	Spot Sale (Low) @	1$ = ₹ 40.85
	(-) E.M. @0.10%	₹ 0.0409
		₹ 40.8091
	Rounding Off	1$ = ₹ 40.8100

Calculation of profit/loss:

1. Swap Loss

Spot Sale @	1$ = ₹ 40.80
Nearest Forward (1 Month) Open Buy @	1$ = ₹ 41.45
Swap Loss @	1$ = ₹ 0.65
Total Swap Loss = ₹ 0.65 x 10,000 $ = ₹ 6,500	

2. Interest

Inflow	1$ = ₹ 40.80
Outflow	1$ = ₹ 41.10
Net Outflow @	1$ = ₹ 0.30
Total Outflow = ₹ 0.30 x 10,000 $ = ₹ 3,000	
Interest Outflow = ₹ 3,000 x 12% x 2/365 = ₹ 2	

3. Exchange Difference (Cancellation Loss)

2 Month Forward Sale @	1$ = ₹ 41.14
Spot Sale @	1$ = ₹ 40.81
Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.33
Total Exchange Difference (Cancellation Loss) = ₹ 0.33 x 10,000 $ = ₹ 3,300	

4. Net Loss = ₹ 6,500 + ₹ 2 + ₹ 3,300 = ₹ 9,802

Customer have to pay ₹ 9,802 for extension @ 1$ = ₹ 41.4425

Question 6

A customer entered into a two month forward contract for Selling 10,000 $ on 1.01.2022 with a Bank. The exchange rates in the interbank market on following dates were:

1.01.2022	Spot	1 $ = ₹ 40/40.50
	2 Month Forward	0.50/0.60
1.02.2022	Spot	1 $ = ₹ 40.10/40.65
	1 Month Forward	0.45/0.75
	2 Month Forward	0.65/0.80
1.03.2022	Spot	1 $ = ₹ 40.80/40.95
	1 Month Forward	0.25/0.50
3.03.2022	Spot	1 $ = ₹ 40.85/41.00
	1 Month Forward	0.30/0.40
4.03.2022	Spot	1 $ = ₹ 40.90/41.05

Exchange Margin is 0.10%.

Interest Rate on Deposit (Inflow of Funds) is 8% and on Advance (Outflow of Funds) is 12%.

Rates rounded to 4 decimals in multiples of 0.0025. Assume 365 days in a year.

Calculate the consequence if:

(i) Customer wants the delivery on due date

(ii) Customer wants delivery on 1.02.2022

(iii) Customer cancels the contract on Due Date

(iv) Customer cancels the contract on 1.02.2022

(v) Customer cancels the contract on 3.03.2022

(vi) Customer does not approach the bank

(vii) Customer wants delivery on 3.03.2022

(viii) Customer extends the contract for one month on due date

(ix) Customer extends the contract for two months on 1.02.2022

(x) Customer extends the contract for one month on 3.03.2022

Answer

(i) Customer wants delivery on due date (i.e. 1.03.2022)

Dealer (Local Bank)	
Contract with Customer	**Contract with Inter-Bank Market**

Date	Transaction	
1.1.22	2 Month Forward Buy	
	Spot (Low)	1$ = ₹ 40
	(+) Prm. (Low)	₹ 0.50
		1$ = ₹ 40.50
	(-) E.M. @0.10$	₹ 0.0405
		1$ = ₹ 40.4595
	Rounding Off	1$ = ₹ 40.4600

Date	Transaction	
1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40
	(+) Prm. (Low)	₹ 0.50
		1$ = ₹ 40.50

Customer will take delivery @ 1$ = ₹ 40.46

(ii) Customer wants delivery on 1.02.2022 (i.e. Early Delivery)

Dealer (Local Bank)

Contract with Customer

Date	Transaction	
1.1.22	2 Month Forward Buy	
	Spot (Low)	1$ = ₹ 40
	(+) Prm. (Low)	₹ 0.50
		1$ = ₹ 40.50
	(-) E.M. @0.10$	₹ 0.0405
		1$ = ₹ 40.4595
	Rounding Off	1$ = ₹ 40.4600
1.2.22	Request for delivery	

Contract with Inter-Bank Market

Date	Transaction	
1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40
	(+) Prm. (Low)	₹ 0.50
		1$ = ₹ 40.50
1.2.22	Spot Sale (Low) @	1$ = ₹ 40.10
1.2.22	1 Month Forward Buy	
	Spot (High)	1$ = ₹ 40.65
	(+) Prm. (High)	₹ 0.75
		1$ = ₹ 41.40

Calculation of profit/loss:

1. Swap Loss

Spot Sale @	1$ = ₹ 40.10
1 Month Forward Buy @	1$ = ₹ 41.40
Swap Loss @	1$ = ₹ 1.30
Total Swap Loss = ₹ 1.30 x 10,000 $ = ₹ 13,000	

2. Interest

Inflow	1$ = ₹ 40.10

Outflow	1$ =	₹ 40.46
Net Outflow @	1$ =	₹ 0.36
Total Outflow = ₹ 0.36 x 10,000 $ = ₹ 3,600		
Interest Outflow = ₹ 3,600 x 12% x 28/365 = ₹ 33		

3. Net Loss = ₹ 13,000 + ₹ 33 = ₹ 13,033

After paying ₹ 13,033 customer can take delivery @ 1$ = ₹ 40.46

(iii) Customer cancel the contract on due date (i.e. 1.03.2022)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Buy		1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40		Spot (Low)	1$ = ₹ 40
	(+) Prm. (Low)	₹ 0.50		(+) Prm. (Low)	₹ 0.50
		1$ = ₹ 40.50			1$ = ₹ 40.50
	(-) E.M. @0.10$	₹ 0.0405			
		1$ = ₹ 40.4595			
	Rounding Off	1$ = ₹ 40.4600			
1.3.22	Request for Cancellation		1.3.22	Cancellation	
				Spot Buy (High) @	1$ = ₹ 40.95
				(+) E.M. @0.10%	₹ 0.0410
					1$ = ₹ 40.9910
				Rounding Off	1$ = ₹ 40.9900

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ =	₹ 40.46
Spot Buy @	1$ =	₹ 40.99
Exchange Difference (Cancellation Loss) @	1$ =	₹ 0.53
Total Exchange Difference (Cancellation Loss) = ₹ 0.53 x 10,000 $ = ₹ 5,300		

2. Net Loss = ₹ 5,300

Customer have to pay ₹ 5,300 for cancellation charges

(iv) Customer cancel the contract on 1.02.2022 (i.e. Early Cancellation)

Dealer (Local Bank)	
Contract with Customer	**Contract with Inter-Bank Market**

Date	Transaction	
1.1.22	2 Month Forward Buy	
	Spot (Low)	1$ = ₹ 40
	(+) Prm. (Low)	₹ 0.50
		1$ = ₹ 40.50
	(-) E.M. @0.10$	₹ 0.0405
		1$ = ₹ 40.4595
	Rounding Off	1$ = ₹ 40.4600
1.2.22	Request for Cancellation	

Date	Transaction	
1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40
	(+) Prm. (Low)	₹ 0.50
		1$ = ₹ 40.50
1.2.22	Cancellation (1 Month Forward Buy)	
	Spot (High)	1$ = ₹ 40.65
	(+) Prm. (High)	₹ 0.75
		1$ = ₹ 41.40
	(+) E.M. @0.10%	₹ 0.0414
		1$ = ₹ 41.4414
	Rounding Off	1$ = ₹ 41.4425

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ = ₹ 40.4600
1 Month Forward Buy @	1$ = ₹ 41.4425
Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.9825
Total Exchange Difference (Cancellation Loss) = ₹ 0.9825 x 10,000 $ = ₹ 9,825	

2. Net Loss = ₹ 9,825

Customer have to pay ₹ 9,825 for cancellation charges

(v) Customer cancel the contract on 3.03.2022 (i.e. Late Cancellation)

Dealer (Local Bank)			
Contract with Customer		**Contract with Inter-Bank Market**	
Date	Transaction	Date	Transaction
1.1.22	2 Month Forward Buy	1.1.22	2 Month Forward Sale
	Spot (Low) 1$ = ₹ 40		Spot (Low) 1$ = ₹ 40
	(+) Prm. (Low) ₹ 0.50		(+) Prm. (Low) ₹ 0.50
	1$ = ₹ 40.50		1$ = ₹ 40.50
	(-) E.M. @0.10$ ₹ 0.0405		
	1$ = ₹ 40.4595		
	Rounding Off 1$ = ₹ 40.4600		

1.3.22 Does not approach	1.3.22 Spot Buy (High) @ 1$ = ₹ 40.95 Nearest Forward (1 Month) Open Sale Spot (Low) 1$ = ₹ 40.80 (+) Prm. (Low) ₹ 0.25 1$ = ₹ 41.05
3.3.22 Request for Cancellation	3.3.22 Cancellation Spot Buy (High) @ 1$ = ₹ 41 (+) E.M. @0.10% ₹ 0.0410 1$ = ₹ 41.0410 Rounding Off 1$ = ₹ 41.0400

Calculation of profit/loss:

1. Swap Gain

Spot Buy @	1$ = ₹ 40.95
Nearest Forward (1 Month) Open Sale @	1$ = ₹ 41.05
Swap Gain @	1$ = ₹ 0.10
Total Swap Gain = ₹ 0.10 x 10,000 $ = ₹ 1,000	

2. Interest

Inflow	1$ = ₹ 40.50
Outflow	1$ = ₹ 40.95
Net Outflow @	1$ = ₹ 0.45
Total Outflow = ₹ 0.45 x 10,000 $ = ₹ 4,500	
Interest Outflow = ₹ 4,500 x 12% x 2/365 = ₹ 3	

3. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ = ₹ 40.46
Spot Buy @	1$ = ₹ 41.04
Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.58
Total Exchange Difference (Cancellation Loss) = ₹ 0.58 x 10,000 $ = ₹ 5,800	

4. Net Loss = - ₹ 1,000 + ₹ 3 + ₹ 5,800 = ₹ 4,803

Customer have to pay ₹ 4,803 for cancellation charges

(vi) Customer does not approach the bank (i.e. Automatic Cancellation)

Dealer (Local Bank)	
Contract with Customer	**Contract with Inter-Bank Market**

Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Buy		1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40		Spot (Low)	1$ = ₹ 40
	(+) Prm. (Low)	₹ 0.50		(+) Prm. (Low)	₹ 0.50
		1$ = ₹ 40.50			1$ = ₹ 40.50
	(-) E.M. @0.10$	₹ 0.0405			
		1$ = ₹ 40.4595			
	Rounding Off	1$ = ₹ 40.4600			
1.3.22	Does not approach		1.3.22	Spot Buy (High) @	1$ = ₹ 40.95
			1.3.22	Nearest Forward (1 Month) Open Sale	
				Spot (Low)	1$ = ₹ 40.80
				(+) Prm. (Low)	₹ 0.25
					1$ = ₹ 41.05
4.3.22	Does not approach		4.3.22	Cancellation	
				Spot Buy (High) @	1$ = ₹ 41.05
				(+) E.M. @0.10%	₹ 0.0411
					1$ = ₹ 41.0911
				Rounding Off	1$ = ₹ 41.0900

Calculation of profit/loss:

1. Swap Gain

Spot Buy @	1$ = ₹ 40.95
Nearest Forward (1 Month) Open Sale @	1$ = ₹ 41.05
Swap Gain @	1$ = ₹ 0.10
Total Swap Gain = ₹ 0.10 x 10,000 $ = ₹ 1,000	

2. Interest

Inflow	1$ = ₹ 40.50
Outflow	1$ = ₹ 40.95
Net Outflow @	1$ = ₹ 0.45
Total Outflow = ₹ 0.45 x 10,000 $ = ₹ 4,500	
Interest Outflow = ₹ 4,500 x 12% x 3/365 = ₹ 4	

3. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ = ₹ 40.46

Spot Buy @	1$ = ₹ 41.09
Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.63
Total Exchange Difference (Cancellation Loss) = ₹ 0.63 x 10,000 $ = ₹ 6,300	

4. Net Loss = - ₹ 1,000 + ₹ 4 + ₹ 6,300 = ₹ 5,304

Customer have to pay ₹ 5,303 for cancellation charges

(vii) Customer wants delivery on 3.03.2022 (i.e. Late Delivery)

Dealer (Local Bank)						
Contract with Customer				**Contract with Inter-Bank Market**		
Date	Transaction			Date	Transaction	
1.1.22	2 Month Forward Buy			1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ =	₹ 40		Spot (Low)	1$ = ₹ 40
	(+) Prm. (Low)		₹ 0.50		(+) Prm. (Low)	₹ 0.50
		1$ =	₹ 40.50			1$ = ₹ 40.50
	(-) E.M. @0.10$		₹ 0.0405			
		1$ =	₹ 40.4595			
	Rounding Off	1$ =	₹ 40.4600			
1.3.22	Does not approach			1.3.22	Spot Buy (High) @	1$ = ₹ 40.95
				1.3.22	Nearest Forward (1 Month) Open Sale	
					Spot (Low)	1$ = ₹ 40.80
					(+) Prm. (Low)	₹ 0.25
						1$ = ₹ 41.05
3.3.22	Request for Delivery			3.3.22	Cancellation	
3.3.22	New Contract for Spot Buy				Spot Buy (High) @	1$ = ₹ 41
	Spot (Low)	1$ =	₹ 40.85		(+) E.M. @0.10%	₹ 0.0410
	(-) E.M. @0.10$		₹ 0.0409			1$ = ₹ 41.0410
		1$ =	₹ 40.8091		Rounding Off	1$ = ₹ 41.0400
	Rounding Off	1$ =	₹ 40.8100			

Calculation of profit/loss:

1. Swap Gain

Spot Buy @	1$ = ₹ 40.95
Nearest Forward (1 Month) Open Sale @	1$ = ₹ 41.05
Swap Gain @	1$ = ₹ 0.10
Total Swap Gain = ₹ 0.10 x 10,000 $ = ₹ 1,000	

2. Interest

Inflow	1$ = ₹ 40.50
Outflow	1$ = ₹ 40.95
Net Outflow @	1$ = ₹ 0.45
Total Outflow = ₹ 0.45 x 10,000 $ = ₹ 4,500	
Interest Outflow = ₹ 4,500 x 12% x 2/365 = ₹ 3	

3. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ = ₹ 40.46
Spot Buy @	1$ = ₹ 41.04
Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.58
Total Exchange Difference (Cancellation Loss) = ₹ 0.58 x 10,000 $ = ₹ 5,800	

4. Net Loss = - ₹ 1,000 + ₹ 3 + ₹ 5,800 = ₹ 4,803

After paying ₹ 4,803 customer can take delivery @ 1$ = ₹ 40.81

(viii) Customer extends the contract for 1 Month on due date (i.e. 1.03.2022)

Dealer (Local Bank)			
Contract with Customer		**Contract with Inter-Bank Market**	
Date Transaction		Date Transaction	
1.1.22 2 Month Forward Buy		1.1.22 2 Month Forward Sale	
Spot (Low)	1$ = ₹ 40	Spot (Low)	1$ = ₹ 40
(+) Prm. (Low)	₹ 0.50	(+) Prm. (Low)	₹ 0.50
	1$ = ₹ 40.50		1$ = ₹ 40.50
(-) E.M. @0.10$	₹ 0.0405		
	1$ = ₹ 40.4595		
Rounding Off	1$ = ₹ 40.4600		
1.3.22 Request for Extension		1.3.22 Cancellation	
New Contract for 1 M Forward Buy		Spot Buy (High) @	1$ = ₹ 40.95
Spot (Low)	1$ = ₹ 40.80	(+) E.M. @0.10%	₹ 0.0410
(+) Prm. (Low)	₹ 0.25		1$ = ₹ 40.9910
	1$ = ₹ 41.05	Rounding Off	1$ = ₹ 40.9900
(-) E.M. @0.10$	₹ 0.0411		
	1$ = ₹ 41.0089		
Rounding Off	1$ = ₹ 41.0100		

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ = ₹ 40.46
Spot Buy @	1$ = ₹ 40.99
Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.53
Total Exchange Difference (Cancellation Loss) = ₹ 0.53 x 10,000 $ = ₹ 5,300	

2. Net Loss = ₹ 5,300

Customer have to pay ₹ 5,300 for extension @ 1$ = ₹ 41.01

(ix) Customer extends the contract for 2 Months on 1.02.2022 (i.e. Early Extension)

Dealer (Local Bank)

Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Buy		1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40		Spot (Low)	1$ = ₹ 40
	(+) Prm. (Low)	₹ 0.50		(+) Prm. (Low)	₹ 0.50
		1$ = ₹ 40.50			1$ = ₹ 40.50
	(-) E.M. @0.10$	₹ 0.0405			
		1$ = ₹ 40.4595			
	Rounding Off	1$ = ₹ 40.4600			
1.2.22	Request for Extension		1.2.22	Cancellation (1 Month Forward Buy)	
	New Contract for 2 M Forward Buy			Spot (High)	1$ = ₹ 40.65
	Spot (Low)	1$ = ₹ 40.10		(+) Prm. (High)	₹ 0.75
	(+) Prm. (Low)	₹ 0.65			1$ = ₹ 41.40
		1$ = ₹ 40.75		(+) E.M. @0.10%	₹ 0.0414
	(-) E.M. @0.10$	₹ 0.0408			1$ = ₹ 41.4414
		1$ = ₹ 40.7092		Rounding Off	1$ = ₹ 41.4425
	Rounding Off	1$ = ₹ 40.7100			

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ = ₹ 40.4600
1 Month Forward Buy @	1$ = ₹ 41.4425
Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.9825
Total Exchange Difference (Cancellation Loss) = ₹ 0.9825 x 10,000 $ = ₹ 9,825	

2. Net Loss = ₹ 9,825

Customer have to pay ₹ 9,825 for extension @ 1$ = ₹ 40.71

(x) Customer extends the contract for 1 Month on 3.3.2022 (i.e. Late Extension)

Dealer (Local Bank)					
Contract with Customer				**Contract with Inter-Bank Market**	
Date	Transaction			Date	Transaction
1.1.22	2 Month Forward Buy			1.1.22	2 Month Forward Sale
	Spot (Low)	1$ =	₹ 40		Spot (Low) 1$ = ₹ 40
	(+) Prm. (Low)		₹ 0.50		(+) Prm. (Low) ₹ 0.50
		1$ =	₹ 40.50		1$ = ₹ 40.50
	(-) E.M. @0.10$		₹ 0.0405		
		1$ =	₹ 40.4595		
	Rounding Off	1$ =	₹ 40.4600		
1.3.22	Does not approach			1.3.22	Spot Buy (High) @ 1$ = ₹ 40.95
				1.3.22	Nearest Forward (1 Month) Open Sale
					Spot (Low) 1$ = ₹ 40.80
					(+) Prm. (Low) ₹ 0.25
					1$ = ₹ 41.05
3.3.22	Request for Extension			3.3.22	Cancellation
	New Contract for 1 M Forward Buy				Spot Buy (High) @ 1$ = ₹ 41
	Spot (Low)	1$ =	₹ 40.85		(+) E.M. @0.10% ₹ 0.0410
	(+) Prm. (Low)		₹ 0.30		1$ = ₹ 41.0410
		1$ =	₹ 41.15		Rounding Off 1$ = ₹ 41.0400
	(-) E.M. @0.10$		₹ 0.0412		
		1$ =	₹ 41.1088		
	Rounding Off	1$ =	₹ 41.1100		

Calculation of profit/loss:

1. Swap Gain

Spot Buy @	1$ = ₹ 40.95
Nearest Forward (1 Month) Open Sale @	1$ = ₹ 41.05
Swap Gain @	1$ = ₹ 0.10
Total Swap Gain = ₹ 0.10 x 10,000 $ = ₹ 1,000	

2. Interest

Inflow	1$ = ₹ 40.50

Outflow	1$ =	₹ 40.95
Net Outflow @	1$ =	₹ 0.45
Total Outflow = ₹ 0.45 x 10,000 $ = ₹ 4,500 Interest Outflow = ₹ 4,500 x 12% x 2/365 = ₹ 3		

3. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ =	₹ 40.46
Spot Buy @	1$ =	₹ 41.04
Exchange Difference (Cancellation Loss) @	1$ =	₹ 0.58
Total Exchange Difference (Cancellation Loss) = ₹ 0.58 x 10,000 $ = ₹ 5,800		

4. Net Loss = - ₹ 1,000 + ₹ 3 + ₹ 5,800 = ₹ 4,803

Customer have to pay ₹ 4,803 for extension @ 1$ = ₹ 41.11

Question 7

A customer entered into a two month forward contract for Buying 10,000 $ on 1.01.2022 with a Bank. The exchange rates in the interbank market on following dates were:

1.01.2022	Spot	1 $ = ₹ 40/40.50
	2 Month Forward	0.60/0.50
1.02.2022	Spot	1 $ = ₹ 40.10/40.65
	1 Month Forward	0.75/0.45
	2 Month Forward	0.80/0.65
1.03.2022	Spot	1 $ = ₹ 40.80/40.95
	1 Month Forward	0.50/0.25
3.03.2022	Spot	1 $ = ₹ 40.85/41.00
	1 Month Forward	0.40/0.30
4.03.2022	Spot	1 $ = ₹ 40.90/41.05

Exchange Margin is 0.10%.

Interest Rate on Deposit (Inflow of Funds) is 8% and on Advance (Outflow of Funds) is 12%.

Rates rounded to 4 decimals in multiples of 0.0025. Assume 365 days in a year.

Calculate the consequence if:

(i) Customer wants the delivery on due date

(ii) Customer wants delivery on 1.02.2022

(iii) Customer cancels the contract on Due Date

(iv) Customer cancels the contract on 1.02.2022

(v) Customer cancels the contract on 3.03.2022

(vi) Customer does not approach the bank

(vii) Customer wants delivery on 3.03.2022

(viii) Customer extends the contract for one month on due date

(ix) Customer extends the contract for two months on 1.02.2022

(x) Customer extends the contract for one month on 3.03.2022

Answer

(i) Customer wants delivery on due date (i.e. 1.03.2022)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Sale		1.1.22	2 Month Forward Buy	
	Spot (High)	1$ = ₹ 40.50		Spot (High)	1$ = ₹ 40.50
	(-) Disc. (Low)	₹ 0.50		(-) Disc. (Low)	₹ 0.50
		1$ = ₹ 40			1$ = ₹ 40
	(+) E.M. @0.10$	₹ 0.04			
		1$ = ₹ 40.04			

Customer will take delivery by paying @ 1$ = ₹ 40.04

(ii) Customer wants delivery on 1.02.2022 (i.e. Early Delivery)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Sale		1.1.22	2 Month Forward Buy	
	Spot (High)	1$ = ₹ 40.50		Spot (High)	1$ = ₹ 40.50
	(-) Disc. (Low)	₹ 0.50		(-) Disc. (Low)	₹ 0.50
		1$ = ₹ 40			1$ = ₹ 40
	(+) E.M. @0.10$	₹ 0.04			
		1$ = ₹ 40.04			
1.2.22	Request for delivery		1.2.22	Spot Buy (High) @	1$ = ₹ 40.65
			1.2.22	1 Month Forward Sale	
				Spot (Low)	1$ = ₹ 40.10
				(-) Disc. (High)	₹ 0.75
					1$ = ₹ 39.35

Calculation of profit/loss:

1. Swap Loss

Spot Buy @	1$ =	₹ 40.65
1 Month Forward Sale @	1$ =	₹ 39.35
Swap Loss @	1$ =	₹ 1.30
Total Swap Loss = ₹ 1.30 x 10,000 $ = ₹ 13,000		

2. Interest

Inflow	1$ =	₹ 40.04
Outflow	1$ =	₹ 40.65
Net Outflow @	1$ =	₹ 0.61
Total Outflow = ₹ 0.61 x 10,000 $ = ₹ 6,100		
Interest Outflow = ₹ 6,100 x 12% x 28/365 = ₹ 56		

3. Net Loss = ₹ 13,000 + ₹ 56 = ₹ 13,056

After paying ₹ 13,056 customer can take delivery @ 1$ = ₹ 40.04

(iii) Customer cancel the contract on due date (i.e. 1.03.2022)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Sale		1.1.22	2 Month Forward Buy	
	Spot (High)	1$ = ₹ 40.50		Spot (High)	1$ = ₹ 40.50
	(-) Disc. (Low)	₹ 0.50		(-) Disc. (Low)	₹ 0.50
		1$ = ₹ 40			1$ = ₹ 40
	(+) E.M. @0.10$	₹ 0.04			
		1$ = ₹ 40.04			
1.3.22	Request for Cancellation		1.3.22	Cancellation	
				Spot Sale (Low) @	1$ = ₹ 40.80
				(-) E.M. @0.10%	₹ 0.0408
					1$ = ₹ 40.7592
				Rounding Off	1$ = ₹ 40.7600

Calculation of profit/loss:

1. Exchange Difference (Cancellation Gain)

2 Month Forward Sale @	1$ =	₹ 40.04
Spot Sale @	1$ =	₹ 40.76
Exchange Difference (Cancellation Gain) @	1$ =	₹ 0.72
Total Exchange Difference (Cancellation Gain) = ₹ 0.72 x 10,000 $ = ₹ 7,200		

2. Net Gain = ₹ 7,200

Bank have to pay ₹ 7,200 cancellation charges to Customer

(iv) Customer cancel the contract on 1.02.2022 (i.e. Early Cancellation)

Dealer (Local Bank)	
Contract with Customer	**Contract with Inter-Bank Market**
Date Transaction	Date Transaction
1.1.22 2 Month Forward Sale	1.1.22 2 Month Forward Buy
Spot (High) 1$ = ₹ 40.50	Spot (High) 1$ = ₹ 40.50
(-) Disc. (Low) ₹ 0.50	(-) Disc. (Low) ₹ 0.50
1$ = ₹ 40	1$ = ₹ 40
(+) E.M. @0.10$ ₹ 0.04	
1$ = ₹ 40.04	
1.2.22 Request for Cancellation	1.2.22 Cancellation (1 Month Forward Sale)
	Spot (Low) 1$ = ₹ 40.10
	(-) Disc. (High) ₹ 0.75
	1$ = ₹ 39.35
	(-) E.M. @0.10% ₹ 0.0394
	1$ = ₹ 39.3106
	Rounding Off 1$ = ₹ 39.3100

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Sale @	1$ = ₹ 40.04
1 Month Forward Sale @	1$ = ₹ 39.31
Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.73
Total Exchange Difference (Cancellation Loss) = ₹ 0.73 x 10,000 $ = ₹ 7,300	

2. Net Loss = ₹ 7,300

Customer have to pay ₹ 7,300 for cancellation charges

(v) Customer cancel the contract on 3.03.2022 (i.e. Late Cancellation)

Dealer (Local Bank)	
Contract with Customer	**Contract with Inter-Bank Market**
Date Transaction	Date Transaction
1.1.22 2 Month Forward Sale	1.1.22 2 Month Forward Buy
Spot (High) 1$ = ₹ 40.50	Spot (High) 1$ = ₹ 40.50

(-) Disc. (Low) ₹ 0.50 1$ = ₹ 40 (+) E.M. @0.10$ ₹ 0.04 1$ = ₹ 40.04	(-) Disc. (Low) ₹ 0.50 1$ = ₹ 40
1.3.22 Does not approach	1.3.22 Spot Sale (Low) @ 1$ = ₹ 40.80 1.3.22 Nearest Forward (1 Month) Open Buy Spot (High) 1$ = ₹ 40.95 (-) Disc. (Low) ₹ 0.25 1$ = ₹ 40.70
3.3.22 Request for Cancellation	3.3.22 Cancellation Spot Sale (Low) @ 1$ = ₹ 40.85 (-) E.M. @0.10% ₹ 0.0409 ₹ 40.8091 Rounding Off 1$ = ₹ 40.8100

Calculation of profit/loss:

1. Swap Gain

Spot Sale @	1$ =	₹ 40.80
Nearest Forward (1 Month) Open Buy @	1$ =	₹ 40.70
Swap Gain @	1$ =	₹ 0.10
Total Swap Gain = ₹ 0.10 x 10,000 $ = ₹ 1,000		

2. Interest

Inflow	1$ =	₹ 40.80
Outflow	1$ =	₹ 40
Net Inflow @	1$ =	₹ 0.80
Total Inflow = ₹ 0.80 x 10,000 $ = ₹ 8,000 Interest Inflow = ₹ 8,000 x 8% x 2/365 = ₹ 4		

3. Exchange Difference (Cancellation Gain)

2 Month Forward Sale @	1$ =	₹ 40.04
Spot Sale @	1$ =	₹ 40.81
Exchange Difference (Cancellation Gain) @	1$ =	₹ 0.77
Total Exchange Difference (Cancellation Gain) = ₹ 0.77 x 10,000 $ = ₹ 7,700		

4. Net Gain = ₹ 1,000 + ₹ 4 + ₹ 7,700 = ₹ 8,704

Bank have to pay ₹ 8,704 cancellation charges to Customer

(vi) Customer does not approach the bank (i.e. Automatic Cancellation)

Dealer (Local Bank)	
Contract with Customer	**Contract with Inter-Bank Market**
Date Transaction	Date Transaction
1.1.22 2 Month Forward Sale	1.1.22 2 Month Forward Buy
Spot (High) 1$ = ₹ 40.50	Spot (High) 1$ = ₹ 40.50
(-) Disc. (Low) ₹ 0.50	(-) Disc. (Low) ₹ 0.50
1$ = ₹ 40	1$ = ₹ 40
(+) E.M. @0.10$ ₹ 0.04	
1$ = ₹ 40.04	
1.3.22 Does not approach	1.3.22 Spot Sale (Low) @ 1$ = ₹ 40.80
	1.3.22 Nearest Forward (1 Month) Open Buy
	Spot (High) 1$ = ₹ 40.95
	(-) Disc. (Low) ₹ 0.25
	1$ = ₹ 40.70
4.3.22 Does not approach	4.3.22 Cancellation
	Spot Sale (Low) @ 1$ = ₹ 40.90
	(-) E.M. @0.10% ₹ 0.0409
	1$ = ₹ 40.8591
	Rounding Off 1$ = ₹ 40.8600

Calculation of profit/loss:

1. Swap Gain

Spot Sale @	1$ = ₹ 40.80
Nearest Forward (1 Month) Open Buy @	1$ = ₹ 40.70
Swap Gain @	1$ = ₹ 0.10
Total Swap Gain = ₹ 0.10 x 10,000 $ = ₹ 1,000	

2. Interest

Inflow	1$ = ₹ 40.80
Outflow	1$ = ₹ 40
Net Inflow @	1$ = ₹ 0.80
Total Inflow = ₹ 0.80 x 10,000 $ = ₹ 8,000	

Interest Inflow = ₹ 8,000 x 8% x 3/365 = ₹ 5

3. Exchange Difference (Cancellation Gain)

2 Month Forward Sale @	1$ =	₹ 40.04
Spot Sale @	1$ =	₹ 40.86
Exchange Difference (Cancellation Gain) @	1$ =	₹ 0.82
Total Exchange Difference (Cancellation Gain) = ₹ 0.82 x 10,000 $ = ₹ 8,200		

4. Net Gain = ₹ 1,000 + ₹ 5 + ₹ 8,200 = ₹ 9,205

All gain is retained by bank. Nothing is to be paid to customer since it is automatic cancellation.

(vii) Customer wants delivery on 3.03.2022 (i.e. Late Delivery)

Dealer (Local Bank)						
Contract with Customer				**Contract with Inter-Bank Market**		
Date	Transaction			Date	Transaction	
1.1.22	2 Month Forward Sale			1.1.22	2 Month Forward Buy	
	Spot (High)	1$ =	₹ 40.50		Spot (High)	1$ = ₹ 40.50
	(-) Disc. (Low)		₹ 0.50		(-) Disc. (Low)	₹ 0.50
		1$ =	₹ 40			1$ = ₹ 40
	(+) E.M. @0.10$		₹ 0.04			
		1$ =	₹ 40.04			
1.3.22	Does not approach			1.3.22	Spot Sale (Low) @	1$ = ₹ 40.80
				1.3.22	Nearest Forward (1 Month) Open Buy	
					Spot (High)	1$ = ₹ 40.95
					(-) Disc. (Low)	₹ 0.25
						1$ = ₹ 40.70
3.3.22	Request for Delivery			3.3.22	Cancellation	
3.3.22	New Contract for Spot Sale				Spot Sale (Low) @	1$ = ₹ 40.85
	Spot (High)	1$ =	₹ 41		(-) E.M. @0.10%	₹ 0.0409
	(+) E.M. @0.10$		₹ 0.0410			₹ 40.8091
		1$ =	₹ 41.0410		Rounding Off	1$ = ₹ 40.8100
	Rounding Off	1$ =	₹ 41.0400			

Calculation of profit/loss:

1. Swap Gain

Spot Sale @	1$ =	₹ 40.80

Nearest Forward (1 Month) Open Buy @	1$ = ₹ 40.70
Swap Gain @	1$ = ₹ 0.10
Total Swap Gain = ₹ 0.10 x 10,000 $ = ₹ 1,000	

2. Interest

Inflow	1$ = ₹ 40.80
Outflow	1$ = ₹ 40
Net Inflow @	1$ = ₹ 0.80
Total Inflow = ₹ 0.80 x 10,000 $ = ₹ 8,000	
Interest Inflow = ₹ 8,000 x 8% x 2/365 = ₹ 4	

3. Exchange Difference (Cancellation Gain)

2 Month Forward Sale @	1$ = ₹ 40.04
Spot Sale @	1$ = ₹ 40.81
Exchange Difference (Cancellation Gain) @	1$ = ₹ 0.77
Total Exchange Difference (Cancellation Gain) = ₹ 0.77 x 10,000 $ = ₹ 7,700	

4. Net Gain = ₹ 1,000 + ₹ 4 + ₹ 7,700 = ₹ 8,704

Bank have to pay ₹ 8,704 to Customer & he can take delivery @ 1$ = ₹ 41.04

(viii) Customer extends the contract for 1 Month on due date (i.e. 1.03.2022)

Dealer (Local Bank)

Contract with Customer

Date	Transaction	
1.1.22	2 Month Forward Sale	
	Spot (High)	1$ = ₹ 40.50
	(-) Disc. (Low)	₹ 0.50
		1$ = ₹ 40
	(+) E.M. @0.10$	₹ 0.04
		1$ = ₹ 40.04
1.3.22	Request for Extension	
	New Contract for 1 M Forward Sale	
	Spot (High)	1$ = ₹ 40.95
	(-) Disc. (Low)	₹ 0.25
		1$ = ₹ 40.70
	(+) E.M. @0.10$	₹ 0.0407
		1$ = ₹ 40.7407

Contract with Inter-Bank Market

Date	Transaction	
1.1.22	2 Month Forward Buy	
	Spot (High)	1$ = ₹ 40.50
	(-) Disc. (Low)	₹ 0.50
		1$ = ₹ 40
1.3.22	Cancellation	
	Spot Sale (Low) @	1$ = ₹ 40.80
	(-) E.M. @0.10%	₹ 0.0408
		1$ = ₹ 40.7592
	Rounding Off	1$ = ₹ 40.7600

Rounding Off	1$ = ₹ 40.7400	

Calculation of profit/loss:

1. Exchange Difference (Cancellation Gain)

2 Month Forward Sale @	1$ =	₹ 40.04
Spot Sale @	1$ =	₹ 40.76
Exchange Difference (Cancellation Gain) @	1$ =	₹ 0.72
Total Exchange Difference (Cancellation Gain) = ₹ 0.72 x 10,000 $ = ₹ 7,200		

2. Net Gain = ₹ 7,200

Bank have to pay ₹ 7,200 to Customer for extension @ 1$ = ₹ 40.74

(ix) Customer extends the contract for 2 Months on 1.02.2022 (i.e. Early Extension)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Sale		1.1.22	2 Month Forward Buy	
	Spot (High)	1$ = ₹ 40.50		Spot (High)	1$ = ₹ 40.50
	(-) Disc. (Low)	₹ 0.50		(-) Disc. (Low)	₹ 0.50
		1$ = ₹ 40			1$ = ₹ 40
	(+) E.M. @0.10$	₹ 0.04			
		1$ = ₹ 40.04			
1.2.22	Request for Extension		1.2.22	Cancellation (1 Month Forward Sale)	
	New Contract for 2 M Forward Sale			Spot (Low)	1$ = ₹ 40.10
	Spot (High)	1$ = ₹ 40.65		(-) Disc. (High)	₹ 0.75
	(-) Disc. (Low)	₹ 0.65			1$ = ₹ 39.35
		1$ = ₹ 40		(-) E.M. @0.10%	₹ 0.0394
	(+) E.M. @0.10$	₹ 0.04			1$ = ₹ 39.3106
		1$ = ₹ 40.04		Rounding Off	1$ = ₹ 39.3100

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Sale @	1$ =	₹ 40.04
1 Month Forward Sale @	1$ =	₹ 39.31
Exchange Difference (Cancellation Loss) @	1$ =	₹ 0.73
Total Exchange Difference (Cancellation Loss) = ₹ 0.73 x 10,000 $ = ₹ 7,300		

2. Net Loss = ₹ 7,300

Customer have to pay ₹ 7,300 for extension @ 1$ = ₹ 40.04

(x) Customer extends the contract for 1 Month on 3.3.2022 (i.e. Late Extension)

Dealer (Local Bank)					
Contract with Customer				**Contract with Inter-Bank Market**	
Date	Transaction			Date	Transaction	
1.1.22	2 Month Forward Sale			1.1.22	2 Month Forward Buy	
	Spot (High)	1$ =	₹ 40.50		Spot (High)	1$ = ₹ 40.50
	(-) Disc. (Low)		₹ 0.50		(-) Disc. (Low)	₹ 0.50
		1$ =	₹ 40			1$ = ₹ 40
	(+) E.M. @0.10$		₹ 0.04			
		1$ =	₹ 40.04			
1.3.22	Does not approach			1.3.22	Spot Sale (Low) @	1$ = ₹ 40.80
				1.3.22	Nearest Forward (1 Month) Open Buy	
					Spot (High)	1$ = ₹ 40.95
					(-) Disc. (Low)	₹ 0.25
						1$ = ₹ 40.70
3.3.22	Request for Extension			3.3.22	Cancellation	
	New Contract for 1 M Forward Sale				Spot Sale (Low) @	1$ = ₹ 40.85
	Spot (High)	1$ =	₹ 41		(-) E.M. @0.10%	₹ 0.0409
	(-) Disc. (Low)		₹ 0.30			₹ 40.8091
		1$ =	₹ 40.70		Rounding Off	1$ = ₹ 40.8100
	(+) E.M. @0.10$		₹ 0.0407			
		1$ =	₹ 40.7407			
	Rounding Off	1$ =	₹ 40.7400			

Calculation of profit/loss:

1. Swap Gain

Spot Sale @	1$ = ₹ 40.80
Nearest Forward (1 Month) Open Buy @	1$ = ₹ 40.70
Swap Gain @	1$ = ₹ 0.10
Total Swap Gain = ₹ 0.10 x 10,000 $ = ₹ 1,000	

2. Interest

Inflow	1$ = ₹ 40.80

Outflow	1$ =	₹ 40
Net Inflow @	1$ =	₹ 0.80
Total Inflow = ₹ 0.80 x 10,000 $ = ₹ 8,000 Interest Inflow = ₹ 8,000 x 8% x 2/365 = ₹ 4		

3. Exchange Difference (Cancellation Gain)

2 Month Forward Sale @	1$ =	₹ 40.04
Spot Sale @	1$ =	₹ 40.81
Exchange Difference (Cancellation Gain) @	1$ =	₹ 0.77
Total Exchange Difference (Cancellation Gain) = ₹ 0.77 x 10,000 $ = ₹ 7,700		

4. Net Gain = ₹ 1,000 + ₹ 4 + ₹ 7,700 = ₹ 8,704

Bank have to pay ₹ 8,704 to Customer for extension @ 1$ = ₹ 40.74

Question 8

A customer entered into a two month forward contract for Selling 10,000 $ on 1.01.2022 with a Bank. The exchange rates in the interbank market on following dates were:

1.01.2022	Spot	1 $ = ₹ 40/40.50
	2 Month Forward	0.60/0.50
1.02.2022	Spot	1 $ = ₹ 40.10/40.65
	1 Month Forward	0.75/0.45
	2 Month Forward	0.80/0.65
1.03.2022	Spot	1 $ = ₹ 40.80/40.95
	1 Month Forward	0.50/0.25
3.03.2022	Spot	1 $ = ₹ 40.85/41.00
	1 Month Forward	0.40/0.30
4.03.2022	Spot	1 $ = ₹ 40.90/41.05

Exchange Margin is 0.10%.

Interest Rate on Deposit (Inflow of Funds) is 8% and on Advance (Outflow of Funds) is 12%.

Rates rounded to 4 decimals in multiples of 0.0025. Assume 365 days in a year.

Calculate the consequence if:

(i) Customer wants the delivery on due date

(ii) Customer wants delivery on 1.02.2022

(iii) Customer cancels the contract on Due Date

(iv) Customer cancels the contract on 1.02.2022

(v) Customer cancels the contract on 3.03.2022

(vi) Customer does not approach the bank

(vii) Customer wants delivery on 3.03.2022

(viii) Customer extends the contract for one month on due date

(ix) Customer extends the contract for two months on 1.02.2022

(x) Customer extends the contract for one month on 3.03.2022

Answer

(i) Customer wants delivery on due date (i.e. 1.03.2022)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Buy		1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40		Spot (Low)	1$ = ₹ 40
	(-) Disc. (High)	₹ 0.60		(-) Disc. (High)	₹ 0.60
		1$ = ₹ 39.40			1$ = ₹ 39.40
	(-) E.M. @0.10$	₹ 0.0394			
		1$ = ₹ 39.3606			
	Rounding Off	1$ = ₹ 39.3600			

Customer will take delivery @ 1$ = ₹ 39.36

(ii) Customer wants delivery on 1.02.2022 (i.e. Early Delivery)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Buy		1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40		Spot (Low)	1$ = ₹ 40
	(-) Disc. (High)	₹ 0.60		(-) Disc. (High)	₹ 0.60
		1$ = ₹ 39.40			1$ = ₹ 39.40
	(-) E.M. @0.10$	₹ 0.0394			
		1$ = ₹ 39.3606			
	Rounding Off	1$ = ₹ 39.3600			
1.2.22	Request for delivery		1.2.22	Spot Sale (Low) @	1$ = ₹ 40.10
			1.2.22	1 Month Forward Buy	
				Spot (High)	1$ = ₹ 40.65
				(-) Disc. (Low)	₹ 0.45
					1$ = ₹ 40.20

Calculation of profit/loss:

1. Swap Loss

Spot Sale @	1$ =	₹ 40.10
1 Month Forward Buy @	1$ =	₹ 40.20
Swap Loss @	1$ =	₹ 0.10
Total Swap Loss = ₹ 0.10 x 10,000 $ = ₹ 1,000		

2. Interest

Inflow	1$ =	₹ 40.10
Outflow	1$ =	₹ 39.36
Net Inflow @	1$ =	₹ 0.74
Total Inflow = ₹ 0.74 x 10,000 $ = ₹ 7,400		
Interest Inflow = ₹ 7,400 x 8% x 28/365 = ₹ 45		

3. Net Loss = ₹ 1,000 – ₹ 45 = ₹ 955

After paying ₹ 955 customer can take delivery @ 1$ = ₹ 39.36

(iii) Customer cancel the contract on due date (i.e. 1.03.2022)

Dealer (Local Bank)						
Contract with Customer				**Contract with Inter-Bank Market**		
Date	Transaction			Date	Transaction	
1.1.22	2 Month Forward Buy			1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ =	₹ 40		Spot (Low)	1$ = ₹ 40
	(-) Disc. (High)		₹ 0.60		(-) Disc. (High)	₹ 0.60
		1$ =	₹ 39.40			1$ = ₹ 39.40
	(-) E.M. @0.10$		₹ 0.0394			
		1$ =	₹ 39.3606			
	Rounding Off	1$ =	₹ 39.3600			
1.3.22	Request for Cancellation			1.3.22	Cancellation	
					Spot Buy (High) @	1$ = ₹ 40.95
					(+) E.M. @0.10%	₹ 0.0410
						1$ = ₹ 40.9910
					Rounding Off	1$ = ₹ 40.9900

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ =	₹ 39.36

Spot Buy @	1$ = ₹ 40.99
Exchange Difference (Cancellation Loss) @	1$ = ₹ 1.63
Total Exchange Difference (Cancellation Loss) = ₹ 1.63 x 10,000 $ = ₹ 16,300	

2. Net Loss = ₹ 16,300

Customer have to pay ₹ 16,300 for cancellation charges

(iv) Customer cancel the contract on 1.02.2022 (i.e. Early Cancellation)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Buy		1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40		Spot (Low)	1$ = ₹ 40
	(-) Disc. (High)	₹ 0.60		(-) Disc. (High)	₹ 0.60
		1$ = ₹ 39.40			1$ = ₹ 39.40
	(-) E.M. @0.10$	₹ 0.0394			
		1$ = ₹ 39.3606			
	Rounding Off	1$ = ₹ 39.3600			
1.2.22	Request for Cancellation		1.2.22	Cancellation (1 Month Forward Buy)	
				Spot (High)	1$ = ₹ 40.65
				(-) Disc. (Low)	₹ 0.45
					1$ = ₹ 40.20
				(+) E.M. @0.10%	₹ 0.0402
					1$ = ₹ 40.2402
				Rounding Off	1$= ₹ 40.2400

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ = ₹ 39.3600
1 Month Forward Buy @	1$ = ₹ 40.2400
Exchange Difference (Cancellation Loss) @	1$ = ₹ 0.8800
Total Exchange Difference (Cancellation Loss) = ₹ 0.88 x 10,000 $ = ₹ 8,800	

2. Net Loss = ₹ 8,800

Customer have to pay ₹ 8,800 for cancellation charges

(v) Customer cancel the contract on 3.03.2022 (i.e. Late Cancellation)

Dealer (Local Bank)

Contract with Customer			Contract with Inter-Bank Market		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Buy		1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40		Spot (Low)	1$ = ₹ 40
	(-) Disc. (High)	₹ 0.60		(-) Disc. (High)	₹ 0.60
		1$ = ₹ 39.40			1$ = ₹ 39.40
	(-) E.M. @0.10$	₹ 0.0394			
		1$ = ₹ 39.3606			
	Rounding Off	1$ = ₹ 39.3600			
1.3.22	Does not approach		1.3.22	Spot Buy (High) @	1$ = ₹ 40.95
			1.3.22	Nearest Forward (1 Month) Open Sale	
				Spot (Low)	1$ = ₹ 40.80
				(-) Disc. (High)	₹ 0.50
					1$ = ₹ 40.30
3.3.22	Request for Cancellation		3.3.22	Cancellation	
				Spot Buy (High) @	1$ = ₹ 41
				(+) E.M. @0.10%	₹ 0.0410
					1$ = ₹ 41.0410
				Rounding Off	1$ = ₹ 41.0400

Calculation of profit/loss:

1. Swap Loss

Spot Buy @	1$ = ₹ 40.95
Nearest Forward (1 Month) Open Sale @	1$ = ₹ 40.30
Swap Loss @	1$ = ₹ 0.65
Total Swap Loss = ₹ 0.65 x 10,000 $ = ₹ 6,500	

2. Interest

Inflow	1$ = ₹ 39.40
Outflow	1$ = ₹ 40.95
Net Outflow @	1$ = ₹ 1.55
Total Outflow = ₹ 1.55 x 10,000 $ = ₹ 15,500	
Interest Outflow = ₹ 15,500 x 12% x 2/365 = ₹ 10	

3. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ = ₹ 39.36
Spot Buy @	1$ = ₹ 41.04
Exchange Difference (Cancellation Loss) @	1$ = ₹ 1.68
Total Exchange Difference (Cancellation Loss) = ₹ 1.68 x 10,000 $ = ₹ 16,800	

4. Net Loss = ₹ 6,500 + ₹ 10 + ₹ 16,800 = ₹ 23,310

Customer have to pay ₹ 23,310 for cancellation charges

(vi) Customer does not approach the bank (i.e. Automatic Cancellation)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Buy		1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40		Spot (Low)	1$ = ₹ 40
	(-) Disc. (High)	₹ 0.60		(-) Disc. (High)	₹ 0.60
		1$ = ₹ 39.40			1$ = ₹ 39.40
	(-) E.M. @0.10$	₹ 0.0394			
		1$ = ₹ 39.3606			
	Rounding Off	1$ = ₹ 39.3600			
1.3.22	Does not approach		1.3.22	Spot Buy (High) @	1$ = ₹ 40.95
			1.3.22	Nearest Forward (1 Month) Open Sale	
				Spot (Low)	1$ = ₹ 40.80
				(-) Disc. (High)	₹ 0.50
					1$ = ₹ 40.30
4.3.22	Does not approach		4.3.22	Cancellation	
				Spot Buy (High) @	1$ = ₹ 41.05
				(+) E.M. @0.10%	₹ 0.0411
					1$ = ₹ 41.0911
				Rounding Off	1$ = ₹ 41.0900

Calculation of profit/loss:

1. Swap Loss

Spot Buy @	1$ = ₹ 40.95
Nearest Forward (1 Month) Open Sale @	1$ = ₹ 40.30
Swap Loss @	1$ = ₹ 0.65
Total Swap Loss = ₹ 0.65 x 10,000 $ = ₹ 6,500	

2. Interest

Inflow	1$ =	₹ 39.40
Outflow	1$ =	₹ 40.95
Net Outflow @	1$ =	₹ 1.55
Total Outflow = ₹ 1.55 x 10,000 $ = ₹ 15,500		
Interest Outflow = ₹ 15,500 x 12% x 3/365 = ₹ 15		

3. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ =	₹ 39.36
Spot Buy @	1$ =	₹ 41.09
Exchange Difference (Cancellation Loss) @	1$ =	₹ 1.73
Total Exchange Difference (Cancellation Loss) = ₹ 1.73 x 10,000 $ = ₹ 17,300		

4. Net Loss = ₹ 6,500 + ₹ 15 + ₹ 17,300 = ₹ 23,815

Customer have to pay ₹ 23,815 for cancellation charges

(vii) Customer wants delivery on 3.03.2022 (i.e. Late Delivery)

Dealer (Local Bank)						
Contract with Customer				**Contract with Inter-Bank Market**		
Date	Transaction			Date	Transaction	
1.1.22	2 Month Forward Buy			1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ =	₹ 40		Spot (Low)	1$ = ₹ 40
	(-) Disc. (High)		₹ 0.60		(-) Disc. (High)	₹ 0.60
		1$ =	₹ 39.40			1$ = ₹ 39.40
	(-) E.M. @0.10$		₹ 0.0394			
		1$ =	₹ 39.3606			
	Rounding Off	1$ =	₹ 39.3600			
1.3.22	Does not approach			1.3.22	Spot Buy (High) @	1$ = ₹ 40.95
				1.3.22	Nearest Forward (1 Month) Open Sale	
					Spot (Low)	1$ = ₹ 40.80
					(-) Disc. (High)	₹ 0.50
						1$ = ₹ 40.30
3.3.22	Request for Delivery			3.3.22	Cancellation	
3.3.22	New Contract for Spot Buy				Spot Buy (High) @	1$ = ₹ 41
	Spot (Low)	1$ =	₹ 40.85		(+) E.M. @0.10%	₹ 0.0410

(-) E.M. @0.10$	₹ 0.0409		1$ = ₹ 41.0410
	1$ = ₹ 40.8091	Rounding Off	1$ = ₹ 41.0400
Rounding Off	1$ = ₹ 40.8100		

Calculation of profit/loss:

1. Swap Loss

Spot Buy @	1$ = ₹ 40.95
Nearest Forward (1 Month) Open Sale @	1$ = ₹ 40.30
Swap Loss @	1$ = ₹ 0.65
Total Swap Loss = ₹ 0.65 x 10,000 $ = ₹ 6,500	

2. Interest

Inflow	1$ = ₹ 39.40
Outflow	1$ = ₹ 40.95
Net Outflow @	1$ = ₹ 1.55
Total Outflow = ₹ 1.55 x 10,000 $ = ₹ 15,500	
Interest Outflow = ₹ 15,500 x 12% x 2/365 = ₹ 10	

3. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ = ₹ 39.36
Spot Buy @	1$ = ₹ 41.04
Exchange Difference (Cancellation Loss) @	1$ = ₹ 1.68
Total Exchange Difference (Cancellation Loss) = ₹ 1.68 x 10,000 $ = ₹ 16,800	

4. Net Loss = ₹ 6,500 + ₹ 10 + ₹ 16,800 = ₹ 23,310

After paying ₹ 23,310 customer can take delivery @ 1$ = ₹ 40.81

(viii) Customer extends the contract for 1 Month on due date (i.e. 1.03.2022)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Buy		1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40		Spot (Low)	1$ = ₹ 40
	(-) Disc. (High)	₹ 0.60		(-) Disc. (High)	₹ 0.60
		1$ = ₹ 39.40			1$ = ₹ 39.40
	(-) E.M. @0.10$	₹ 0.0394			
		1$ = ₹ 39.3606			
	Rounding Off	1$ = ₹ 39.3600			

1.3.22	Request for Extension			1.3.22	Cancellation	
	New Contract for 1 M Forward Buy				Spot Buy (High) @	1$ = ₹ 40.95
	Spot (Low)	1$ = ₹ 40.80			(+) E.M. @0.10%	₹ 0.0410
	(-) Disc. (High)	₹ 0.50				1$ = ₹ 40.9910
		1$ = ₹ 40.30			Rounding Off	1$ = ₹ 40.9900
	(-) E.M. @0.10$	₹ 0.0403				
		1$ = ₹ 40.2597				
	Rounding Off	1$ = ₹ 40.2600				

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ = ₹ 39.36
Spot Buy @	1$ = ₹ 40.99
Exchange Difference (Cancellation Loss) @	1$ = ₹ 1.63
Total Exchange Difference (Cancellation Loss) = ₹ 1.63 x 10,000 $ = ₹ 16,300	

2. Net Loss = ₹ 16,300

Customer have to pay ₹ 16,300 for extension @ 1$ = ₹ 40.26

(ix) Customer extends the contract for 2 Months on 1.02.2022 (i.e. Early Extension)

Dealer (Local Bank)						
Contract with Customer				**Contract with Inter-Bank Market**		
Date	Transaction			Date	Transaction	
1.1.22	2 Month Forward Buy			1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40			Spot (Low)	1$ = ₹ 40
	(-) Disc. (High)	₹ 0.60			(-) Disc. (High)	₹ 0.60
		1$ = ₹ 39.40				1$ = ₹ 39.40
	(-) E.M. @0.10$	₹ 0.0394				
		1$ = ₹ 39.3606				
	Rounding Off	1$ = ₹ 39.3600				
1.2.22	Request for Extension			1.2.22	Cancellation (1 Month Forward Buy)	
	New Contract for 2 M Forward Buy				Spot (High)	1$ = ₹ 40.65
	Spot (Low)	1$ = ₹ 40.10			(-) Disc. (Low)	₹ 0.45
	(-) Disc. (High)	₹ 0.80				1$ = ₹ 40.20
		1$ = ₹ 39.30			(+) E.M. @0.10%	₹ 0.0402
	(-) E.M. @0.10$	₹ 0.0393				1$ = ₹ 40.2402
		1$ = ₹ 39.2607			Rounding Off	1$= ₹ 40.2400

Rounding Off	1$ = ₹ 39.2600	

Calculation of profit/loss:

1. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ =	₹ 39.3600
1 Month Forward Buy @	1$ =	₹ 40.2400
Exchange Difference (Cancellation Loss) @	1$ =	₹ 0.8800
Total Exchange Difference (Cancellation Loss) = ₹ 0.88 x 10,000 $ = ₹ 8,800		

2. Net Loss = ₹ 8,800

Customer have to pay ₹ 8,800 for extension @ 1$ = ₹ 39.26

(x) Customer extends the contract for 1 Month on 3.3.2022 (i.e. Late Extension)

Dealer (Local Bank)					
Contract with Customer			**Contract with Inter-Bank Market**		
Date	Transaction		Date	Transaction	
1.1.22	2 Month Forward Buy		1.1.22	2 Month Forward Sale	
	Spot (Low)	1$ = ₹ 40		Spot (Low)	1$ = ₹ 40
	(-) Disc. (High)	₹ 0.60		(-) Disc. (High)	₹ 0.60
		1$ = ₹ 39.40			1$ = ₹ 39.40
	(-) E.M. @0.10$	₹ 0.0394			
		1$ = ₹ 39.3606			
	Rounding Off	1$ = ₹ 39.3600			
1.3.22	Does not approach		1.3.22	Spot Buy (High) @	1$ = ₹ 40.95
			1.3.22	Nearest Forward (1 Month) Open Sale	
				Spot (Low)	1$ = ₹ 40.80
				(-) Disc. (High)	₹ 0.50
					1$ = ₹ 40.30
3.3.22	Request for Extension		3.3.22	Cancellation	
	New Contract for 1 M Forward Buy			Spot Buy (High) @	1$ = ₹ 41
	Spot (Low)	1$ = ₹ 40.85		(+) E.M. @0.10%	₹ 0.0410
	(-) Disc. (High)	₹ 0.40			1$ = ₹ 41.0410
		1$ = ₹ 40.45		Rounding Off	1$ = ₹ 41.0400
	(-) E.M. @0.10$	₹ 0.0405			
		1$ = ₹ 40.4095			
	Fineness of Quotation	1$ = ₹ 40.4100			

Calculation of profit/loss:

1. Swap Loss

Spot Buy @	1$ =	₹ 40.95
Nearest Forward (1 Month) Open Sale @	1$ =	₹ 40.30
Swap Loss @	1$ =	₹ 0.65
Total Swap Loss = ₹ 0.65 x 10,000 $ = ₹ 6,500		

2. Interest

Inflow	1$ =	₹ 39.40
Outflow	1$ =	₹ 40.95
Net Outflow @	1$ =	₹ 1.55
Total Outflow = ₹ 1.55 x 10,000 $ = ₹ 15,500		
Interest Outflow = ₹ 15,500 x 12% x 2/365 = ₹ 10		

3. Exchange Difference (Cancellation Loss)

2 Month Forward Buy @	1$ =	₹ 39.36
Spot Buy @	1$ =	₹ 41.04
Exchange Difference (Cancellation Loss) @	1$ =	₹ 1.68
Total Exchange Difference (Cancellation Loss) = ₹ 1.68 x 10,000 $ = ₹ 16,800		

4. Net Loss = ₹ 6,500 + ₹ 10 + ₹ 16,800 = ₹ 23,310

Customer have to pay ₹ 23,310 for extension @ 1$ = ₹ 40.41

Question 9

A customer with whom the Bank had entered into 3 months' forward purchase contract for Swiss Francs 10,000 at the rate of 27.25 comes to the bank after 2 months and requests cancellation of the contract. On this date, the rates, prevailing, are:

Spot	CHF 1 = ₹ 27.30/27.35
One month forward	₹ 27.45/27.52

What is the loss/gain to the customer on cancellation?

Answer

The contract would be cancelled at the one month forward rate of ₹ 27.52.

	₹
Francs bought from customer under original forward contract at:	27.25
Francs bought to cancel the contract at:	27.52
Net amount payable by customer per Franc	0.27

At ₹ 0.27 per Franc, exchange difference for CHF 10,000 is ₹ 2,700.

Loss to the Customer:

Exchange difference (Loss) = ₹ 2,700

Question 10

A bank enters into a forward purchase TT covering an export bill for Swiss Francs 1,00,000 at ₹ 32.4000 due 25th April and covered itself for same delivery in the local interbank market at ₹ 32.4200. However, on 25th March, exporter sought for cancellation of the contract as the tenor of the bill is changed.

In Singapore market, Swiss Francs were quoted against dollars as under:

Spot	USD 1 = Sw. Fcs. 1.5076/1.5120
One month forward	1.5150/1.5160
Two months forward	1.5250/1.5270
Three months forward	1.5415/1.5445

and in the interbank market US dollars were quoted as under:

Spot	USD 1 = ₹ 49.4302/.4455
Spot/April	.4100/.4200
Spot/May	.4300/.4400
Spot/June	.4500/.4600

Calculate the cancellation charges, payable by the customer if exchange margin required by the bank is 0.10% on buying and selling.

Rates rounded to 4 decimals in multiples of 0.0025.

Answer

First the contract will be cancelled at TT Rate

USD/Rupee Spot Rate	₹ 49.4455
Add: Premium for April	₹ 0.4200
	₹ 49.8655
Add: Exchange Margin @ 0.10%	₹ 0.0499
	₹ 49.9154
Rounded off to ₹ 49.9150	
USD/Sw. Fcs One Month Forward Rate	Sw. Fcs. 1.5150
Sw. Fcs. Spot Rate (₹ 49.9150/1.5150)	₹ 32.9472
Rounded Off	₹ 32.9475
Bank buys Sw. Fcs. Under original contract	₹ 32.4000
Bank buys under Cancellation	₹ 32.9475

Difference payable by customer	₹ 00.5475

Exchange difference of Sw. Fcs. 1,00,000 payable by customer = ₹ 54,750

(Sw. Fcs. 1,00,000 x ₹ 0.5475)

Question 11

Suppose you as a banker entered into a forward purchase contract for US$ 50,000 on 5th March with an export customer for 3 months at the rate of ₹ 59.6000. On the same day you also covered yourself in the market at ₹ 60.6025. However on 5th May your customer comes to you and requests extension of the contract to 5th July. On this date (5th May) quotation for US$ in the market is as follows:

Spot	₹ 59.1300/1400 per US$
Spot/5th June	₹ 59.2300/2425 per US$
Spot/5th July	₹ 59.6300/6425 per US$

Assuming a margin 0.10% on buying and selling, determine the extension charges payable by the customer and the new rate quoted to the customer.

Rates rounded to 4 decimals in multiples of 0.0025.

Answer

(a) Cancellation of Original Contract

The forward purchase contract shall be cancelled at the for the forward rate for delivery June.

Interbank forward rate	₹ 59.2425
Add: Exchange Margin	₹ 0.0592
Net amount payable by customer per US$	₹ 59.3017
Rounded off to ₹ 59.3025	
Buying US$ under original contract at original rate	₹ 59.6000
Forward rate to cancel the contract	₹ 59.3025
Difference per US$	₹ 00.2975

Exchange difference for US$ 50,000 payable to the customer is ₹ 14,875

(b) Rate for booking new contract

The forward contract shall be rebooked with the delivery 15th July as follows:

Forward buying rate (5th July)	₹ 59.6300
Less: Exchange Margin	₹ 0.0596
	₹ 59.5704

Rounded off to ₹ 59.5700

Question 12

On 15th January 2022 you as a banker booked a forward contract for US$ 2,50,000 for your import customer deliverable on 15th March 2022 at ₹ 65.3450. On due date customer request you to cancel the

contract. On this date quotation for US$ in the inter-bank market is as follows:

Spot	₹ 65.2900/2975 per US$
Spot/April	3000/3100
Spot/May	6000/6100

Assuming that the flat charges for the cancellation is ₹ 100 and exchange margin is 0.10%, then determine the cancellation charges payable by the customer.

Rates rounded to 4 decimals in multiples of 0.0025.

Answer

Since this is sale contract, it shall be cancelled at ready buying rate on date of cancellation as follows:

Spot Rate on 15 March 2022	₹ 65.2900
Less: Exchange Margin	₹ 0.0653
	₹ 65.2247
Rounded off	₹ 65.2250
Dollar sold to customer at	₹ 65.3450
Dollar bought from customer	₹ 65.2250
Net amount payable by the customer per US$	₹ 0.1200
Amount payable by the customer	
Flat Charges	₹ 100.00
Cancellation Charges (₹ 0.12 x 2,50,000)	₹ 30,000.00
	₹ 30,100.00

Question 13

Suppose you are a banker and one of your export customer has booked a US$ 1,00,000 forward sale contract for 2 months with you at the rate of ₹ 62.5200 and simultaneously you covered yourself in the interbank market at ₹ 62.5900. However on due date, after 2 months your customer comes to you and requests for cancellation of the contract and also requests for extension of the contract by one month. On this date quotation for US$ in the market was as follows:

Spot	₹ 62.7200/62.6800
1 month forward	₹ 62.6400/62.7400

Determine the extension charges payable by the customer assuming exchange margin of 0.10% on buying as well as selling.

Rates rounded to 4 decimals in multiples of 0.0025.

Answer

Cancellation

First the original contract shall be cancelled as follows:

US$/₹ Spot Rate	₹ 62.7200

Add: Margin @ 0.10%	₹ 0.06272
Net amount payable by customer per US$	₹ 62.78272
Rounded off	₹ 62.7825
Bank buys US$ under original contract at	₹ 62.5200
Bank buys to cancel the contract at	₹ 62.7825
	₹ 0.2625

Thus total cancellation charges payable by the customer for US$ 1,00,000 is ₹ 26,250.

Rebooking

Forward US$/₹ Buying Rate	₹ 62.6400
Less: Margin @ 0.10%	₹ 0.06264
Net amount payable by customer per US$	₹ 62.57736
Rounded off	₹ 62.5775

Question 14

An importer requests his bank to extend the forward contract for US$ 20,000 which is due for maturity on 30th October, 2022, for a further period of 3 months. He agrees to pay the required margin money for such extension of the contract.

Contracted Rate – US$ 1 = ₹ 42.32

The US Dollar quoted on 30-10-2022:

Spot – 41.5000/41.5200

3 months' Premium – 0.87%/0.93%

Margin money for buying and selling rate is 0.075% and 0.20% respectively.

Rates rounded to 4 decimals in multiples of 0.0025.

Compute:

(i) The cost to the importer in respect of the extension of the forward contract, and

(ii) The rate of new forward contract.

Answer

(i) The contract is to be cancelled on 30-10-2022

At the spot rate of US$ 1	= ₹ 41.5000
Less: Margin Money 0.075%	= ₹ 0.0311
	= ₹ 41.4689 or ₹ 41.4700
US$ 20,000 @ ₹ 41.47	= ₹ 8,29,400
US$ 20,000 @ ₹ 42.32	= ₹ 8,46,400
The difference in favour of the Bank/Cost to the importer	= ₹ 17,000

(ii) The Rate of New Forward Contract

Spot Selling Rate US$ 1	= ₹ 41.5200
Add: Premium @ 0.93%	= ₹ 0.3861
	= ₹ 41.9061
Add: Margin Money 0.20%	= ₹ 0.0838
	= ₹ 41.9899 or ₹ 41.9900

Question 15

On 1 October 2022 Mr. X an exporter enters into a forward contract with a BNP Bank to sell US$ 1,00,000 on 31 December 2022 at ₹ 65.40/$. However, due to the request of the importer, Mr. X received amount on 28 November 2022. Mr. X requested the bank to take delivery of the remittance on 30 November 2022 i.e. before due date. The inter-banking rates on 28 November 2022 was as follows:

Spot	₹ 65.22/65.27
One Month Premium	10/15

If bank agrees to take early delivery, then what will be net inflow to Mr. X assuming that the prevailing prime lending rate is 18%. Assume 365 days in a year.

Answer

Bank will buy from customer at the agreed rate of ₹ 65.40. In addition to the same if bank will charge/ pay swap difference and interest on outlay funds.

(a)	Swap Difference	
	Bank Sells at Spot Rate on 28 November 2022	₹ 65.22
	Bank Buys at Forward Rate of 31 December 2022 (65.27 + 0.15)	₹ 65.42
	Swap Loss per US$	₹ 00.20
	Swap loss for US$ 1,00,000	₹ 20,000
(b)	Interest on Outlay Funds	
	On 28th November Bank sells at	₹ 65.22
	It buys from customer at	₹ 65.40
	Outlay of Funds per US$	₹ 00.18
	Interest on Outlay fund for US$ 1,00,000 for 31 days	₹ 275.00
	(US$ 1,00,000 x 00.18 x 31/365 x 18%)	
(c)	Charges for early delivery	
	Swap loss	₹ 20,000.00
	Interest on Outlay fund for US$ 1,00,000 for 31 days	₹ 275.00
		₹ 20,275.00
(d)	Net Inflow to Mr. X	
	Amount received on sale (₹ 65.40 x 1,00,000)	₹ 65,40,000
	Less: Charges for early delivery payable to bank	(₹ 20,275)

₹ 65,19,725

Question 16

An importer booked a forward contract with his bank on 10th April for USD 2,00,000 due on 10th June @ ₹ 64.4000. The bank covered its position in the market at ₹ 64.2800.

The exchange rates for dollar in the interbank market on 10th June and 13th June were:

	10th June	13th June
Spot USD 1=	₹ 63.8000/8200	₹ 63.6800/7200
Spot/June	₹ 63.9200/9500	₹ 63.8000/8500
July	₹ 64.0500/0900	₹ 63.9300/9900
August	₹ 64.3000/3500	₹ 64.1800/2500
September	₹ 64.6000/6600	₹ 64.4800/5600

Exchange Margin 0.10% and interest on outlay of funds @ 12%. The importer requested on 13th June for extension of contract with due date on 10th August.

Rates rounded to 4 decimals in multiples of 0.0025.

Assume 360 days in a year.

On 10th June, Bank Swaps by selling spot and buying one month forward. Calculate:

(i) Cancellation rate

(ii) Amount payable on $ 2,00,000

(iii) Swap loss

(iv) Interest on outlay of funds, if any

(v) New contract rate

(vi) Total Cost

Answer

(i) Cancellation Rate:

The forward sale contract shall be cancelled at Spot TT for $ prevailing on the date of cancellation as follows:

$/₹ Market Spot Rate	₹ 63.6800
Less: Exchange Margin @ 0.10%	₹ 0.0636
	₹ 63.6163

Rounded off to ₹ 63.6175

(ii) Amount payable on $ 2,00,000

Bank sells under original contract $ 2,00,000 @ ₹ 64.4000	₹ 1,28,80,000
Bank sells for cancellation $ 2,00,000 @ ₹ 63.6175	₹ 1,27,23,500

Amount payable by customer	₹ 1,56,500

(iii) Swap Loss

On 10th June the bank does a swap sale of $ at market buying rate of ₹ 63.8000 and forward purchase for June at market selling rate of ₹ 63.9500.

Bank buys at	₹ 63.9500
Bank sells at	₹ 63.8000
Amount payable by customer	₹ 0.1500

Swap Loss for $ 2,00,000 in ₹ = ₹ 30,000

(iv) Interest on Outlay of Funds

On 10th June, the bank receives delivery under cover contract at ₹ 64.2800 and sell spot at ₹ 63.8000.

Bank buys at	₹ 64.2800
Bank sells at	₹ 63.8000
Amount payable by customer	₹ 0.4800

Outlay for $ 2,00,000 in ₹ 96,000

Interest on ₹ 96,000 @ 12% for 3 days = ₹ 96

(v) New Contract Rate

The contract will be extended at current rate

$/₹ Market forward selling Rate for August	₹ 64.2500
Add: Exchange Margin @ 0.10%	₹ 0.0643
	₹ 64.3143

Rounded off to ₹ 64.3150

(vi) Total Cost

Cancellation Charges	₹ 1,56,500.00
Swap Loss	₹ 30,000.00
Interest	₹ 96.00
	₹ 1,86,596.00

Question 17

On 10th July, an importer entered into a forward contract with bank for US $ 50,000 due on 10th September at an exchange rate of ₹ 66.8400. The bank covered its position in the interbank market at ₹ 66.6800.

How the bank would react if the customer requests on 13th September:

(i) to cancel the contract?

(ii) to execute the contract?

(iii) to extend the contract with due date to fall on 10th November?

The exchange rates for US$ in the interbank market were as below:

	10th September	13th September
Spot US$1 =	66.1500/1700	65.9600/9900
Spot/September	66.2800/3200	66.1200/1800
Spot/October	66.4100/4300	66.2500/3300
Spot/November	66.5600/6100	66.4000/4900

Exchange margin was 0.1% on buying and selling. Interest on outlay of funds was 12% p.a.

Rates rounded to 4 decimals in multiples of 0.0025.

Assume 365 days in a year.

You are required to show the calculations to:

(i) cancel the Contract,

(ii) execute the Contract, and

(iii) extend the Contract as above.

Answer

In each of the case first the FEADI Rule of Automatic Cancellation shall be applied and customer shall pay the charges consisted of following:

(a) Exchange Difference

(b) Swap Loss

(c) Interest on Outlay Funds

(a) Exchange Difference

(1) Cancellation Rate:

The forward sale contract shall be cancelled at Spot TT for $ prevailing on the date of cancellation as follows:

$/₹ Market Spot Rate	₹ 65.9600
Less: Exchange Margin @ 0.10%	₹ 0.0660
	₹ 65.8940

Rounded off to ₹ 65.8950

(2) Amount payable on $ 50,000

Bank sells under original contract $ 50,000 @ ₹ 66.8400	₹ 33,42,000
Bank sells for cancellation $ 50,000 @ ₹ 65.8950	₹ 32,94,750
Amount payable by customer	₹ 47,250

(b) Swap Loss

On 10th September the bank does a swap sale of $ at market buying rate of ₹ 66.1500 and forward

purchase for September at market selling rate of ₹ 66.3200.

Bank buys at	₹ 66.3200
Bank sells at	₹ 66.1500
Amount payable by customer	₹ 0.1700

Swap Loss for $ 50,000 in ₹ = ₹ 8,500

(c) Interest on Outlay of Funds

On 10th September, the bank receives delivery under cover contract at ₹ 66.6800 and sell spot at ₹ 66.1500.

Bank buys at	₹ 66.6800
Bank sells at	₹ 66.1500
Amount payable by customer	₹ 0.5300

Outlay for $ 50,000 in ₹ 26,500

Interest on ₹ 26,500 @ 12% for 3 days = ₹ 26

(d) Total Cost

Cancellation Charges	₹ 47,250.00
Swap Loss	₹ 8,500.00
Interest	₹ 26.00
	₹ 55,776.00

(e) New Contract Rate

The contract will be extended at current rate

$/₹ Market forward selling Rate for November	₹ 66.4900
Add: Exchange Margin @ 0.10%	₹ 0.0665
	₹ 66.5565

Rounded off to ₹ 66.5575

(i) Charges for Cancellation of Contract = ₹ 55,776.00

(ii) Charges for Execution of Contract

Charges for Cancellation of Contract	₹ 55,776.00
Spot Selling US$ 50,000 on 13th September at ₹ 65.9900 + 0.0660 (Exchange Margin) = ₹ 66.0560 rounded to ₹ 66.0550	₹ 33,02,750.00
	₹ 33,58,526.00

(iii) Charges for Extension of Contract

Charges for Cancellation of Contract	₹ 55,776.00
New Forward Rate	₹ 66.5575

Question 18

Z has to remit USD$ 1,00,000 for her daughter's education on 4th April 2022. Accordingly, she has booked a forward contract with his bank on 4th January 2022 @ ₹ 73.8775. The Bank has covered its position in the market @ ₹ 73.7575.

The exchange rates for USD$ in the interbank market on 4th, 7th and 14th April 2022 were:

	4th April ₹	7th April ₹	14th April ₹
Spot USD 1 =	73.2775/73.2975	73.1575/73.1975	73.1375/73.1775
Spot/April	73.3975/73.4275	73.2775/73.3275	73.2575/73.3075
May	73.7775/73.8250	73.6575/73.7275	73.6375/73.7050
June	74.0700/74.1325	73.9575/74.0675	73.9500/74.0525

Exchange margin of 0.10 percent and interest outlay of funds @ 12 percent are applicable. The remitter, due to rescheduling of the semester, has requested on 14th April 2022 for extension of contract with due date on 14th June 2022.

Calculate:

(i) Cancellation Rate;

(ii) Amount Payable on $ 1,00,000;

(iii) Swap loss;

(iv) Interest on outlay of funds, if any;

(v) New Contract Rate; and

(vi) Total Cost

Note: Rates must be rounded to 4 decimal places in multiples of 0.0025 and assume 365 days in a year.

Answer

(ii) Cancellation Rate:

The forward sale contract shall be cancelled at Spot TT for $ prevailing on the date of cancellation as follows:

$/₹ Market Spot Rate	₹ 73.1575
Less: Exchange Margin @ 0.10%	₹ 0.0732
	₹ 73.0843

Rounded off to ₹ 73.0850

(iii) Amount payable on $ 1,00,000

Bank sells under original contract $ 1,00,000 @ ₹ 73.8775	₹ 73,87,750
Bank sells for cancellation $ 1,00,000 @ ₹ 73.0850	₹ 73,08,500
Amount payable by customer	₹ 79,250

(iv) Swap Loss

On 4th April, the bank does a swap sale of $ at market buying rate of ₹ 73.4275 and forward

purchase for April at market selling rate of ₹ 73.2775.

Bank buys at	₹ 73.4275
Bank sells at	₹ 73.2775
Amount payable by customer	₹ 0.1500

Swap Loss for $ 1,00,000 in ₹ = ₹ 15,000

(v) Interest on Outlay of Funds

On 4th April, the bank receives delivery under cover contract at ₹ 73.7575 and sell spot at ₹ 73.2775.

Bank buys at	₹ 73.7575
Bank sells at	₹ 73.2775
Amount payable by customer	₹ 0.4800

Outlay for $ 1,00,000 in ₹ 48,000

Interest on ₹ 48,000 @ 12% for 3 days = ₹ 47

(vi) New Contract Rate

The contract will be extended at current rate

$/₹ Market forward selling Rate for June	₹ 74.0525
Add: Exchange Margin @ 0.10%	₹ 0.0741
	₹ 74.1266

Rounded off to ₹ 74.1275

(vii) Total Cost

Cancellation Charges	₹ 79,250.00
Swap Loss	₹ 15,000.00
Interest	₹ 47.00
	₹ 94,297.00

Forward Contract

Question 19

In March, 2022, the Multinational Industries make the following assessment of dollar rates per British pound to prevail as on 1.9.2022:

$/Pound	Probability
1.60	0.15
1.70	0.20
1.80	0.25

1.90	0.20
2.00	0.20

(i) What is the expected spot rate for 1.9.2022?

(ii) If, as of March, 2022, the 6-month forward rate is $ 1.80, should the firm sell forward its pound receivables due in September, 2022?

Answer

(i) Calculation of expected spot rate for September, 2022:

$ for £ **(1)**	**Probability** **(2)**	**Expected $/£** **(1) x (2) = (3)**
1.60	0.15	0.24
1.70	0.20	0.34
1.80	0.25	0.45
1.90	0.20	0.38
2.00	0.20	0.40
	1.00	1.81

Therefore, the expected spot value of $ for £ for September, 2022 would be $ 1.81.

(ii) If the six-month forward rate is $ 1.80, the expected profits of the firm can be maximised by retaining its pounds receivable.

Question 20

ZX Ltd. has made purchases worth USD 80,000 on 1st May 2022 for which it has to make a payment on 1st November 2022. The present exchange rate is INR/USD 75. The company can purchase forward dollars at INR/USD 74. The company will have to make an upfront premium @ 1 per cent of the forward amount purchased. The cost of funds to ZX Ltd. is 10 per cent per annum.

The company can hedge its position with the following expected rate of USD in foreign exchange market on 1st May 2022:

	Exchange Rate	**Probability**
(i)	INR/USD 77	0.15
(ii)	INR/USD 71	0.25
(iii)	INR/USD 79	0.20
(iv)	INR/USD 74	0.40

You are required to advise the company for a suitable cover for risk.

Answer

(i) If ZX Ltd. does not take forward (Unhedged Position):

Expected Rate = ₹ 77 x 0.15 + ₹ 71 x 0.25 + ₹ 79 x 0.20 + ₹ 74 x 0.40

= ₹ 11.55 + ₹ 17.75 + ₹ 15.80 + ₹ 29.60 = ₹ 74.70

Expected Amount Payable = USD 80,000 x ₹ 74.70 = ₹ 59,76,000

(ii) If the ZX Ltd. hedge its position in the forward market:

Particulars	Amount (₹)
If company purchases US$ 80,000 forward premium is (80,000 x 74 x 1%)	59,200
Interest on ₹ 59,200 for 6 months at 10%	2,960
Total hedging cost (a)	62,160
Amount to be paid for US$ 80,000 @ ₹ 74.00 (b)	59,20,000
Total Cost (a) + (b)	59,82,160

Advise: Since cashflow is less in case of unhedged position company should opt for the same.

Question 21

XYZ has taken a six-month loan from its foreign collaborator for USD 2 million. Interest is payable on maturity @ LIBOR plus 1%. The following information is available:

Spot Rate	INR/USD	68.5275
6 months Forward rate	INR/USD	68.4575
6 months LIBOR for USD	2%	
6 months LIBOR for INR	6%	

You are required to:

(i) Calculate Rupee requirements if forward cover is taken.

(ii) Advise the company on the forward cover.

What will be your opinion if spot rate of INR/USD is 68.4275?

Answer

(i) Rupee requirement if forward cover is taken:

6 Month Forward rate	68.4575
Interest amount (20,00,000 x 3%* x 6/12)	US$ 30,000
Principal amount	US$ 20,00,000
	US$ 20,30,000

Rupee Requirement = INR 68.4575 x US$ 20,30,000 = INR 13,89,68,725

*LIBOR + 1%

(ii) Forward Rate as per Interest Rate Parity after 6 months is expected to be:

= 68.5275 x (1.03)/(1.01) = 69.8845/US$

The company should take forward cover because as per Interest Rate Parity, the rate after 6 months is expected to be higher than forward rate.

However, if spot rate is 68.4275, the expected rate as per Interest Rate Parity shall be:

= 68.4275 x (1.03)/(1.01) = 69.7825/US$

Thus, still the company should take forward cover.

Question 22

ABC Co. have taken a 6 month loan from their foreign collaborators for US Dollars 2 million. Interest payable on maturity is at LIBOR plus 1.0%. Current 6-month LIBOR is 2%. Enquiries regarding exchange rates with their bank elicits the following information:

Spot USD 1	₹ 48.5275
6 months forward	₹ 48.4575

(i) What would be their total commitment in Rupees, if they enter into a forward contract?

(ii) Will you advise them to do so? Explain giving reasons.

Answer

Firstly, the interest is calculated at 3% p.a. for 6 months.

That is: USD 20,00,000 x 3/100 x 6/12 = USD 30,000

From the forward points quoted, it is seen that the second figure is less than the first, this means that the currency is quoted at a discount.

(i) The value of the total commitment in Indian rupees is calculated as below:

Principal Amount of loan	USD 20,00,000
Add: Interest	USD 30,000
Amount due	USD 20,30,000
Forward Rate	₹ 48.4575
Value of Commitment	₹ 9,83,68,725

(ii) It is seen from the forward rates that the market expectation is that the dollar will depreciate. If the firm's own expectation is that the dollar will depreciate more than what the bank has quoted, it may be worthwhile not to cover forward and keep the exposure open.

If the firm has no specific view regarding future dollar price movements, it would be better to cover the exposure. This would freeze the total commitment and insulate the firm from undue market fluctuations. In other words, it will be advisable to cut the losses at this point of time.

Given the interest rate differentials and inflation rates between India and USA, it would be unwise to expect continuous depreciation of the dollar. The US Dollar is a stronger currency than the Indian Rupee based on past trends and it would be advisable to cover the exposure.

Question 23

A company is considering hedging its foreign exchange risk. It has made a purchase on 1st July, 2022 for which it has to make a payment of US$ 60,000 on December 31, 2022. The present exchange rate is 1

US$ = ₹ 65. It can purchase forward 1 $ at ₹ 64. The company will have to make an upfront premium @ 2% of the forward amount purchased. The cost of funds to the company is 12% per annum.

In the following situations, compute the profit/loss the company will make if it hedges its foreign exchange risk with the exchange rate on 31st December, 2022 as:

(i) ₹ 68 per US $.

(ii) ₹ 62 per US $.

(iii) ₹ 70 per US $.

(iv) ₹ 65 per US $.

Answer

	(₹)
Present Exchange Rate ₹ 65 = 1 US$	
If company purchases US$ 60,000 forward premium is 60,000 x 64 x 2%	76,800
Interest on ₹ 76,800 for 6 months at 12%	4,608
Total hedging cost	81,408
If exchange rate is ₹ 68	
Then gain (₹ 68 – ₹ 64) for US$ 60,000	2,40,000
Less: Hedging cost	81,408
Net gain	1,58,592
If US$ = ₹ 62	
Then loss (₹ 64 – ₹ 62) for US$ 60,000	1,20,000
Add: Hedging Cost	81,408
Total Loss	2,01,408
If US$ = ₹ 70	
Then Gain (₹ 70 – ₹ 64) for US$ 60,000	3,60,000
Less: Hedging Cost	81,408
Total Gain	2,78,592
If US$ = ₹ 65	
Then Gain (₹ 65 – ₹ 64) for US$ 60,000	60,000
Less: Hedging Cost	81,408
Net Loss	21,408

Question 24

ABC Ltd. of UK has exported goods worth Can$ 5,00,000 receivable in 6 months. The exporter wants to hedge the receipt in the forward market. The following information is available:

Spot Exchange Rate Can$ 2.5/£

Interest Rate in UK	12%
Interest Rate in Canada	15%

The forward rates truly reflect the interest rates differential. Find out the gain/loss to UK exporter if Can$ spot rates (i) declines 2%, (ii) gains 4% or (iii) remains unchanged over next 6 months.

Answer

Forward Rate = 2.50 (1 + 0.075)/(1 + 0.060) = Can$ 2.535/£

(i) If spot rate decline by 2%

Spot Rate = Can$ 2.50 x 1.02 = Can$ 2.55/£

	£
£ receipt as per Forward Rate (Can$ 5,00,000/Can$ 2.535)	1,97,239
£ receipt as per Spot Rate (Can$ 5,00,000/Can$ 2.55)	1,96,078
Gain due to forward contract	1,161

(ii) If spot rate gains by 4%

Spot Rate = Can$ 2.50 x 0.96 = Can$ 2.40/£

	£
£ receipt as per Forward Rate (Can$ 5,00,000/Can$ 2.535)	1,97,239
£ receipt as per Spot Rate (Can$ 5,00,000/Can$ 2.40)	2,08,333
Loss due to forward contract	11,094

(iii) If spot rate remains unchanged

	£
£ receipt as per Forward Rate (Can$ 5,00,000/Can$ 2.535)	1,97,239
£ receipt as per Spot Rate (Can$ 5,00,000/Can$ 2.50)	2,00,000
Loss due to forward contract	2,761

Question 25

Following information relates to AKC 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	Yen 650	US$ 10.23	Euro 11.99
Receipts from sale due in 90 days	Yen 78,00,000	US$ 1,02,300	Euro 95,920

Foreign exchange rate information:

	Yen/₹	US$/₹	Euro/₹
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

Advice AKC Ltd. by calculating average contribution to sales ratio whether it should hedge its foreign currency risk or not.

Answer

				Total (₹)
Sum due	Yen 78,00,000	US$ 1,02,300	Euro 95,920	
Unit input price	Yen 650	US$ 10.23	Euro 11.99	
Unit sold	12,000	10,000	8000	
Variable cost per unit	₹ 225	₹ 395	₹ 510	
Variable cost	₹ 27,00,000	₹ 39,50,000	₹ 40,80,000	₹ 1,07,30,000
Three months forward rate for selling	2.427	0.0216	0.0178	
Rupee value of receipts	₹ 32,13,844	₹ 47,36,111	₹ 53,88,764	₹ 1,33,38,719
Contribution	₹ 5,13,844	₹ 7,86,111	₹ 13,08,764	₹ 26,08,719
Average contribution to sale ratio				19.56%
If risk is not hedged				
Three months spot rate for selling	2.459	0.02156	0.0179	
Rupee value of receipt	₹ 31,72,021	₹ 47,44,898	₹ 53,58,659	₹ 1,32,75,578
Total contribution	₹ 4,72,021	₹ 7,94,898	₹ 12,78,659	₹ 25,45,578
Average contribution to sale ratio				19.17%

AKC Ltd. is advised to hedge its foreign currency exchange risk.

Question 26

A company operating in Japan has today effected sales to an Indian company, the payment being due 3 months from the date of invoice. The invoice amount is 108 lakhs yen. At today's spot rate, it is equivalent to ₹ 30 lakhs. It is anticipated that the exchange rate will decline by 10% over the 3 months period and in order to protect the yen payments, the importer proposes to take appropriate action in the foreign exchange market. The 3 months forward rate is presently quoted as 3.3 yen per rupee. You are required to calculate the expected loss and to show how it can be hedged by a forward contract.

Answer

Spot rate of ₹ 1 against yen = 108 lakhs yen/₹ 30 lakhs = 3.6 yen

3 months Forward rate of ₹ 1 against yen = 3.3 yen

Anticipated decline in Exchange rate = 10%.

Expected spot rate after 3 months = 3.6 yen – 10% of 3.6 = 3.6 yen – 0.36 yen = 3.24 yen per rupee

	₹ (in lakhs)
If the expected exchange rate risk is not hedged:	
Present cost of 108 lakhs yen	30
Cost after 3 months: 108 lakhs yen/3.24 yen	33.33
Expected Loss	3.33
If the expected exchange rate risk is hedged by a Forward contract:	
Present cost	30
Cost after 3 months if forward contract is taken 108 lakhs yen/3.3 yen	32.73
Expected Loss	2.73

Suggestion: If the exchange rate risk is not covered with forward contract, the expected exchange loss is ₹ 3.33 lakhs. This could be reduced to ₹ 2.73 lakhs if it is covered with Forward contract. Hence, taking forward contract is suggested.

Question 27

JKL Ltd., an Indian company has an export exposure of JPY 1,00,00,000 payable August 31, 2022. Japanese Yen (JPY) is not directly quoted against Indian Rupee.

The current spot rates are:

INR/US$ = ₹ 62.22

JPY/US$ = JPY 102.34

It is estimated that Japanese Yen will depreciate to 124 level and Indian Rupee to depreciate against US $ to ₹ 65.

Forward rates for August 2022 are

INR/US$ = ₹ 66.50

JPY/US$ = JPY 110.35

Required:

(i) Calculate the expected loss, if the hedging is not done. How the position will change, if the firm takes forward cover?

(ii) If the spot rates on August 31, 2022 are:

INR/US$ = ₹ 66.25

JPY/US$ = JPY 110.85

Is the decision to take forward cover justified?

(Note: Calculate rate in 4 decimals)

Answer

Since the direct quote for ¥ and ₹ is not available it will be calculated by cross exchange rate as follows:

₹/$ x $/¥ = ₹/¥

62.22/102.34 = 0.6080

Spot rate on date of export 1¥ = ₹ 0.6080

Expected Rate of ¥ for August 2022 = ₹ 0.5242 (₹ 65/¥ 124)

Forward Rate of ¥ for August 2022 = ₹ 0.6026 (₹ 66.50/¥ 110.35)

(i) Calculation of expected loss without hedging

Value of export at the time of export (₹ 0.6080 x ¥ 1,00,00,000)	₹ 60,80,000
Estimated payment to be received on Aug. 2022 (₹ 0.5242 x ¥ 1,00,00,000)	₹ 52,42,000
Loss	₹ 8,38,000

Hedging of loss under Forward Cover

Value of export at the time of export (₹ 0.6080 x ¥ 1,00,00,000)	₹ 60,80,000
Payment to be received under Forward Cover (₹ 0.6026 x ¥ 1,00,00,000)	₹ 60,26,000
Loss	₹ 54,000

By taking forward cover loss is reduced to ₹ 54,000.

(ii) Actual Rate of ¥ on August 2022 = ₹ 0.5977 (₹ 66.25/¥ 110.85)

Value of export at the time of export (₹ 0.6080 x ¥ 1,00,00,000)	₹ 60,80,000
Actual payment received on Aug. 2022 (₹ 0.5977 x ¥ 1,00,00,000)	₹ 59,77,000
Loss	₹ 1,03,000

The decision to take forward cover is still justified.

Question 28

The following 2-way quotes appear in the foreign exchange market:

	Spot	2-months forward
₹/US$	₹ 46.00/₹ 46.25	₹ 47.00/₹ 47.50

Required:

(i) How many US dollars should a firm sell to get ₹ 25 lakhs after 2 months?

(ii) How many Rupees is the firm required to pay to obtain US$ 2,00,000 in the spot market?

(iii) Assume the firm has US$ 69,000 in current account earning no interest. ROI on Rupee investment is 10% p.a. Should the firm encash the US$ now or 2 months later?

Answer

(i) US$ required to get ₹ 25 lakhs after 2 months at the Rate of ₹ 47/$

$$\therefore \frac{₹\ 25,00,000}{₹\ 47} = \text{US\$ } 53,191.49$$

(ii) ₹ required to get US$ 2,00,000 now at the rate of ₹ 46.25/$

∴ US$ 2,00,000 x ₹ 46.25 = ₹ 92,50,000

(iii) Encashing US$ 69,000 Now Vs 2 month later

Proceed if we can encash in open mkt ($ 69,000 x ₹ 46) =	₹ 31,74,000
Opportunity gain (31,74,000 x 10% x 2/12)	₹ 52,900
Likely sum at end of 2 months	₹ 32,26,900
Proceeds if we can encash by forward rate:	
$ 69,000 x ₹ 47.00	₹ 32,43,000

It is better to encash the proceeds after 2 months.

Question 29

NP and Co. has imported goods for US$ 7,00,000. The amount is payable after three months. The company has also exported goods for US$ 4,50,000 and this amount is receivable in two months. For receivable amount a forward contract is already taken at ₹ 48.90.

The market rates for Rupee and Dollar are as under:

Spot	₹ 48.50/70
Two months	₹ 48.25/30
Three months	₹ 48.40/45

The company wants to cover the risk and it has two options as under:

(A) To cover payables in the forward market and

(B) To lag the receivables by one month and cover the risk only for the net amount. No interest for delaying the receivables is earned.

Evaluate both the options if the cost of Rupee Funds is 12%. Which option is preferable?

Answer

(A) To cover payable and receivable in forward Market

Amount payable after 3 months	$ 7,00,000
Forward Rate	₹ 48.45
Thus Payable Amount (₹) (A)	₹ 3,39,15,000
Amount receivable after 2 months	$ 4,50,000
Forward Rate	₹ 48.90
Thus Receivable Amount (₹) (B)	₹ 2,20,05,000
Interest @ 12% p.a. for 1 month (C)	₹ 2,20,050
Net Amount Payable in (₹) (A) – (B) – (C)	₹ 1,16,89,950

(B) Assuming that since the forward contract for receivable was already booked it shall be cancelled if we lag the receivables. Accordingly any profit/loss on cancellation of contract shall also be calculated and shall be adjusted as follows:

Amount Payable ($)	$ 7,00,000
Amount receivable after 3 months	$ 4,50,000

Net Amount payable	$ 2,50,000
Applicable Rate	₹ 48.45
Amount payable in (₹) (A)	₹ 1,21,12,500
Profit on cancellation of Forward cost (48.90 – 48.30) x 4,50,000 (B)	₹ 2,70,000
Thus net amount payable in (₹) (A) – (B)	₹ 1,18,42,500

Since net payable amount is least in case of first option, hence the company should cover payable and receivables in forward market.

Leading or Lagging Payment Decision

Question 30

DEF Ltd. has imported goods to the extent of US$ 1 crore. The payment terms are 60 days interest-free credit. For additional credit of 30 days, interest at the rate of 7.75% p.a. will be charged.

The banker of DEF Ltd. has offered a 30 days loan at the rate of 9.5% p.a. Their quote for the foreign exchange is as follows:

Spot rate INR/US$	62.50
60 days forward rate INR/US$	63.15
90 days forward rate INR/US$	63.45

Which one of the following options would be better?

(i) Pay the supplier on 60th day and avail bank loan for 30 days.

(ii) Avail the supplier's offer of 90 days credit.

Assume 360 days in a year.

Answer

(i) Pay the supplier in 60 days

If payment made to supplier in 60 days, applicable forward rate for 1 USD	₹ 63.15
Payment Due	USD 1 crore
Outflow in Rupees (USD 1 crore x ₹ 63.15)	₹ 63.15 crore
Add: Interest on loan for 30 days @9.5% p.a.	₹ 0.50 crore
Total Outflow in ₹	₹ 63.65 crore

(ii) Availing supplier's offer of 90 days credit

Amount Payable	USD 1.00000 crore
Add: Interest on credit period for 30 days @7.75% p.a.	USD 0.00646 crore
Total Outflow in USD	USD 1.00646 crore
Applicable forward rate for 1 USD	₹ 63.45
Total Outflow in ₹ (USD 1.00646 crore x ₹ 63.45)	₹ 63.86 crore

Alternative 1 is better as it entails lower cash outflow.

Question 31

Z Ltd. importing goods worth USD 2 million, requires 90 days to make the payment. The overseas supplier has offered a 60 days interest free credit period and for additional credit for 30 days an interest of 8% per annum.

The bankers of Z Ltd offer a 30 days loan at 10% per annum and their quote for foreign exchange is as follows:

	₹
Spot 1 USD	56.50
60 days forward for 1 USD	57.10
90 days forward for 1 USD	57.50

You are required to evaluate the following options:

(i) Pay the supplier in 60 days, or

(ii) Avail the supplier's offer of 90 days credit.

Assume 360 days in a year.

Answer

(i) Pay the supplier in 60 days

If payment is made to supplier in 60 days, applicable forward rate for 1 USD	₹ 57.10
Payment Due	USD 20,00,000
Outflow in Rupees (USD 20,00,000 x ₹ 57.10)	₹ 11,42,00,000
Add: Interest on loan for 30 days @10% p.a.	₹ 9,51,667
Total Outflow in ₹	₹ 11,51,51,667

(ii) Availing supplier's offer of 90 days credit

Amount Payable	USD 20,00,000
Add: Interest on credit period for 30 days @8% p.a.	USD 13,333
Total Outflow in USD	USD 20,13,333
Applicable forward rate for 1 USD	₹ 57.50
Total Outflow in ₹ (USD 20,13,333 x ₹ 57.50)	₹ 11,57,66,648

Alternative 1 is better as it entails lower cash outflow.

Question 32

Gibralater Limited has imported 5,000 bottles of shampoo at landed cost in Mumbai, of US$ 20 each. The company has the choice for paying for the goods immediately or in 3 months' time. It has a clean

overdraft limited where 14% p.a. rate of interest is charged.

Calculate which of the following method would be cheaper to Gibralter Limited.

(i) Pay in 3 months' time with interest @ 10% and cover risk forward for 3 months.

(ii) Settle now at a current spot rate and pay interest of the overdraft for 3 months.

The rates are as follows:

Mumbai ₹/$ spot:	60.25 – 60.55
3 months swap:	35/25

Answer

Option - I

$ 20 x 5,000 = $ 1,00,000

Repayment in 3 months' time = $ 1,00,000 x (1 + 0.10/4) = $ 1,02,500

3-months outright forward rate = ₹ 59.90/₹ 60.30

Repayment obligation in ₹ ($ 1,02,500 x ₹ 60.30) = ₹ 61,80,750

Option –II

Overdraft ($ 1,00,000 x ₹ 60.55)	₹ 60,55,000
Interest on Overdraft (₹ 60,55,000 x 0.14/4)	₹ 2,11,925
	₹ 62,66,925

Option I should be preferred as it has lower outflow.

Question 33

An Indian importer has to settle an import bill for $ 1,30,000. The exporter has given the Indian exporter two options:

(i) Pay immediately without any interest charges.

(ii) Pay after three months with interest at 5 percent per annum.

The importer's bank charges 15 percent per annum on overdrafts. The exchange rates in the market are as follows:

Spot rate (₹/$) : 48.35/48.36

3-Months forward rate (₹/$) : 48.81/48.83

The importer seeks your advice. Give your advice.

Answer

(i) If importer pays now, he will have to buy US$ in Spot Market by availing overdraft facility. Accordingly, the outflow under this option will be

	₹
Amount required to purchase $ 1,30,000 [$ 1,30,000 x ₹ 48.36]	62,86,800
Add: Overdraft Interest for 3 months @15% p.a.	2,35,755

	65,22,555

(ii) If importer makes payment after 3 months then, he will have to pay interest for 3 months @ 5% p.a. for 3 month along with the sum of import bill. Accordingly, he will have to buy $ in forward market. The outflow under this option will be as follows:

	$
Amount of Bill	1,30,000
Add: Interest for 3 months @5% p.a.	1,625
	1,31,625

Amount to be paid in Indian Rupee after 3 month under the forward purchase contract

= ₹ 64,27,249 (US$ 1,31,625 x ₹ 48.83)

Since outflow of cash is least in (ii) option, it should be opted for.

Question 34

XYZ Ltd. has imported goods to the extent of US$ 8 Million. The payment terms are as under:

(1) 1% discount if full amount is paid immediately or

(2) 60 days interest free credit. However, in case of a further delay up to 30 days, interest at the rate of 8% p.a. will be charged for additional days after 60 days. M/s XYZ Ltd. has ₹ 25 Lakh available and for remaining it has an offer from bank for a loan up to 90 days @ 9.0% p.a.

The quotes for foreign exchange are as follows:

Spot Rate INR/US$ (buying)	₹ 66.98
60 days Forward Rate INR/US$ (buying)	₹ 67.16
90 days Forward Rate INR/US$ (buying)	₹ 68.03

Advise which one of the following options would be better for XYZ Ltd.

(i) Pay immediately after utilizing cash available and for balance amount take 90 days loan from bank.

(ii) Pay the supplier on 60th day and avail bank's loan (after utilizing cash) for 30 days.

(iii) Avail supplier offer of 90 days credit and utilize cash available.

Further presume that the cash available with XYZ Ltd. will fetch a return of 4% p.a. in India till it is utilized.

Assume year has 360 days. Ignore Taxation.

Compute your working upto four decimals and cash flows in ₹ in Crore.

Answer

To evaluate which option would be better we shall compute the outflow under each option as follows:

(i) Pay Immediately availing discount

Particulars	Amount
Spot Rate	₹ 66.98

Amount required in US$ [US$ 8 million (1 – 0.01)]	US$ 7.92 Million
Amount required in ₹ [₹ 66.98 x US$ 7.92 Million]	₹ 53.0482 Crore
Cash Available	₹ 0.2500 Crore
Loan required [₹ 53.0482 Crore – ₹ 0.25 Crore]	₹ 52.7982 Crore
Interest for 90 days @ 9%	₹ 1.1880 Crore
Total Outflow	₹ 53.9862 Crore

(ii) Pay the supplier on 60th day and avail bank's loan (after utilizing cash) for 30 days.

Particulars	Amount
Applicable Forward Rate	₹ 67.16
Amount required in ₹ [₹ 67.16 x US$ 8 Million]	₹ 53.7280 Crore
Cash Available	₹ 0.2500 Crore
Interest earned on Cash for 60 days @ 4%	₹ 0.0017 Crore
Loan required [₹ 53.7280 Crore – (₹ 0.25 Crore + ₹ 0.0017 Crore)]	₹ 53.4763 Crore
Interest for 30 days @ 9%	₹ 0.4011 Crore
Total Outflow	₹ 53.8774 Crore

(iii) Avail supplier offer of 90 days credit and utilize cash available

Particulars	Amount
Amount Payable	US$ 8 Million
Interest for 30 days @ 8%	US$ 0.0533 Million
Amount required in $	US$ 8.0533 Million
Applicable Forward Rate	₹ 68.03
Amount required in ₹ [₹ 68.03 x US$ 8.0533 Million]	₹ 54.7866 Crore
Cash Available	₹ 0.2500 Crore
Interest earned on Cash for 90 days @ 4%	₹ 0.0025 Crore
Total Outflow	₹ 54.5341 Crore

Decision: Cash outflow is least in case of Option (ii) same should be opted for.

Question 35

India Imports co., purchased USD 1,00,000 worth of machines from a firm in New York, USA. The value of the rupee in terms of the Dollar has been decreasing. The firm in New York offers 2/10, net 90 terms. The spot rate for the USD is ₹ 55; the 90 days forward rate is ₹ 56.

(i) Compute the Rupee cost of paying the account within the 10 days.

(ii) Compute the Rupee cost of buying a forward contract to liquidate the account in 10 days.

(iii) The difference between part a and part b is the result of the time value of money (the discount for prepayment) and protection from currency value fluctuation. Determine the magnitude of each of

these components.

Answer

(i) (98,000) (₹ 55) = ₹ 53,90,000

(ii) (1,00,000) (₹ 56) = ₹ 56,00,000

(iii) Differences = ₹ 56,00,000 – ₹ 53,90,000 = ₹ 2,10,000

Time value of money = (1,00,000 – 98,000) (₹ 56) = ₹ 1,12,000

Protection from devaluation = (98,000) (₹ 56 – ₹ 55) = ₹ 98,000

Money Market Cover

Question 36

An Indian exporting firm, Rohit and Bros., would be cover itself against a likely depreciation of pound sterling. The following data is given:

Receivables of Rohit and Bros:	£ 5,00,000
Spot rate:	₹ 56.00/£
Payment date:	3-months
3 months interest rate:	India : 12 per cent per annum
	UK : 5 per cent per annum

What should the exporter do?

Answer

The only thing lefts Rohit and Bros to cover the risk in the money market. The following steps are required to be taken:

(i) Borrow pound sterling for 3-months. The borrowing has to be such that at the end of three months, the amount becomes £ 5,00,000. Say, the amount borrowed is £ x. Therefore

x [1 + 0.05 x 3/12] = 5,00,000

x = £ 4,93,827

(ii) Convert the borrowed sum into rupees at the spot rate.

This gives: £ 4,93,827 x ₹ 56 = ₹ 2,76,54,312

(iii) The sum thus obtained is placed in the money market at 12 per cent to obtain at the end of 3-months:

S = ₹ 2,76,54,312 x [1 + 0.12 x 3/12] = ₹ 2,84,83,941

(iv) The sum of £ 5,00,000 received from the client at the end of 3 months is used to refund the loan taken earlier.

From the calculations. It is clear that the money market operation has resulted into a net gain of ₹ 4,83,941 (₹ 2,84,83,941 – ₹ 5,00,000 x 56).

If pound sterling has depreciated in the meantime. The gain would be even bigger.

Question 37

An exporter is a UK based company. Invoice amount is $ 3,50,000. Credit period is three months. Exchange rates in London are:

Spot Rate ($/£) 1.5865 – 1.5905

3-month Forward Rate ($/£) 1.6100 – 1.6140

Rates of interest in Money Market:

	Deposit	Loan
$	7%	9%
£	5%	8%

Compute and show how a money market hedge can be put in place. Compare and contrast the outcome with a forward contract.

Answer

Identify: Foreign currency is an asset. Amount $ 3,50,000.

Create: $ Liability.

Borrow: In $. The borrowing rate is 9% per annum or 2.25% per quarter.

Amount to be borrowed: 3,50,000/1.0225 = $ 3,42,298.29

Convert: Sell $ and buy £. The relevant rate is the Ask rate, namely, 1.5905 per £. Amount of £s received on conversion is 2,15,214.27 (3,42,298.29/1.5905).

Invest: £ 2,15,214.27 will be invested at 5% for 3 months and get £ 2,17,904.45

Settle: The liability of $ 3,42,298.29 at interest of 2.25 per cent quarter matures to $ 3,50,000 receivable from customer.

Using forward rate, amount receivable is = 3,50,000/1.6140 = £ 2,16,852.54

Amount received through money market hedge = £ 2,17,904.45

Gain = 2,17,904.45 – 2,16,852.54 = £ 1,051.91

So, money market hedge is beneficial for the exporter.

Question 38

Columbus Surgicals Inc. is based in US, has recently imported surgical raw materials from the UK and has been invoiced for £ 4,80,000, payable in 3 months. It has also exported surgical goods to India and France.

The Indian customer has been invoiced for £ 1,38,000, payable in 3 months, and the French customer has been invoiced for € 5,90,000, payable in 4 months.

Current spot and forward rates are as follows:

£/US$

Spot: 0.9830 – 0.9850

Three months forward: 0.9520 – 0.9545

US$/€

Spot:	1.8890 – 1.8920
Four months forward:	1.9510 – 1.9540

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 markets hedge and suggest which the best hedging technique is.

Answer

£ Exposure

Since Columbus has a £ receipt (£ 1,38,000) and payment of (£ 4,80,000) maturing at the same time i.e. 3 months, it can match them against each other leaving a net liability of £ 3,42,000 to be hedged.

(i) Forward market hedge

Buy 3 months' forward contract accordingly, amount payable after 3 months will be

£ 3,42,000/0.9520 = US$ 3,59,244

(ii) Money market hedge

To pay £ after 3 months' Columbus shall requires to borrow in US$ and translate to £ and then deposit in £.

For payment of £ 3,42,000 in 3 months (@2.5% interest) amount required to be deposited now (£ 3,42,000/1.025) = £ 3,33,658

With spot rate of 0.9830 the US$ loan needed will be = US$ 3,39,429

Loan repayable after 3 months (@3.25% interest) will be = US$ 3,50,460

In this case the money market hedge is a cheaper option.

€ Receipt

Amount to be hedged = € 5,90,000

(i) Forward market hedge

Sell 4 months' forward contract accordingly, amount receivable after 4 months will be (€ 5,90,000 x 1.9510) = US$ 11,51,090

(ii) Money market hedge

For money market hedge Columbus shall borrow in € and then translate to US$ and deposit in US$

For receipt of € 5,90,000 in 4 months (@ 5.33% interest) amount required to be borrowed now (€ 5,90,000/1.0533) = € 5,60,144

With spot rate of 1.8890 the US$ deposit will be = US$ 10,58,113

Deposit amount will increase over 4 months (@3.83% interest) will be = US$ 10,98,639

In this case, more will be received in US$ under the forward hedge.

Currency Futures

Question 39

EFD Ltd. is an export business house based in Mumbai. The Company prepares invoice in customers' currency. Its debtors of US$ 1,00,000 is due on September 1, 2022.

Market information as at June 1, 2022 is:

Exchange Rates US$/₹	
Spot	0.02140
1 Month Forward	0.02136
3 Months Forward	0.02127

Currency Futures US$/₹	
Contract size: ₹ 4,72,000	
1 Month	0.02126
3 Months	0.02118

	Initial Margin	**Interest Rates in India**
1 Month	₹ 10,000	7.50%
3 Months	₹ 15,000	8.00%

On September 1, 2022 the spot rate US$/INR is 0.02133 and currency future rate is 0.02134.

Which of the following methods would be most advantageous for EFD Ltd?

(a) Using forward contract

(b) Using currency futures

(c) Not hedging currency risks.

Answer

Receipts using a forward contract = $ 1,00,000/0.02127 = ₹ 47,01,457

Receipts using currency futures

The number of contracts needed is ($ 1,00,000/0.02118)/4,72,000 = 10

Initial margin payable is 10 x ₹ 15,000 = ₹ 1,50,000

On September 1 Close at 0.02133

Receipts = $ 1,00,000/0.02133 = ₹ 46,88,233

Variation Margin = [(0.02134 – 0.02118) x 10 x 4,72,000]/0.02133 = ₹ 35,406

Less: Interest Cost = 1,50,000 x 0.08 x 3/12 = (₹ 3,000)

Net Receipts = ₹ 47,20,639

Receipts under different methods of hedging

Forward contract ₹ 47,01,457

Futures ₹ 47,20,639

No hedge ($ 1,00,000/0.02133) ₹ 46,88,233

The most advantageous option would have been to hedge with futures.

Question 40

Nitrogen Ltd, a UK company is in the process of negotiating an order amounting to € 4 million with a large German retailer on 6 months credit. If successful, this will be the first time that Nitrogen Ltd has exported goods into the highly competitive German market. The following three alternatives are being considered for managing the transaction risk before the order is finalized.

(i) Invoice the German firm in Sterling using the current exchange rate to calculate the invoice amount.

(ii) Alternative of invoicing the German firm in € and using a forward foreign exchange contract to hedge the transaction risk.

(iii) Invoice the German first in € and use sufficient 6 months sterling future contracts (to the nearly whole number) to hedge the transaction risk.

Following data is available:

Spot Rate	€ 1.1750 – € 1.1770/£
6 months forward points	0.60 – 0.55 Euro Cents
6 months future contract is currently trading at	€ 1.1760/£
6 months future contract size is	£ 62,500
After 6 months Spot rate and future rate	€ 1.1785/£

Required:

(a) Calculate to the nearest £ the receipt for Nitrogen Ltd, under each of the three proposals.

(b) In your opinion, which alternative would you consider to be the most appropriate and the reason thereof.

Answer

(a) Receipt under three proposals

(i) Invoicing in Sterling

Invoicing in £ will produce = $\frac{€\ 4\ \text{million}}{1.1770}$ = £ 33,98,471

(ii) Use of Forward Contract

Forward Rate = € 1.1770 – 0.0055 = 1.1715

Using Forward Market hedge Sterling receipt would be (€ 4 million/1.1715) = £ 34,14,426

(iii) Use of Future Contract

The equivalent sterling of the order placed based on future price (€1.1760)

= € 4 million/1.1760 = £ 34,01,360

Number of Contracts = £ 34,01,360/62,500 = 54 Contracts (to the nearest whole number)

Thus, € amount hedged by future contract will be = 54 x £ 62,500 = £ 33,75,000

Buy Future at	€ 1.1760
Sell Future at	€ 1.1785
	€ 0.0025

Total profit on Future Contracts = 54 x £ 62,500 x € 0.0025 = € 8,438

After 6 months

Amount Received	€ 40,00,000
Add: Profit on Future Contracts	€ 8,438
	€ 40,08,438

Sterling Receipts

On sale of € at spot = €40,08,438/1.1785 = £ 34,01,305

(b) Proposal of option (b) is preferable because the option (a) & (c) produces least receipts.

Question 41

Zaz plc, a UK Company is in the process of negotiating an order amounting € 2.8 million with a large German retailer on 6 months credit. If successful, this will be first time for Zaz has exported goods into the highly competitive German Market. The Zaz is considering following 3 alternatives for managing the transaction risk before the order is finalized.

(a) Mr. Peter the Marketing head has suggested that in order to remove transaction risk completely Zaz should invoice the German firm in Sterling using the current €/£ average spot rate to calculate the invoice amount.

(b) Mr. Wilson, CE is doubtful about Mr. Peter's proposal and suggested an alternative of invoicing the German firm in € and using a forward exchange contract to hedge the transaction risk.

(c) Ms. Karen, CFO is agreed with the proposal of Mr. Wilson to invoice the German first in €, but she is of opinion that Zaz should use sufficient 6 month sterling future contracts (to the nearest whole number) to hedge the transaction risk.

Following data is available

Sport Rate	€ 1.1960 – € 1.1970/£
6 months forward points	0.60 – 0.55 Euro Cents
6 month future contract is currently trading at	€ 1.1943/£
6 month future contract size is	£ 62,500
After 6 month Spot rate and future rate	€ 1.1873/£

You are required to

(i) Calculate (to the nearest £) the £ receipt for Zaz plc, under each of 3 above proposals.

(ii) In your opinion which alternative you consider to be most appropriate.

(iii) Interpret the proposal of Mr. Peter from non-financial point of view.

Answer

(i) Receipt under three proposals

(a) Proposal of Mr. Peter

Invoicing in £ will produce = € 2.8 million/1.1965 = £ 23,40,159

(b) Proposal of Mr. Wilson

Forward Rate = € 1.1970 – 0.0055 = 1.1915

In Forward Market hedge Sterling receipt would be (€ 2.8 million/1.1915) = £ 23,49,979

(c) Proposal of Ms. Karen

The equivalent sterling of the order placed based on future price (€ 1.1943)

= € 2.8 million/1.1943 = £ 23,44,470

Number of Contracts = £ 23,44,470/62,500 = 37 Contracts (to the nearest whole number)

Thus, € amount hedged by future contract will be = 37 x £ 62,500 = £ 23,12,500

Buy Future at	€ 1.1943
Sell Future at	€ 1.1873
	€ 0.0070

Total loss on Future Contracts = 37 x £ 62,500 x € 0.0070 = € 16,188

After 6 months

Amount Received	€ 28,00,000
Less: Loss on Future Contracts	€ 16,188
	€ 27,83,812

Sterling Receipts

On sale of € at spot = € 27,83,812/1.1873 = £ 23,44,658

(ii) Proposal of option (b) is preferable because the option (a) & (c) produces least receipts.

(iii) Further, in case of proposal (a) there must be a doubt as to whether this would be acceptable to German firm as it is described as a competitive market and Zaz plc is moving into it first time.

Question 42

ABC Technologic is expecting to receive a sum of US$ 4,00,000 after 3 months. The company decided to go for future contract to hedge against the risk. The standard size of future contract available in the market is $ 1,000. As on date spot and futures $ contract are quoting at ₹ 44.00 & ₹ 45.00 respectively. Suppose after 3 months the company closes out its position futures are quoting at ₹ 44.50 and spot rate is also quoting at ₹ 44.50. You are required to calculate effective realization for the company while selling the receivable. Also calculate how company has been benefitted by using the future option.

Answer

The company can hedge position by selling future contracts as it will receive amount from outside.

Number of Contracts = $ 4,00,000/$ 1,000 = 400 contracts

Gain by trading in futures = (₹ 45 – ₹ 44.50) 4,00,000= ₹ 2,00,000

Net Inflow after 3 months = ₹ 44.50 x $ 4,00,000 + 2,00,000 = ₹ 1,80,00,000

Effective Price Realization = ₹ 1,80,00,000/$ 4,00,000 = ₹ 45 Per US$

Currency Options

Question 43

XYZ Ltd. a US firm will need £ 3,00,000 in 180 days. In this connection, the following information is available:

Spot rate 1 £ = $ 2.00

180 days forward rate of £ as of today = $ 1.96

Interest rates are as follows:

	U.K.	US
180 days deposit rate	4.5%	5%
180 days borrowing rate	5%	5.5%

A call option on £ that expires in 180 days has an exercise price of $ 1.97 and a premium of $ 0.04.

XYZ Ltd. has forecasted the spot rates 180 days hence as below:

Future rate	Probability
$ 1.91	25%
$ 1.95	60%
$ 2.05	15%

Which of the following strategies would be most preferable to XYZ Ltd.?

(a) A forward contract;

(b) A money market hedge;

(c) An option contract;

(d) No hedging.

Show calculations in each case.

Answer

(a) Forward contract:

Dollar needed in 180 days = £ 3,00,000 x $ 1.96 = $ 5,88,000

(b) Money market hedge:

Borrow $, convert to £, invest £, repay $ loan in 180 days

Amount in £ to be invested = 3,00,000/1.045 = £ 2,87,081

Amount of $ needed to convert into £ = 2,87,081 x 2 = $ 5,74,162

Interest and principal on $ loan after 180 days = $ 5,74,162 x 1.055 = $ 6,05,741

(c) Call option:

Expected Spot rate in 180 days	Premium/ unit	Exercise Option	Total price per unit	Total price for £ 3,00,000 [Xi]	Prob. [Pi]	Pi Xi

1.91	0.04	No	1.95	5,85,000	0.25	1,46,250
1.95	0.04	No	1.99	5,97,000	0.60	3,58,200
2.05	0.04	Yes	2.01*	6,03,000	0.15	90,450
						5,94,900
Add: Interest on Premium @5.5% (12,000 x 5.5%)						660
						5,95,560

*($ 1.97 + $ 0.04)

(d) No hedge option:

Expected Future spot rate	Dollar needed (Xi)	Prob. (Pi)	Pi Xi
1.91	5,73,000	0.25	1,43,250
1.95	5,85,000	0.60	3,51,000
2.05	6,15,000	0.15	92,250
			5,86,500

The probability distribution of outcomes for no hedge strategy appears to be most preferable because least number of $ are needed under this option to arrange £ 3,00,000.

Question 44

An American firm is under obligation to pay interests of Can$ 10,10,000 and Can$ 7,05,000 on 31st July and 30th September respectively. The firm is risk averse and its policy is to hedge the risk involved in all foreign exchange transactions. The finance manager of the firm is thinking of hedging the risk considering two methods i.e. Fixed forward or Option contracts.

It is now June 30. Following quotations regarding rate of exchange, US$ per Can$, from the firm's bank were obtained:

Spot	1 Month Forward	3 Months Forward
0.9284 – 0.9288	0.9301	0.9356

Price for a US$/Can$ option on a U.S. stock exchange (cents per Can$, payable on purchase of the option, contract size Can$ 50,000) are as follows:

Strike Price	Calls		Puts	
(US$/Can$)	July	Sept.	July	Sept.
0.93	1.56	2.56	0.88	1.75
0.94	1.02	NA	NA	NA
0.95	0.65	1.64	1.92	2.34

According to the suggestion of finance manager if options are to be used, one month option should be bought at a strike price of 94 cents and three month option at a strike price of 95 cents and for the remainder uncovered by the options the firm would bear the risk itself. For this, it would use forward rate as the best estimate of spot. Transaction costs are ignored.

Recommend, which of the above two methods would be appropriate for the American firm to hedge its foreign exchange risk on the two interest payments.

Answer

Forward Market Cover

Hedge the risk by buying Can$ in 1 and 3 months' time will be:

July = 10,10,000 x 0.9301 = US$ 9,39,401

Sept. = 7,05,000 x 0.9356 = US$ 6,59,598

Option Contracts

July Payment = 10,10,000/50,000 = 20.20

September Payment = 7,05,000/50,000 = 14.10

Company would like to take out 20 contracts for July and 14 contracts for September respectively. Therefore costs, if the options were exercised, will be:

	July		Sept.	
	Can$	**US$**	**Can$**	**US$**
Covered by Contracts	10,00,000	9,40,000	7,00,000	6,65,000
Balance bought at spot rate	10,000	9,301	5,000	4,678
Option Costs:				
Can$ 50,000 x 20 x 0.0102		10,200	–	
Can$ 50,000 x 14 x 0.0164	–			11,480
Total cost in US$ of using Option Contract		9,59,501		6,81,158

Decision: As the firm is stated as risk averse and the money due to be paid is certain, a fixed forward contract, being the cheapest alternative in the both the cases, would be recommended.

Question 45

A Ltd. of U.K. has imported some chemical worth of USD 3,64,897 from one of the U.S. suppliers. The amount is payable in six months' time. The relevant spot and forward rates are:

Spot rate	USD 1.5617 – 1.5673
6 months' forward rate	USD 1.5455 – 1.5609

The borrowing rates in U.K. and U.S. are 7% and 6% respectively and the deposit rates are 5.5% and 4.5% respectively.

Currency options are available under which one option contract is for GBP 12,500. The option premium for GBP at a strike price of USD 1.70/GBP is USD 0.037 (call option) and USD 0.096 (put option) for 6 months period.

The company has 3 choices:

(i) Forward cover

(ii) Money market cover, and

(iii) Currency option

Which of the alternatives is preferable by the company?

Answer

In the given case, the exchange rates are indirect. These can be converted into direct rates as follows:

Spot rate

$$GBP = \frac{1}{USD\ 1.5617} \text{ to } \frac{1}{USD\ 1.5673}$$

USD = GBP 0.64033 – GBP 0.63804

6 months' forward rate

$$GBP = \frac{1}{USD\ 1.5455} \text{ to } \frac{1}{USD\ 1.5609}$$

USD = GBP 0.64704 – GBP 0.64066

Payoff in 3 alternatives

(i) Forward Cover

Amount payable	USD 3,64,897
Forward rate	GBP 0.64704
Payable in GBP	GBP 2,36,103

(ii) Money market Cover

Amount payable	USD 3,64,897
PV @ 4.5% for 6 months i.e. (1/1.0225) = 0.9779951	USD 3,56,867
Spot rate purchase	GBP 0.64033
Borrow GBP 3,56,867 x 0.64033	GBP 2,28,512
Interest for 6 months @7%	GBP 7,998
Payable after 6 months	GBP 2,36,510

(iii) Currency options

Amount payable	USD 3,64,897
Unit in Options contract	GBP 12,500
Value in USD at strike rate of 1.70 (GBP 12,500 x 1.70)	USD 21,250
Number of contracts USD 3,64,897/USD 21,250	17.17
Exposure covered USD 21,250 x 17	USD 3,61,250
Exposure to be covered by Forward (USD 3,64,897 – USD 3,61,250)	USD 3,647
Options premium 17 x GBP 12,500 x 0.096	USD 20,400
Premium in GBP (USD 20,400 x 0.64033)	GBP 13,063
Total payment in currency option	
Payment under option (17 x 12,500)	GBP 2,12,500
Premium payable	GBP 13,063

Payment for forward cover (USD 3,647 x 0.64704)	GBP 2,360
	GBP 2,27,923

Thus total payment in:

(i)	Forward Cover	2,36,103 GBP
(ii)	Money Market	2,36,510 GBP
(iii)	Currency Option	2,27,923 GBP

The company should take currency option for hedging the risk.

Note: Interest on Option Premium can also be considered in the above solution.

Question 46

XYZ, an Indian firm, will need to pay JAPANESE YEN (JY) 5,00,000 on 30th June. In order to hedge the risk involved in foreign currency transaction, the firm is considering two alternative methods i.e. forward market cover and currency option contract.

On 1st April, following quotations (JY/INR) are made available:

Spot	3 months forward
1.9516/1.9711	1.9726/1.9923

The prices for forex currency option on purchase are as follows:

Strike Price	JY 2.125
Call option (June)	JY 0.047
Put option (June)	JY 0.098

For excess or balance of JY covered, the firm would use forward rate as future spot rate. You are required to recommend cheaper hedging alternative for XYZ.

Answer

(i) Forward Cover

3-month Forward Rate = $\frac{1}{1.9726}$ = ₹ 0.5070/JY

Accordingly, INR required for JY 5,00,000 (5,00,000 x ₹ 0.5070) = ₹ 2,53,500

(ii) Option Cover

To purchase JY 5,00,000, XYZ shall enter into a Put Option @ JY 2.125/INR

Accordingly, outflow in INR	$\left(\frac{\text{JY } 5,00,000}{2.125}\right)$	₹ 2,35,294
Premium	$\left(\frac{\text{INR } 2,35,294 \times 0.098}{1.9516}\right)$	₹ 11,815
		₹ 2,47,109

Since outflow of cash is least in case of Option same should be opted for. Further if price of INR goes above JY 2.125/INR the outflow shall further be reduced.

Two Point Arbitrage

Question 47

In International Monetary Market an international forward bid for December, 15 on pound sterling is $ 1.2816 at the same time that the price of IMM sterling future for delivery on December, 15 is $ 1.2806. The contract size of pound sterling is £ 62,500. How could the dealer use arbitrage in profit from this situation and how much profit is earned?

Answer

Buy £ 62,500 x 1.2806 =	$ 80,037.50
Sell £ 62,500 x 1:2816 =	$ 80,100.00
Profit =	$ 62.50

Question 48

Citi Bank quotes JPY/USD 105.00 – 106.50 and Honk Kong Bank quotes USD/JPY 0.0090 – 0.0093.

(a) Are these quotes identical if not then how they are different?

(b) Is there a possibility of arbitrage?

(c) If there is an arbitrage opportunity, then show how would you make profit from the given quotation in both cases if you are having JPY 1,00,000 or US$ 1,000.

Answer

(a) No, while Citi Bank's quote is a Direct Quote for JPY (i.e. for Japan) the Hong Kong Bank quote is a Direct Quote for USD (i.e. for USA).

(b) Since Citi Bank quote imply USD/JPY 0.0094 – 0.0095 and both rates exceed those offered by Hong Kong Bank, there is an arbitrage opportunity.

Alternatively, it can also be said that Hong Kong Bank quote imply JPY/USD 107.53 – 111.11 and both rates exceed quote by Citi Bank, there is an arbitrage opportunity.

(c) Let us how arbitrage profit can be made.

(i)	Convert US$ 1,000 into JPY by buying from Hong Kong Bank	JPY 1,07,530
	Sell these JPY to Citi Bank at JPY/USD 106.50 and convert in US$	US$ 1,009.67
	Thus, arbitrage gain (US$ 1,009.67 – US$ 1,000.00)	US$ 9.67
(ii)	Convert JPY 1,00,000 into USD by buying from Citi Bank at JPY/USD 106.50	US$ 938.97
	Sell these US$ to Hong Kong Bank at JPY/USD 107.53 and convert in US$	JPY 1,00,967.44
	Thus, arbitrage gain (JPY 1,00,967.44 – JPY 1,00,000)	JPY 967.44

Triangular (Three Point) Arbitrage

Question 49

Followings are the spot exchange rates quoted at three different forex markets:

USD/INR	48.30 in Mumbai
GBP/INR	77.52 in London
GBP/USD	1.6231 in New York

The arbitrageur has USD 1,00,00,000. Assuming that there are no transaction costs, explain whether there is any arbitrage gain possible from the quoted spot exchange rates.

Answer

The arbitrageur can proceed as stated below to realize arbitrage gains.

(i) Buy ₹ from USD 1,00,00,000 At Mumbai (48.30 x 1,00,00,000) = ₹ 48,30,00,000

(ii) Convert these ₹ to GBP at London (₹ 48,30,00,000/₹ 77.52) = GBP 62,30,650.155

(iii) Convert GBP to USD at New York (GBP 62,30,650.155 x 1.6231) = USD 1,01,12,968.26

There is net gain of USD 1,01,12,968.26 less USD 1,00,00,000 i.e. USD 1,12,968.26

Covered Interest Arbitrage

Question 50

Spot rate 1 US$ = ₹ 48.0123

180 days Forward rate for 1 US $ = ₹ 48.8190

Annualised interest rate for 6 months – Rupee = 12%

Annualised interest rate for 6 months – US$ = 8%

Is there any arbitrage possibility? If yes how an arbitrageur can take advantage of the situation, if he is willing to borrow ₹ 40,00,000 or US$ 83,312.

Answer

Spot Rate = ₹ 40,00,000/US$ 83,312 = 48.0123

Forward Premium on US$ = [(48.8190 – 48.0123)/48.0123] x 12/6 x 100 = 3.36%

Interest rate differential = 12% – 8% = 4%

Since the negative Interest rate differential is greater than forward premium there is a possibility of arbitrage inflow into India.

The advantage of this situation can be taken in the following manner:

1. Borrow US$ 83,312 for 6 months

   Amount to be repaid after 6 months

   = US$ 83,312 (1 + 0.08 x 6/12) = US$ 86,644.48

2. Convert US$ 83,312 into Rupee and get the principal i.e. ₹ 40,00,000

   Interest on Investments for 6 months = ₹ 40,00,000 x 0.06 = ₹ 2,40,000

   Total amount at the end of 6 months = ₹ (40,00,000 + 2,40,000) = ₹ 42,40,000

3. Converting the same at the forward rate = ₹ 42,40,000/₹ 48.8190= US$ 86,851.43

Hence the gain is US$ (86,851.43 – 86,644.48) = US$ 206.95 OR ₹ 10,103 i.e., ($ 206.95 x ₹ 48.8190)

Question 51

Given the following information:

Exchange rate-

Canadian Dollar 0.666 per DM (Spot)

Canadian Dollar 0.671 per DM (3 months)

Interest rates-

DM 8% p.a.

Canadian Dollar 10% p.a.

What operations would be carried out by the arbitrageur to earn the possible arbitrage gains, if he is willing to borrow CAN$ 1,000 or DM 1,501.

Answer

In this case, DM is at a premium against the Canadian$ premium

= [(0.671 – 0.666)/0.666] x 12/3 x 100 = 3%

Whereas interest rate differential = 10% – 8% = 2%

Since the interest rate differential is smaller than the premium, it will be profitable to place money in Deutsch Marks the currency whose 3 months interest is lower.

The following operations are carried out:

(i) Borrow CAN$ 1,000 at 10% for 3 months,

(ii) Change this sum into DM at the Spot Rate to obtain DM = (CAN$ 1,000/0.666) = 1501.50

(iii) Place DM 1,501.50 in the money market for 3 months to obtain a sum of DM

Principal	DM 1,501.50
Add: interest @ 8% for 3 months	DM 30.03
	DM 1,531.53

(iv) Sell DM at 3 months forward to obtain DM 1,531.53 x 0.671 = CAN$ 1,027.66

(v) Refund the debt taken in CAN $ with the interest due on it, i.e.

Principal	CAN$ 1,000.00
Add: interest @ 10% for 3 months	CAN$ 25.00
Total	CAN$ 1,025.00

Net arbitrage gain = CAN$ 1,027.66 – CAN$ 1,025.00 = CAN$ 2.66

Question 52

Mercy is a Forex Dealer with XYZ Bank. She notices following information relating to Canadian Dollar (CAD) and German Deutschmark (DEM):

Exchange rate – CAD 0.775 per DEM (Spot)

CAD 0.780 per DEM (3 months)

Interest rates – DEM 7% p.a.

CAD 9% p.a.

(i) Assuming that there is no transaction cost determine does the Interest Rate Parity holds in above quotations.

(ii) If yes, then explain the steps that would be required to make an arbitrage profit if Mercy is authorized to work with CAD 1 Million for the same purpose. Also determine the profit that would be made in CAD.

Note: Ignore the decimal points in the amounts.

Answer

(i) For 3 months, r_{CAD} = 2.25% and r_{DEM} = 1.75%. Since the exchange rate is in CAD/DEM term the appropriate equation for Interest Rate Parity is as follows:

$$\frac{F}{S} = \frac{(1 + r_{CAD})}{(1 + r_{DEM})}$$

$$\frac{0.780}{0.775} = \frac{(1 + 0.0225)}{(1 + 0.0175)}$$

$1.00645 \neq 1.00491$

Since both sides are not equal, Interest Rate Parity does not hold.

(ii) Since IRP does not hold there is an arbitrage opportunity.

Interest Differential = 2.25% – 1.75% = 0.50%

$$\text{Premium} = \frac{0.780 - 0.775}{0.775} \times 100 = 0.645\%$$

Since the interest rate differential is smaller than the premium, it will be profitable to place money in Deutschmarks the currency whose 3-months interest is lower.

The following operations are carried out:

(i) Borrow CAD 1 Million at 9 per cent for 3 months;

(ii) Change this sum into DEM at the spot rate = (10,00,000/0.775) = 12,90,323

(iii) Place DM 12,90,323 in the money market for 3 months to obtain a sum of DM

Principal:	12,90,323
Add: Interest @ 7% for 3 months	22,581
Total	13,12,904

(iv) Sell DEM at 3-months forward to obtain CAD = (13,12,904 x 0.780) = CAD 10,24,065

(v) Refund the debt taken in CAD with the interest due on it, i.e.,

	CAD
Principal	10,00,000
Add: Interest @ 9% for 3 months	22,500
Total	10,22,500

Net arbitrage gain = CAD 10,24,065 – CAD 10,22,500 = CAD 1,565

Question 53

Spot rate 1 US$ = ₹ 68.50

USD premium on a six month forward is 3%. The annualized interest in US is 4% and 9% in India.

Is there any arbitrage possibility? If yes, how a trader can take advantage of the situation if he is willing to borrow USD 3 million.

Answer

Spot Rate = ₹ 68.50

Forward Rate = ₹ 68.50 x 1.03 = ₹ 70.56

Forward Premium on US$ = 3% x 12/6 = 6.00%

Interest rate differential = 9% – 4% = 5%

Since the Interest rate differential is less than forward premium there is a possibility of arbitrage outflow from India.

The advantage of this situation can be taken in the following manner:

1. Borrow equivalent amount of US$ 30,00,000 in India for 6 months at Spot Rate

   ₹ 68.50 x US$ 30,00,000 = ₹ 20,55,00,000

   Amount to be repaid after 6 months

   = ₹ 20,55,00,000 (1 + 0.09 x 6/12) = ₹ 21,47,47,500

2. Convert ₹ 20,55,00,000 into US$ and get the principal i.e. = US$ 30,00,000

   Interest on Investments for 6 months – US$ 30,00,000 x 0.02 = US$ 60,000

   Total amount at the end of 6 months = US$ (30,00,000 + 60,000) = US$ 30,60,000

   Converting the same at the forward rate

   = US$ 30,60,000 x ₹ 70.56 = ₹ 21,59,13,600

Hence the gain is ₹ (21,59,13,600 – 21,47,47,500) = ₹ 11,66,100

Or ₹ 11,66,100/₹ 70.56 = US$ 16,526

Cross Rates

Question 54

Given:

US$ 1 = ¥ 107.31

£ 1 = US$ 1.26

A$ 1 = US$ 0.70

(i) Calculate the cross rate for Pound in Yen terms

(ii) Calculate the cross rate for Australian Dollar in Yen terms

(iii) Calculate the cross rate for Pounds in Australian Dollar terms

Answer

(i) Calculate the cross rate for Pounds in Yen terms

1 £ = ? ¥

US$ 1 = ¥ 107.31

£ 1 = US$ 1.26

$$\frac{¥}{\$} \times \frac{\$}{£} = \frac{¥}{£}$$

$$\frac{¥}{£} = 107.31 \times 1.26$$

£ 1 = ¥ 135.21

(ii) Calculate the cross rate for Australian Dollar in Yen terms

A$ 1 = ¥ ?

US$ 1 = ¥ 107.31

A$ 1 = US$ 0.70

$$\frac{¥}{\$} \times \frac{\$}{A\$} = \frac{¥}{A\$}$$

$$\frac{¥}{A\$} = 107.31 \times 0.70$$

A$ 1 = ¥ 75.12

(iii) Calculate the cross rate for Pounds in Australian Dollar terms

£ 1 = A$?

A$ 1 = US$ 0.70

US$ 1 = A$ 1.4286

£ 1 = US$ 1.26

$$\frac{A\$}{\$} \times \frac{\$}{£} = \frac{A\$}{£}$$

$$\frac{A\$}{£} = 1.4286 \times 1.26 = 1.80$$

£ 1 = A$ 1.80

Question 55

XYZ Bank, Amsterdam, wants to purchase ₹ 25 million against £ for funding their Nostro account and they have credited LORO account with Bank of London, London.

Calculate the amount of £'s credited. Ongoing inter-bank rates are per $, ₹ 61.3625/3700 & per £, $ 1.5260/70.

Answer

To purchase Rupee, XYZ Bank shall first sell £ and purchase $ and then sell $ to purchase Rupee.

Accordingly, following rate shall be used: $(£/₹)_{ask}$

The available rates are as follows:

$(\$/£)_{bid}$ = $ 1.5260

$(\$/£)_{ask}$ = $ 1.5270

$(₹/\$)_{bid}$ = ₹ 61.3625

$(₹/\$)_{ask}$ = ₹ 61.3700

From above available rates we can compute required rate as follows:

$(£/₹)_{ask}$ = $(£/\$)_{ask}$ x $(\$/₹)_{ask}$

= (1/1.5260) x (1/61.3625)

= £ 0.0107

Thus amount of £ to be credited

= ₹ 2,50,00,000 x £ 0.0107

= £ 2,67,500

Question 56

On January 28, 2022 an importer customer requested a bank to remit Singapore Dollar (SGD) 25,00,000 under an irrevocable LC. However, due to bank strikes, the bank could effect the remittance only on February 4, 2022. The interbank market rates were as follows:

	January 28, 2022	February 4, 2022
US$ 1 =	₹ 45.85/45.90	₹ 45.91/45.97
Pound 1 =	US$ 1.7840/1.7850	US$ 1.7765/1.7775
Pound 1 =	SGD 3.1575/3.1590	SGD 3.1380/3.1390

The bank wishes to retain an exchange margin of 0.125%.

Required:

How much does the customer stand to gain or lose due to the delay?

(Note: Calculate rate in multiples of .0001)

Answer

On January 28, 2022 the importer customer requested to remit SGD 25 lakhs.

To consider sell rate for the bank:

US$ =	₹ 45.90
Pound 1 =	US$ 1.7850
Pound 1 =	SGD 3.1575
Therefore, SGD 1 = [(₹ 45.90 x 1.7850)/SGD 3.1575] =	₹ 25.9482
Add: Exchange margin (0.125%)	₹ 0.0324
	₹ 25.9806

On February 4, 2022 the rates are

US $ =	₹ 45.97
Pound 1 =	US$ 1.7775
Pound 1 =	SGD 3.1380
Therefore, SGD 1 = [(₹ 45.97 x 1.7775)/SGD 3.1380] =	₹ 26.0394
Add: Exchange margin (0.125%)	₹ 0.0325
	₹ 26.0719

Hence, loss to the importer = SGD 25,00,000 (₹ 26.0719 – ₹ 25.9806) = ₹ 2,28,250

Question 57

An importer customer of your bank wishes to book a forward contract with your bank on 3rd September for sale to him of SGD 5,00,000 to be delivered on 30th October.

The spot rates on 3rd September are USD/₹ 49.3700/3800 and USD/SGD 1.7058/68. The swap points are:

USD/₹		USD/SGD	
Spot/September	0300/0400	1st month forward	48/49
Spot/October	1100/1300	2nd month forward	96/97
Spot/November	1900/2200	3rd month forward	138/140
Spot/December	2700/3100		
Spot/January	3500/4000		

Calculate the rate to be quoted to the importer by assuming an exchange margin of 5 paisa.

Answer

USD/₹ on 3rd September	49.3800
Swap Point for October	0.1300
	49.5100
Add: Exchange Margin	0.0500
	49.5600
USD/SGD on 3rd September	1.7058
Swap Point for 2nd month Forward	0.0096
	1.7154

Cross Rate for SGD/₹ of 30th October

USD/₹ selling rate = ₹ 49.5600

SGD/₹ buying rate = SGD 1.7154

SGD/₹ cross rate = ₹ 49.5600/1.7154 = ₹ 28.8912

Question 58

You have following quotes from Bank A and Bank B:

	Bank A	Bank B
SPOT	USD/CHF 1.4650/55	USD/CHF 1.4653/60
3 months	5/10	
6 months	10/15	
SPOT	GBP/USD 1.7645/60	GBP/USD 1.7640/50
3 months	25/20	
6 months	35/25	

Calculate:

(i) How much minimum CHF amount you have to pay for 1 Million GBP spot?

(ii) Considering the quotes from Bank A only, for GBP/CHF what are the Implied Swap points for Spot over 3 months?

Answer

(i) To Buy 1 Million GBP Spot against CHF

1. First to Buy USD against CHF at the cheaper rate i.e. from Bank A at 1 USD = CHF 1.4655
2. Then to Buy GBP against USD at a cheaper rate i.e. from Bank B at 1 GBP = USD 1.7650

By applying chain rule Buying rate would be

1 GBP = 1.7650 x 1.4655 CHF

1 GBP = CHF 2.5866

Amount payable = 1 Million GBP x CHF 2.5866 = CHF 25,86,600

(ii) Spot rate Bid rate GBP 1 = CHF 1.4650 x 1.7645 = CHF 2.5850

Offer rate GBP 1 = CHF 1.4655 x 1.7660 = CHF 2.5881

GBP/USD 3 months swap points are at discount

Outright 3 Months forward rate GBP 1 = USD 1.7620/1.7640

USD/CHF 3 months swap points are at premium

Outright 3 Months forward rate USD 1 = CHF 1.4655/1.4665

Hence

3 Months Forward rate Bid Rate GBP 1 = CHF 1.4655 x 1.7620 = CHF 2.5822

Offer rate GBP 1 = CHF 1.4665 x 1.7640 = CHF 2.5869

Outright 3 Months forward rate GBP 1 = CHF 2.5822/2.5869

Spot rate GBP 1 = CHF 2.5850/2.5881

Therefore 3 month swap points are at discount of 28/12.

Question 59

You sold Hong Kong Dollar 1,00,00,000 value spot to your customer at ₹ 5.70 & covered yourself in London market on the same day, when the exchange rates were

US$ 1 = HK$ 7.5880/7.5920

Local interbank market rates for US$ were

Spot US$ 1 = ₹ 42.70/42.85

Calculate cover rate and ascertain the profit or loss in the transaction. Ignore brokerage.

Answer

The bank (Dealer) covers itself by buying from the market at market selling rate.

Rupee/Dollar selling rate = ₹ 42.85

Dollar/Hong Kong Dollar = HK$ 7.5880

Rupee/Hong Kong Dollar cross rate = ₹ 42.85/7.5880 = ₹ 5.6471

Profit/Loss to the Bank

Amount received from customer (1 crore x 5.70) =	₹ 5,70,00,000
Amount paid on cover deal (1 crore x 5.6471) =	₹ 5,64,71,000
Profit to Bank =	₹ 5,29,000

Question 60

You, a foreign exchange dealer of your bank, are informed that your bank has sold a T.T. on Copenhagen for Danish Kroner 10,00,000 at the rate of Danish Kroner 1 = ₹ 6.5150. You are required to cover the transaction either in London or New York market. The rates on that date are as under:

Mumbai-London	₹ 74.3000	₹ 74.3200
Mumbai-New York	₹ 49.2500	₹ 49.2625
London-Copenhagen	DKK 11.4200	DKK 11.4350
New York-Copenhagen	DKK 07.5670	DKK 07.5840

In which market will you cover the transaction, London or New York, and what will be the exchange profit or loss in the transaction? Ignore brokerages.

Answer

Amount realized on selling Danish Kroner 10,00,000 at ₹ 6.5150 per Kroner = ₹ 65,15,000.

Cover at London:

Bank buys Danish Kroner at London at the market selling rate.

Pound sterling required for the purchase (DKK 10,00,000 ÷ DKK 11.4200) = GBP 87,565.67

Bank buys locally GBP 87,565.67 for the above purchase at the market selling rate of ₹ 74.3200.

The rupee cost will be = ₹ 65,07,881

Profit (₹ 65,15,000 – ₹ 65,07,881) = ₹ 7,119

Cover at New York:

Bank buys Kroners at New York at the market selling rate.

Dollars required for the purchase of Danish Kroner (DKK10,00,000 ÷ 7.5670) = USD 1,32,152.77

Bank buys locally USD 1,32,152.77 for the above purchase at the market selling rate of ₹ 49.2625.

The rupee cost will be = ₹ 65,10,176

Profit (₹ 65,15,000 – ₹ 65,10,176) = ₹ 4,824

The transaction would be covered through London which gets the maximum profit of ₹ 7,119 or lower cover cost at London Market by (₹ 65,10,176 – ₹ 65,07,881) = ₹ 2,295

Question 61

Your forex dealer had entered into a cross currency deal and had sold US$ 10,00,000 against EURO at US$ 1 = EURO 1.4400 for spot delivery.

However, later during the day, the market became volatile and the dealer in compliance with his management's guidelines had to square – up the position when the quotations were:

Spot US$ 1	INR 31.4300/4500
1 month margin	25/20
2 months margin	45/35
Spot US$ 1	EURO 1.4400/4450
1 month forward	1.4425/4490
2 months forward	1.4460/4530

What will be the gain or loss in the transaction?

Answer

The amount of EURO bought by selling US$

US$ 10,00,000 x EURO 1.4400 = EURO 14,40,000

The amount of EURO sold for buying USD 10,00,000 x 1.4450 = EURO 14,45,000

Net Loss in the Transaction = EURO 5,000

To acquire EURO 5,000 from the market @

(a) USD 1 = EURO 1.4400 &

(b) USD1 = INR 31.4500

Cross Currency buying rate of EUR/INR is ₹ 31.4500/1.440 i.e. ₹ 21.8403

Loss in the Transaction = ₹ 21.8403 x 5,000 = ₹ 1,09,201.50

International Cash Management

Question 62

AMK Ltd. an Indian based company has subsidiaries in U.S. and U.K. Forecasts of surplus funds for the

next 30 days from two subsidiaries are as below:

US$ 12,500

UK£ 6,000

Following exchange rate information is obtained:

	$/₹	£/₹
Spot	0.0215	0.0149
30 days forward	0.0217	0.0150

Annual borrowing/deposit rates (Simple) are available.

₹	6.4%/6.2%
$	1.6%/1.5%
£	3.9%/3.7%

The Indian operation is forecasting a cash deficit of ₹ 5,00,000.

It is assumed that interest rates are based on a year of 360 days.

(i) Calculate the cash balance at the end of 30 days period in ₹ for each company under each of the following scenarios ignoring transaction costs and taxes:

(a) Each company invests/finances its own cash balances/deficits in local currency independently.

(b) Cash balances are pooled immediately in India and the net balances are invested/borrowed for the 30 days period.

(ii) Which method do you think is preferable from the parent company's point of view?

Answer

Acting independently

Cash Balances

	Capital (A)	Interest (B)	Total (A+B)	₹ Conversion Rate	₹ in 30 days
India	-5,00,000	-2,666.67	-5,02,667	-	-5,02,667
U.S.	12,500	15.63	12,515.63	0.0217	5,76,757
U.K.	6,000	18.50	6,018.50	0.0150	4,01,233
					4,75,323

Immediate Cash pooling

Cash Balances:

	Capital	₹ Conversion Rate	Amount in ₹
India	-5,00,000	-	-5,00,000
U.S.	12,500	0.0215	5,81,395
U.K.	6,000	0.0149	4,02,685
			4,84,080

Add: Interest on Investment @6.2% p.a. for 30 days	2,501
Total Amount	**4,86,581**

Immediate cash pooling is preferable as it maximizes interest earnings.

Question 63

Suppose you are a treasurer of XYZ plc in the UK. XYZ have two overseas subsidiaries, one based in Amsterdam and one in Switzerland. The Dutch subsidiary has surplus Euros in the amount of 7,25,000 which it does not need for the next three months but which will be needed at the end of that period (91 days). The Swiss subsidiary has a surplus of Swiss Francs in the amount of 9,98,077 that, again, it will need on day 91. The XYZ plc in UK has a net balance of £ 75,000 that is not needed for the foreseeable future.

Given the rates below, what is the advantage of swapping Euros and Swiss Francs into Sterling?

Spot Rate (€)	£ 0.6858 – 0.6869
91 day Pts	0.0037 – 0.0040
Spot Rate (£)	CHF 2.3295 – 2.3326
91 day Pts	0.0242 – 0.0228

Interest rates for the Deposits

Amount of Currency	**91 day Interest Rate % pa**		
	£	**€**	**CHF**
0 – 1,00,000	1	¼	0
1,00,001 – 5,00,000	2	1½	¼
5,00,001 – 10,00,000	4	2	½
Over 10,00,000	5.375	3	1

It is assumed that interest rates are based on a year of 360 days.

Answer

Individual Basis

	Interest	**Amt. after 91 days**	**Conversion in £**
Amsterdam			£ 5,02,414.71
€ 7,25,000 x 0.02 x 91/360 =	€ 3,665.28	€ 7,28,665.28	(728,665.28 x 0.6895)
Switzerland			£ 4,32,651.51
CHF 9,98,077 x 0.005 x 91/360 =	CHF 1,261.46	CHF 9,99,338.46	(999,338.46 ÷ 2.3098)
UK			
£ 75,000 x 0.01 x 91/360 =	£ 189.58	£ 75,189.58	£ 75,189.58
Total GBP at 91 days			**£ 10,10,255.80**

Swap to Sterling

Sell € 7,25,000 (Spot at 0.6858) buy £	£ 4,97,205.00
Sell CHF 9,98,077 (Spot at 2.3326) buy £	£ 4,27,881.76
Independent GBP amount	£ 75,000.00
	£ 10,00,086.76
Interest (£ 10,00,086.76 x 0.05375 x 91/360)	£ 13,587.98
Total GBP at 91 days	£ 10,13,674.74
Less: Total GBP at 91 days as per individual basis	£ 10,10,255.80
Net Gain	£ 3,418.94

Question 64

Suppose you are a treasurer of XYZ plc in the UK. XYZ have two overseas subsidiaries, one is based in Amsterdam and another in Switzerland. The surplus position of funds in hand is as follows which it does not need for the next three months but will be needed at the end of that period (91 days).

Holding Company	£ 1,50,000
Swiss Subsidiary	CHF 19,96,154
Dutch Subsidiary	€ 14,50,000

Exchange Rate as on date are as follows:

Spot Rate (€)	£ 0.6858 – 0.6869
91 day Pts	0.0037 – 0.0040
Spot Rate (£)	CHF 2.3295 – 2.3326
91 day Pts	0.0242 – 0.0228

91-Day Interest rates on p.a. basis on the Deposits in Money Market are as follows:

Amount of Currency	£	€	CHF
0 – 2,00,000	1.00	0.25	Nil
2,00,001 – 10,00,000	2.00	1.50	0.25
10,00,001 – 20,00,000	4.00	2.00	0.50
Over 20,00,000	5.38	3.00	1.00

You have been approached by your banker wherein the above-mentioned surplus was lying, requesting you to swap the surplus lying with other two subsidiaries and place them in deposit with them.

Determine the minimum interest rate per annum (upto 3 decimal points) that should be offered by the bank to your organization so that your organization is ready to undertake such swap arrangement.

Note: Consider 360 days a year.

Answer

XYZ plc shall be ready to undertake this swap arrangement only if it receives the interest on the surplus funds if invested on individual basis as follows:

	Interest	Amt. after 91 days	Conversion in £
Amsterdam			£ 10,04,829.42
€ 14,50,000 x 0.02 x 91/360 =	€ 7,330.56	€ 14,57,330.56	(14,57,330.56 x 0.6895)
Switzerland			£ 8,65,303.02
CHF 19,96,154 x 0.005 x 91/360 =	CHF 2,522.92	CHF 19,98,676.92	(19,98,676.92 ÷ 2.3098)
UK			
£ 1,50,000 x 0.01 x 91/360 =	£ 379.17	£ 1,50,379.17	£ 1,50,379.17
Total GBP at 91 days			**£ 20,20,511.61**

Swap to Sterling

Sell € 14,50,000 (Spot at 0.6858) buy £	£ 9,94,410.00
Sell CHF 19,96,154 (Spot at 2.3326) buy £	£ 8,55,763.53
Independent GBP amount	£ 1,50,000.00
	£ 20,00,173.53
Amount accrued on Individual Basis (Principal + Interest)	£ 20,20,511.61
Interest Required	£ 20,338.08
Required Interest Rate on Per Annum Basis $\frac{20,338.08}{2,000,173.53} \times \frac{360}{91} \times 100$	4.023%

Thus, the minimum rate that should be offered is 4.023%.

Where to Borrow

Question 65

An Indian company obtains the following quotes (₹/$)

Spot:	35.90/36.10
3 - Months forward rate:	36.00/36.25
6 - Months forward rate:	36.10/36.40

The company needs $ funds for six months. Determine whether the company should borrow in $ or ₹ Interest rates are:

3 - Months interest rate:	₹ : 12%, $: 6%
6 - Months interest rate:	₹ : 11.50%, $: 5.5%

Also determine what should be the rate of interest after 3-months to make the company indifferent between 3-months borrowing and 6-months borrowing in the case of:

(i) Rupee borrowing

(ii) Dollar borrowing

Note: For the purpose of calculation, Take the units of dollar and rupee as 100 each.

Answer

(i) If company borrows in $ then outflow would be as follows:

Let company borrows $ 100	$ 100.00
Add: Interest for 6 months @ 5.5%	$ 2.75
Amount Repayable after 6 months	$ 102.75
Applicable 6 month forward rate	36.40
Amount of Cash outflow in Indian Rupees	₹ 3,740.10

If company borrows equivalent amount in Indian Rupee, then outflow would be as follows:

Equivalent ₹ amount ₹ 36.10 x 100	₹ 3,610.00
Add: Interest @11.50%	₹ 207.58
	₹ 3,817.58

Since cash outflow is more in ₹ borrowing then borrowing should be made in $.

(ii) (a) Let 'i_r' be the interest rate of ₹ borrowing make indifferent between 3 months borrowing and 6 months borrowing then

$(1 + 0.03)(1 + i_r) = (1 + 0.0575)$

$i_r = 2.67\%$ or 10.68% (on annualized basis)

(b) Let 'i_d' be the interest rate of $ borrowing after 3 months to make indifference between 3 months borrowings and 6 months borrowings. Then,

$(1 + 0.015)(1 + i_d) = (1 + 0.0275)$

$i_d = 1.232\%$ or 4.93% (on annualized basis)

Question 66

Sun Ltd. is planning to import equipment from Japan at a cost of 3,400 lakh yen. The company may avail loans at 18 percent per annum with quarterly rests with which it can import the equipment. The company has also an offer from Osaka branch of an India based bank extending credit of 180 days at 2 percent per annum against opening of an irrecoverable letter of credit.

Additional information:

Present exchange rate	₹ 100 = 340 yen
180 day's forward rate	₹ 100 = 345 yen

Commission charges for letter of credit at 2 per cent per 12 months.

Advice the company whether the offer from the foreign branch should be accepted.

Answer

Option I (To finance the purchases by availing loan at 18% per annum):

Cost of equipment	**₹ in lakhs**
3400 lakh yen at ₹ 100 = 340 yen	1,000
Add: Interest at 4.5% I Quarter	45

Add: Interest at 4.5% II Quarter (on ₹ 1,045 lakhs)	47.03
Total outflow in Rupees	1,092.03

Option II (To accept the offer from foreign branch):

Cost of letter of credit	**Amount**
At 1% on 3400 lakhs yen at ₹ 100 = 340 yen	₹ 10.00 lakhs
Add: Interest at 4.5% I Quarter	₹ 0.45 lakhs
Add: Interest at 4.5% II Quarter (on ₹ 10.45 lakhs)	₹ 0.47 lakhs
(A)	₹ 10.92 lakhs
Payment at the end of 180 days:	
Cost	3,400.00 lakhs yen
Interest at 2% p.a. [3,400 x 2/100 x 180/365]	33.53 lakhs yen
	3,433.53 lakhs yen
Conversion at ₹ 100 = 345 yen [(3,433.53/345) x 100] (B)	₹ 995.23 lakhs
Total Cost: (A) + (B)	₹ 1,006.15 lakhs

Advise: Option 2 is cheaper by (1,092.03 – 1,006.15) lakh or 85.88 lakh. Hence, the offer may be accepted.

Question 67

Interest rates for 3 months in USA and Canada are as follows:

Currency	Borrow	Lending
US$	4%	2.5%
Canadian$	4.5%	3.5 %

Exchange Rates for spot and 3 months forward are as follows:

Can$/US$ spot	1.235 – 1.240
3 months forward	1.255 – 1.260

Advice, the currency in which borrowing and lending for 3 months needs to be done for the US company. Assume you have to borrow or lent 1,000 US$ or Equivalent Can$. Take 3 months = 90/360 days.

Answer

(i) The outflow under the two options shall be as follows:

If borrowing is made in US$

Particulars	**US$**
Principal amount	1,000
Interest (US$ 1,000 x 90/360 x 4%)	10

Outflow	1,010

If borrowing is made in Can$

Particulars	Can$
Equivalent amount borrowed in Can$ (US$ 1,000 x 1.240)	1,240
Interest (Can$ 1,240 x 90/360 x 4.5%)	13.95
Outflow	1,253.95

Conversion @ forward rates = Can$ 1,253.95/1.255 = US$ 999.16

Since US$ outflow is least in Can$, the borrowings should be made in Can$.

(ii) The inflow under the two options shall be as follows:

If money is lent in US$

Particulars	US$
Amount lent	1,000
Interest (US$ 1,000 x 90/360 x 2.5%)	6.25
Inflow	1,006.25

If money is lent in Can$

Particulars	Can$
Equivalent amount lent in Can$ (US$ 1,000 x 1.235)	1,235
Interest (Can$ 1,235 x 90/360 x 3.5%)	10.81
Inflow	1,245.81

Equivalent inflow in US$ = Can$ 1,245.81/1.260 = US$ 988.74

Since inflow is least in Can$, amount should invest in US$.

Thus, borrowing should be made in Canadian$ and lending should be made in US$.

Question 68

A German subsidiary of an US based MNC has to mobilize 1,00,000 Euro's working capital for the next 12 months. It has the following options:

Loan from German Bank @ 5% p.a.

Loan from US Parent Bank @ 4% p.a.

Loan from Swiss Bank @ 3% p.a.

Banks in Germany charge an additional 0.25% p.a. towards loan servicing. Loans from outside Germany attract withholding tax of 8% on interest payments. If the interest rates given above are market determined, examine which loan is the most attractive using interest rate differential.

Answer

Net Cost under each of the Options is as follows:

(i) Loan from German Bank Cost = 5% + 0.25% = 5.25%

(ii) Loan from US Parent Bank

Effective Rate of Interest $\left(\frac{4\%}{1-0.08}\right)$	4.35%
Premium on US$ $\left(\frac{1.05}{1.04}-1\right)$	0.96%
Net Cost	**5.31%**

(iii) Loan from Swiss Bank

Effective Rate of Interest $\left(\frac{3\%}{1-0.08}\right)$	3.26%
Premium on Swiss Currency $\left(\frac{1.05}{1.03}-1\right)$	1.94%
Net Cost	**5.20%**

Thus, loan from Swiss Bank is the best option as the Total Outflow including Interest is Less i.e. € 1,05,200

Where to Invest

Question 69

The Treasury desk of a global bank incorporated in UK wants to invest GBP 200 million on 1st January, 2022 for a period of 6 months and has the following options:

(1) The Equity Trading desk in Japan wants to invest the entire GBP 200 million in high dividend yielding Japanese securities that would earn a dividend income of JPY 1,182 million. The dividends are declared and paid on 29th June. Post dividend, the securities are expected to quote at a 2% discount. The desk also plans to earn JPY 10 million on a stock borrow lending activity because of this investment. The securities are to be sold on June 29 with a T+1 settlement and the amount remitted back to the Treasury in London.

(2) The Fixed Income desk of US proposed to invest the amount in 6 month G-Secs that provides a return of 5% p.a.

The exchange rates are as follows:

Currency Pair	1-Jan-2022 (Spot)	30-Jun-2022 (Forward)
GBP – JPY	148.0002	150.0000
GBP – USD	1.28000	1.30331

As a treasurer, advise the bank on the best investment option. What would be your decision from a risk perspective? You may ignore taxation.

Answer

(1) Yield from Investment in Equity Trading Index in Japan

Conversion of GBP 200 million in JPY (148.0002)	JPY 29,600.04 million
Dividend Income	JPY 1,182.00 million
Stock Lending	JPY 10.00 million
Investment Value at End (JPY 29,600.04 – 2% of JPY 29,600.04)	JPY 29,008.0392 million
Amount available at End	JPY 30,200.0392 million
Forward Rate of 30.06.2022	JPY 150/GBP
Amount to be Remitted back to London	GBP 201.3336 million
Gain = GBP 201.3336 – GBP 200	GBP 1.3336 million

(2) Fixed Income Desk of US

Conversion of GBP 200 million in USD (1.28000)	USD 256.00 million
Add: Interest @ 5% p.a. for 6 months	USD 6.40 million
Amount available at End	USD 262.40 million
Forward Rate of 30.06.2022	USD 1.30331/GBP
Amount to be Remitted back to London	GBP 201.3335 million
Gain = GBP 201.3335 – GBP 200	GBP 1.3335 million

Decision:

The equivalent amount at the end of 6 months shall be almost same in both the options. The bank can go for any of the options.

However, from risk perspective, the investment in fixed income desk of US is more beneficial as the chance of variation in fixed income securities is less as compared to Equity Desk.

Question 70

ICL an Indian MNC is executing a plant in Sri Lanka. It has raised ₹ 400 billion. Half of the amount will be required after six months' time. ICL is looking an opportunity to invest this amount on 1st April, 2022 for a period of six months. It is considering two underlying proposals:

Market	Japan	US
Nature of Investment	Index Fund (JPY)	Treasury Bills (USD)
Dividend (in billions)	25	–
Income from stock lending (in billions)	11.9276	–
Discount on initial investment at the end	2%	–
Interest	–	5 per cent per annum
Exchange Rate (1st April, 2022)	JPY/INR 1.58	USD/INR 0.014
Exchange Rate (30th September, 2022)	JPY/INR 1.57	USD/INR 0.013

You, as an Investment Manager, is required to suggest the best course of option.

Answer

Investment in JPY			**(in billions)**
Particulars	Currency INR	ER	Currency JPY
Available amount	200	1.58	316
Dividend Income			25
Stock Lending Income			11.9276
Investment value at the end after discount @2% (316 – 2% of 316)			309.68
Amount available at the end			346.6076
Conversion as on 30-09-2022		1.57	₹ 220.7692
Gain			₹ 20.7692

Investment in USD			**(in billions)**
Particulars	Currency INR	ER	Currency USD
Available amount	200	0.014	2.80
Interest for 6 months @5% p.a.			0.07
Amount available at the end			2.87
Conversion as on 30-09-2022		0.013	₹ 220.7692
Gain			₹ 20.7692

The equivalent amount is same in both the options so ICL is indifferent.

However, USD is more stable, and Treasury Bills are risk free, so investment in Treasury Bills (USD) is suggested.

Question 71

Your bank's London office has surplus funds to the extent of USD 5,00,000 for a period of 3 months. The cost of the funds to the bank is 4% p.a. It proposes to invest these funds in London, New York or Frankfurt and obtain the best yield, without any exchange risk to the bank. The following rates of interest are available at the three centers for investment of domestic funds there at for a period of 3 months.

London	5 % p.a.
New York	8% p.a.
Frankfurt	3% p.a.

The market rates in London for US dollars and Euro are as under:

London on New York	
Spot	1.5350/90
1 month	15/18
2 month	30/35
3 months	80/85
London on Frankfurt	

Spot	1.8260/90
1 month	60/55
2 month	95/90
3 month	145/140

At which centre, will be investment be made & what will be the net gain (to the nearest pound) to the bank on the invested funds?

Answer

(i) If investment is made at London

Convert US$ 5,00,000 at Spot Rate (5,00,000/1.5390) =		£ 3,24,886
Add: £ Interest for 3 months on £ 3,24,886 @ 5% =		£ 4,061
		£ 3,28,947
Less: Amount Invested =	$ 5,00,000	
Interest accrued thereon =	$ 5,000	
	$ 5,05,000	
Equivalent amount of £ required to pay the above sum ($ 5,05,000/1.5430) =		£ 3,27,285
Arbitrage Profit =		£ 1,662

(ii) If investment is made at New York

Gain $ 5,00,000 (8% – 4%) x 3/12 =	$ 5,000
Equivalent amount in £ 3 months ($ 5,000/1.5475) =	£ 3,231

(iii) If investment is made at Frankfurt

Convert US$ 5,00,000 at Spot Rate (Cross Rate) 1.8260/1.5390 =	€ 1.1865
Euro equivalent US$ 5,00,000 =	€ 5,93,250
Add: Interest for 3 months @ 3% =	€ 4,449
	€ 5,97,699
3 month Forward Rate of selling € (1/1.8150) =	£ 0.5510
Sell € in Forward Market € 5,97,699 x £ 0.5510 =	£ 3,29,332
Less: Amounted invested and interest thereon =	£ 3,27,285
Arbitrage Profit =	£ 2,047

Since out of three options the maximum profit is in case investment is made in New York. Hence it should be opted.

Exchange Position and Cash Position (Nostro A/c)

Question 72

You as a dealer in foreign exchange have the following position in Swiss Francs on 31st October, 2022:

	Swiss Francs
Balance in the Nostro A/c Credit	1,00,000
Opening Position Overbought	50,000
Purchased a bill on Zurich	80,000
Sold forward TT	60,000
Forward purchase contract cancelled	30,000
Remitted by TT	75,000
Draft on Zurich cancelled	30,000

What steps would you take, if you are required to maintain a credit Balance of Swiss Francs 30,000 in the Nostro A/c and keep as overbought position on Swiss Francs 10,000?

Answer

Exchange Position

Particulars	Purchase Sw. Fcs.	Sale Sw. Fcs.
Opening Balance Overbought	50,000	–
Bill on Zurich	80,000	–
Forward Sales – TT	–	60,000
Cancellation of Forward Contract	–	30,000
TT Sales	–	75,000
Draft on Zurich cancelled	30,000	–
	1,60,000	1,65,000
Closing Balance Oversold	5,000	–
	1,65,000	1,65,000

Cash Position (Nostro A/c)

	Credit	Debit
Opening balance credit	1,00,000	–
TT sales	–	75,000
	1,00,000	75,000
Closing balance (credit)	–	25,000
	1,00,000	1,00,000

The Bank has to buy spot TT Sw. Fcs. 5,000 to increase the balance in Nostro account to Sw. Fcs. 30,000. This would bring down the oversold position on Sw. Fcs. as Nil. Since the bank requires an overbought position of Sw. Fcs. 10,000, it has to buy forward Sw. Fcs. 10,000.

Question 73

Suppose you are a dealer of ABC Bank and on 20.10.2022 you found that your Nostro account with XYZ Bank in London is £ 65,000 and you had overbought £ 35,000. During the day following transaction have taken place:

	£
DD purchased	12,500
Purchased a Bill on London	40,000
Sold forward TT	30,000
Forward purchase contract cancelled	15,000
Remitted by TT	37,500
Draft on London cancelled	15,000

What steps you would take, if you are required to maintain a credit Balance of £ 7,500 in the Nostro A/c and keep as overbought position on £ 7,500?

Answer

Exchange Position:

Particulars	Purchase £	Sale £
Opening Balance Overbought	35,000	–
DD Purchased	12,500	–
Purchased a Bill on London	40,000	–
Sold forward TT	–	30,000
Forward purchase contract cancelled	–	15,000
TT Remittance	–	37,500
Draft on London cancelled	15,000	–
	1,02,500	82,500
Closing Balance Overbought	–	20,000
	1,02,500	1,02,500

Cash Position (Nostro A/c)

	Credit £	Debit £
Opening balance credit	65,000	–
TT Remittance	–	37,500
	65,000	37,500
Closing balance (credit)	–	27,500
	65,000	65,000

To maintain Cash Balance in Nostro Account at £ 7,500 you have to sell £ 20,000 in Spot which will bring Overbought exchange position to Nil. Since bank require Overbought position of £ 7,500 it has to

buy the same in forward market.

Foreign Exchange Exposure

Question 74

Shanti exported 200 pieces of a designer jewellery to USA at $ 200 each. To manufacture and design this jewellery she imported raw material from Japan of the cost of JP¥ 6,000 for each piece.

The labour cost and variable overhead incurred in producing each piece of jewellery are ₹ 1,300 and ₹ 650 respectively.

Suppose Spot Rates are:

₹/US$	₹ 65.00 – ₹ 66.00
JP¥/US$	JP¥ 115 – JP¥ 120

Shanti is expecting that by the time the export remittance is received and payment of import is made the expected Spot Rates are likely to be as follows:

₹/US$	₹ 68.90 – ₹ 69.25
JP¥/US$	JP¥ 105 – JP¥ 112

You are required to calculate the resultant transaction exposure.

Answer

Profit as per Spot Rates

	₹
Sales Revenue (US$ 200 x 200 x ₹ 65)	26,00,000
Less: Cost of Imported Raw Material [200 x (6,000/115) x ₹ 66]	6,88,696
Labour Cost (200 x ₹ 1,300)	2,60,000
Variable Overheads (200 x ₹ 650)	1,30,000
Profit	15,21,304

Profit as per expected Spot Rates

	₹
Sales Revenue (US$ 200 x 200 x ₹ 68.90)	27,56,000
Less: Cost of Imported Raw Material [200 x (6,000/105) x ₹ 69.25]	7,91,429
Labour Cost (200 x ₹ 1,300)	2,60,000
Variable Overheads (200 x ₹ 650)	1,30,000
Profit	15,74,571

Increase/(Decrease) in Profit due to Transaction Exposure (₹ 15,74,571 – ₹ 15,21,304) = ₹ 53,267

Question 75

M/s Omega Electronics Ltd. exports air conditioners to Germany by importing all the components from Singapore. The company is exporting 2,400 units at a price of Euro 500 per unit. The cost of imported components is S$ 800 per unit. The fixed cost and other variables cost per unit are ₹ 1,000 and ₹ 1,500 respectively. The cash flows in foreign currencies are due in six months. The current exchange rates are as follows:

₹/Euro	51.50/55
₹/S$	27.20/25

After six months the exchange rates turn out as follows:

₹/Euro	52.00/05
₹/S$	27.70/75

(1) You are required to calculate loss/gain due to transaction exposure.

(2) Based on the following additional information calculate the loss/gain due to transaction and operating exposure if the contracted price of air conditioners is ₹ 25,000:

(i) the current exchange rate changes to

₹/Euro	51.75/80
₹/S$	27.10/15

(ii) Price elasticity of demand is estimated to be 1.5

(iii) Payments and receipts are to be settled at the end of six months.

Answer

(1) Profit at current exchange rates

2,400 [€ 500 x ₹ 51.50 – (S$ 800 x ₹ 27.25 + ₹ 1,000 + ₹ 1,500)]

2,400 [₹ 25,750 – ₹ 24,300] = ₹ 34,80,000

Profit after change in exchange rates

2,400 [€ 500 x ₹ 52 – (S$ 800 x ₹ 27.75 + ₹ 1,000 + ₹ 1500)]

2,400 [₹ 26,000 – ₹ 24,700] = ₹ 31,20,000

Loss due to Transaction Exposure

₹ 34,80,000 – ₹ 31,20,000 = ₹ 3,60,000

(2) Profit based on new exchange rates

2,400 [₹ 25,000 – (800 x ₹ 27.15 + ₹ 1,000 + ₹ 1,500)]

2,400 [₹ 25,000 – ₹ 24,220] = ₹ 18,72,000

Profit after change in exchange rates at the end of six months

2,400 [₹ 25,000 – (800 x ₹ 27.75 + ₹ 1,000 + ₹ 1,500)]

2,400 [₹ 25,000 – ₹ 24,700] = ₹ 7,20,000

Decline in profit due to transaction exposure

₹ 18,72,000 – ₹ 7,20,000 = ₹ 11,52,000

Current price of each unit in € = ₹ 25,000/₹ 51.50 = € 485.44

Price after change in Exch. Rate = ₹ 25,000/₹ 51.75 = € 483.09

Change in Price due to change in Exch. Rate

= € 485.44 – € 483.09

= € 2.35

Or, in % = € 2.35/€ 485.44 = 0.48%

Price elasticity of demand = 1.5

Increase in demand due to fall in price 0.48 x 1.5 = 0.72%

Size of increased order = 2,400 x 1.0072 = 2,417 units

It is assumed that Fixed Cost shall not be changed with change in units

Fixed Cost = 2,400 [₹ 1,000] = ₹ 24,00,000

Profit = 2,417 [₹ 25,000 – (800 x ₹ 27.75 + ₹ 1,500)] – ₹ 24,00,000

= 2,417 (₹ 1,300) – ₹ 24,00,000 = ₹ 7,42,100

So, increase in profit due to operating exposure = ₹ 7,20,000 – ₹ 7,42,100 = ₹ 22,100

Therefore, decrease in profit due to transaction and operating exposure

= ₹ 18,72,000 – ₹ 7,42,100 = ₹ 11,29,900 [OR, ₹ 11,52,000 – ₹ 22,100 = ₹ 11,29,900]

Question 76

Following are the details of cash inflows and outflows in foreign currency denominations of MNP Co. an Indian export firm, which have no foreign subsidiaries:

Currency	Inflow	Outflow	Spot rate	Forward rate
US$	4,00,00,000	2,00,00,000	48.01	48.82
French Franc (FFr)	2,00,00,000	80,00,000	7.45	8.12
UK£	3,00,00,000	2,00,00,000	75.57	75.98
Japanese Yen	1,50,00,000	2,50,00,000	3.20	2.40

(i) Determine the net exposure of each foreign currency in terms of Rupees.

(ii) Are any of the exposure positions offsetting to some extent?

Note: Do all calculations in million.

Answer

(i) Net exposure of each foreign currency in Rupees

	Inflow (Millions)	Outflow (Millions)	Net Inflow (Millions)	Spread	Net Exposure (Millions)
US$	40	20	20	0.81	16.20
FFr	20	8	12	0.67	8.04

UK£	30	20	10	0.41	4.10
Japan Yen	15	25	–10	–0.80	8.00

(ii) The exposure of Japanese yen position is being offset by a better forward rate.

Question 77

A Inc. and B Inc. intend to borrow $ 2,00,000 and $ 2,00,000 in ¥ respectively for a time horizon of one year. The prevalent interest rates are as follows:

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

The prevalent exchange rate is $ 1 = ¥ 120.

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

Answer

Cash Flows of A Inc.

(i) At the time of exchange of principal amount

Transactions		Cash Flows
Borrowings	$ 2,00,000 x ¥ 120	+¥ 2,40,00,000
Swap		–¥ 2,40,00,000
Swap		+$ 2,00,000
Net Amount		+$ 2,00,000

(ii) At the time of exchange of interest amount

Transactions		Cash Flows
Interest to the lender	¥ 2,40,00,000 x 5%	–¥ 12,00,000
Interest Receipt from B Inc.	¥ 2,40,00,000 x 6%	+¥ 14,40,000
Net Saving (in $)	¥ 2,40,000/¥ 120	+$ 2,000
Interest to B Inc.	$ 2,00,000 x 9%	–$ 18,000
Net Interest Cost		–$ 16,000

A Inc. used $ 2,00,000 at the net cost of borrowing of $ 16,000 i.e. 8%. If it had not opted for swap agreement the borrowing cost would have been 9%. Thus, there is saving of 1%.

Cash Flows of B Inc.

(i) At the time of exchange of principal amount

Transactions		Cash Flows
Borrowings		+$ 2,00,000
Swap		-$ 2,00,000
Swap	$ 2,00,000 x ¥ 120	+¥ 2,40,00,000
Net Amount		+¥ 2,40,00,000

(ii) At the time of exchange of interest amount

Transactions		Cash Flows
Interest to the lender	$ 2,00,000 x 10%	-$ 20,000
Interest Receipt from A Inc.		+$ 18,000
Net Loss (in ¥)	-$ 2,000 x ¥ 120	-¥ 2,40,000
Interest to A Inc.	¥ 2,40,00,000 x 6%	-¥ 14,40,000
Net Interest Cost		-¥ 16,80,000

B Inc. used ¥ 2,40,00,000 at the net cost of borrowing of ¥ 16,80,000 i.e. 7%. If it had not opted for swap agreement the borrowing cost would have been 8%. Thus, there is saving of 1%.

Question 78

Drilldip Inc. a US based company has a won a contract in India for drilling oil field. The project will require an initial investment of ₹ 500 crore. The oil field along with equipments will be sold to Indian Government for ₹ 740 crore in one year time. Since the Indian Government will pay for the amount in Indian Rupee (₹) the company is worried about exposure due exchange rate volatility.

You are required to:

(a) Construct a swap that will help the Drilldip to reduce the exchange rate risk.

(b) Assuming that Indian Government offers a swap at spot rate which is 1 US$ = ₹ 50 in one year, then should the company should opt for this option or should it just do nothing. The spot rate after one year is expected to be 1 US$ = ₹ 54. Further you may also assume that the Drilldip can also take a US$ loan at 8% p.a.

Answer

(a) The following swap arrangement can be entered by Drilldip

(i) Swap a US$ loan today at an agreed rate with any party to obtain Indian Rupees (₹) to make initial investment.

(ii) After one year swap back the Indian Rupees with US$ at the agreed rate. In such case the company is exposed only on the profit earned from the project.

(b) With the swap

	Year 0 (Million US$)	Year 1 (Million US$)
Buy ₹ 500 crore at spot rate of 1 US$ = ₹ 50	(100.00)	----
Swap ₹ 500 crore back at agreed rate of ₹ 50	----	100.00

Sell ₹ 240 crore at 1 US$ = ₹ 54	----	44.44
Interest on US$ loan @8% for one year	----	(8.00)
	(100.00)	136.44

Net result is a net receipt of US$ 36.44 million.

Without the swap

	Year 0 (Million US$)	Year 1 (Million US$)
Buy ₹ 500 crore at spot rate of 1 US$ = ₹ 50	(100.00)	----
Sell ₹ 740 crore at 1 US$ = ₹ 54	----	137.04
Interest on US$ loan @ 8% for one year	----	(8.00)
	(100.00)	129.04

Net result is a net receipt of US$ 29.04 million.

Decision: Since the net receipt is higher in swap option the company should opt for the same.

Section B – Theory Questions

Question 1

Write a short note on Money Market Hedging.

Answer

At its simplest, a money market hedge is an **agreement to exchange a certain amount of one currency for a fixed amount of another currency, at a particular date**. For example, suppose a business owner in India expects to receive 1 Million USD in six months. This Owner could create an agreement now (today) to exchange 1 Million USD for INR at roughly the current exchange rate. Thus, if the USD dropped in value by the time the business owner got the payment, he would still be able to exchange the payment for the original quantity of U.S. dollars specified.

Advantages of Money Market Hedging

(i) **Fixes the future rate**, thus **eliminating downside risk** exposure.

(ii) Flexibility with regard to the amount to be covered.

(iii) It may be feasible **way of hedging** for currencies **where forward contracts are not available.**

Disadvantages of Money Market Hedging

(i) **More complicated** to organize than a forward contract.

(ii) **Fixes the future rate, no** opportunity to **benefit from favorable movements** in exchange rates.

Question 2

What do you mean by Nostro, Vostro and Loro Accounts?

Answer

In interbank transactions, **foreign exchange is transferred from one account to another account** and from one centre to another centre. Therefore, the **banks maintain three types of current accounts** in order to facilitate quick transfer of funds **in different currencies**. These accounts are **Nostro, Vostro and Loro accounts meaning "our", "your" and "their"**.

A bank's **foreign currency account maintained by the bank in a foreign country** and in the home currency of that country is known as **Nostro Account or "our account with you"**. For example, An Indian bank's Swiss franc account with a bank in Switzerland.

Vostro account is local currency account maintained by foreign bank. It is called **"your account with us"**. For example, Indian rupee account maintained by a bank in Switzerland with a bank in India.

The **Loro account** is an account **wherein a bank remits funds in foreign currency to another bank for credit to an account of a third bank**.

Question 3

"Operations in foreign exchange market are exposed to a number of risks." Discuss.

Answer

Transaction Exposure

It measures the **effect of an exchange rate change on outstanding obligations that** existed before exchange rates changed but **were settled after the exchange rate changes**. Thus, it deals with cash flows that result from existing contractual obligations.

Translation Exposure

It refers to **gains or losses caused by the translation of foreign currency assets and liabilities into the currency of the parent company** for consolidation purposes.

Translation exposure, **also called as accounting exposure**, is the potential for accounting derived changes in owner's equity to occur because of the need to "translate" foreign currency financial statements of foreign subsidiaries into a single reporting currency to prepare worldwide consolidated financial statements.

Economic Exposure

It refers to the **extent to which the economic value of a company can decline due to changes in exchange rate**. It is the overall impact of exchange rate changes on the value of the firm. The essence of economic exposure is that **exchange rate changes** significantly **alter the cost of a firm's inputs and the prices of its outputs** and thereby influence its competitive position substantially.

Question 4

Place the following strategies by different persons in the Exposure Management Strategies Matrix.

Strategy 1: Kuljeet a wholesaler of imported items imports toys from China to sell them in the domestic market to retailers. Being a sole trader, he is always so much involved in the promotion of his trade in domestic market and negotiation with foreign supplier that he never pays attention to hedge his payable in foreign currency and leaves his position unhedged.

Strategy 2: Moni, is in the business of exporting and importing brassware to USA and European countries. In order to capture the market he invoices the customers in their home currency. Lavi enters into forward contracts to sell the foreign exchange only if he expects some profit out of it other-wise he leaves his position open.

Strategy 3: TSC Ltd. is in the business of software development. The company has both receivables and payables in foreign currency. The Treasury Manager of TSC Ltd. not only enters into forward contracts to hedge the exposure but carries out cancellation and extension of forward contracts on regular basis to earn profit out of the same. As a result management has started looking Treasury Department as Profit Centre.

Strategy 4: DNB Publishers Ltd. in addition to publishing books are also in the business of importing and exporting of books. As a matter of policy the movement company invoices the customer or receives invoice from the supplier immediately covers its position in the Forward or Future markets and hence never leave the exposure open even for a single day.

Answer

Strategy 1: This strategy is covered by **High Risk: Low Reward** category and worst as it leaves all exposures unhedged. Although this strategy does not involve any time and effort, it carries high risk.

Strategy 2: This strategy covers **Low Risk: Reasonable Reward** category as the exposure is covered wherever there is anticipated profit otherwise it is left.

Strategy 3: This strategy is covered by **High Risk: High Reward** category as to earn profit, cancellations and extensions are carried out. Although this strategy leads to high gains but it is also accompanied by high risk.

Strategy 4: This strategy is covered by **Low Risk: Low Reward** category as company plays a very safe game.

Diagrammatically all these strategies can be depicted as follows:

High Risk

Low Reward	Strategy 1	Strategy 3	High Reward
	Strategy 4	Strategy 2	

Low Risk

CHAPTER - 11
International Financial Management

Section A – Practical Questions

International Sources of Finance [GDRs]

Question 1

X Ltd. is interested in expanding its operation and planning to install manufacturing plant at US. For the proposed project, it requires a fund of $ 10 million (net of issue expenses/floatation cost). The estimated floatation cost is 2% of the issue size. To finance this project, it proposes to issue GDRs.

Additional information:

(i) Expected market price of share at the time of issue of GDR is ₹ 250 (Face Value ₹ 100 per share)

(ii) 2 Shares shall underly each GDR and shall be priced at 10% discount to market price.

(iii) Expected exchange rate ₹ 60/$.

(iv) 20% Dividend is expected to be paid for next year with growth rate 12%.

Required:

(1) You are required to compute the number of GDRs to be issued and cost of the GDR.

(2) If company is able to raise funds in US @ 15% p.a. and company is able to repay loan along with interest from revenues generated from the operations of US, what is your advise to the company?

(3) How much company can save by choosing the option as recommended by you?

Note: Make calculations in million upto 3 decimals

Answer

Net Issue Size = $ 10 million

Gross Issue = $\frac{\$ 10 \text{ million}}{0.98}$ = $ 10.204 million

Issue Price per GDR in ₹ (250 x 2 x 90%) = ₹ 450

Issue Price per GDR in $ (₹ 450/₹ 60) = $ 7.50

Dividend per GDR (D_1) = ₹ 20 x 2 = ₹ 40

Net Proceeds per GDR = ₹ 450 x 0.98 = ₹ 441.00

(1) (a) Number of GDR to be issued

$$\frac{\$ 10.204 \text{ million}}{\$ 7.50} = 1.360 \text{ million}$$

(b) Cost of GDR to X Ltd.

$$k_e = \frac{40.00}{441.00} + 0.12 = 21.07\%$$

(2) If the company receives an offer from US Bank willing to provide an equivalent amount of loan with interest rate of 15%, it should accept the offer.

(3) If the offer is accepted there will be net saving of 6.07%.

International Capital Budgeting Decision using NPV

Question 2

ABC Ltd. is considering a project in US, which will involve an initial investment of US$ 1,10,00,000. The project will have 5 years of life. Current spot exchange rate is ₹ 48 per US$. The risk free rate in US is 8% and the same in India is 12%. Cash inflow expected from the project are as follows:

Year	Cash Inflow
1	US$ 20,00,000
2	US$ 25,00,000
3	US$ 30,00,000
4	US$ 40,00,000
5	US$ 50,00,000

Required rate of return on this project is 14%.

You are required to:

(i) Calculate the NPV of the project using foreign currency approach.

(ii) What will be the impact if there is a withholding tax of 10% applicable on the project.

Note: Present all amounts in million upto 3 decimals

Answer

(i) Viability of the Project

(1 + 0.12) (1 + Risk Premium) = (1 + 0.14)

1 + Risk Premium = 1.14/1.12 = 1.0179

Therefore, Risk adjusted dollar rate is = [1.0179 x 1.08] – 1 = 1.099 – 1 = 0.099

Calculation of NPV

Year	Cash flow (Million) US$	PV Factor at 9.9%	P.V.
1	2.00	0.910	1.820
2	2.50	0.828	2.070
3	3.00	0.753	2.259
4	4.00	0.686	2.744
5	5.00	0.624	3.120
			12.013
Less: Investment			(11.000)
NPV			1.013

Therefore, Rupee NPV of the project is = ₹ (48 x 1.013) Million = ₹ 48.624 Million

(ii) If there is a withholding tax of 10%

Total PV of Cash Inflows	US$ 12.013 Million

Less: Withholding Tax @ 10%	US$ 1.201 Million
PV of Cash Inflow after Withholding Tax	US$ 10.812 Million
Less: Initial Investment	(US$ 11.000 Million)
NPV	(US$ 0.188 Million)

Therefore, Rupee NPV of the project is = ₹ 48 x US$ 0.188 Million = – ₹ 9.024 Million

Thus, if there is a withholding tax of 10%, then the project will not be viable.

Question 3

XY Limited is engaged in large retail business in India. It is contemplating for expansion into a country of Africa by acquiring a group of stores having the same line of operation as that of India.

The exchange rate for the currency of the proposed African country is extremely volatile. Rate of inflation is presently 40% a year. Inflation in India is currently 10% a year. Management of XY Limited expects these rates likely to continue for the foreseeable future.

Estimated projected cash flows, in real terms, in India as well as African country for the first three years of the project are as follows:

	Year 0	Year 1	Year 2	Year 3
Cash flows in Indian ₹	–50,000	–1,500	–2,000	–2,500
Cash flows in African Rands	–2,00,000	50,000	70,000	90,000

XY Ltd. assumes the year 3 nominal cash flows will continue to be earned each year indefinitely. It evaluates all investments using nominal cash flows and a nominal discounting rate. The present exchange rate is African Rand 6 to ₹ 1.

You are required to calculate the net present value of proposed investment considering the following:

(i) African Rand cash flows are converted into rupees and discounted at a risk adjusted rate.

(ii) All cash flows for these projects will be discounted at a rate of 20% to reflect its high risk.

(iii) Ignore taxation.

	Year 1	Year 2	Year 3
PVIF @ 20%	0.833	0.694	0.579

Note: Consider Exchange Rate in 4 decimals and show amount to the nearest rupee in calculations.

Answer

Calculation of NPV

Year	0	1	2	3
Inflation factor in India	1.00	1.10	1.21	1.331
Inflation factor in Africa	1.00	1.40	1.96	2.744
Exchange Rate (as per PPP)	6.00	7.6364	9.7190	12.3696
Cash Flows in Indian ₹				

Real		-50,000	-1,500	-2,000	-2,500
Nominal	(1)	-50,000	-1,650	-2,420	-3,328
Cash Flows in African Rand					
Real		-2,00,000	50,000	70,000	90,000
Nominal		-2,00,000	70,000	1,37,200	2,46,960
In Indian ₹	(2)	-33,333	9,167	14,117	19,965
Net Cash Flow in ₹	(1) + (2)	-83,333	7,517	11,697	16,637
PVF @ 20%		1	0.833	0.694	0.579
PV		-83,333	6,262	8,118	9,633

NPV of 3 years = -₹ 59,320

NPV of Terminal Value = $\frac{₹\ 16,637}{0.20}$ x 0.579 = ₹ 48,164

Total NPV of the Project = -₹ 59,320 + ₹ 48,164 = -₹ 11,156

Question 4

XYZ Ltd., a company based in India, manufactures very high quality modern furniture and sells to a small number of retail outlets in India and Nepal. It is facing tough competition. Recent studies on marketability of products have clearly indicated that the customer is now more interested in variety and choice rather than exclusivity and exceptional quality. Since the cost of quality wood in India is very high, the company is reviewing the proposal for import of woods in bulk from Nepalese supplier.

The estimate of net Indian (₹) and Nepalese Currency (NC) cash flows in Nominal terms for this proposal is shown below:

	Net Cash Flow (in millions)			
Year	**0**	**1**	**2**	**3**
NC	-25.000	2.600	3.800	4.100
Indian (₹)	0	2.869	4.200	4.600

The following information is relevant:

(i) XYZ Ltd. evaluates all investments by using a discount rate of 9% p.a. All Nepalese customers are invoiced in NC. NC cash flows are converted to Indian (₹) at the forward rate and discounted at the Indian rate.

(ii) Inflation rates in Nepal and India are expected to be 9% and 8% p.a. respectively. The current exchange rate is ₹ 1 = NC 1.6

Assuming that you are the finance manager of XYZ Ltd., calculate the net present value (NPV) and modified internal rate of return (MIRR) of the proposal.

You may use following values with respect to discount factor for ₹ 1 @ 9%.

	Present Value	Future Value
Year 1	0.917	1.188

Year 2	0.842	1.090
Year 3	0.772	1

Note: Make calculations in million upto 3 decimals and also round off exchange rate in 3 decimals.

Answer

Working Notes:

(i) Computation of Forward Rates

End of Year		NC/₹
1	NC 1.60 x (1 + 0.09)/(1 + 0.08)	1.615
2	NC 1.615 x (1 + 0.09)/(1 + 0.08)	1.630
3	NC 1.630 x (1 + 0.09)/(1 + 0.08)	1.645

(ii) NC Cash Flows converted in Indian Rupees

Year	NC (Million)	Conversion Rate	₹ (Million)
0	–25.00	1.600	–15.625
1	2.60	1.615	1.61
2	3.80	1.630	2.33
3	4.10	1.645	2.49

Net Present Value

(₹ Million)

Year	Cash Flow in India	Cash Flow in Nepal	Total	PVF @ 9%	PV
0		–15.625	–15.625	1.000	–15.625
1	2.869	1.61	4.479	0.917	4.107
2	4.200	2.33	6.53	0.842	5.498
3	4.600	2.49	7.09	0.772	5.473
					–0.547

Modified Internal Rate of Return

	Year 0	Year 1	Year 2	Year 3
Cash Flow (₹ Million)	–15.625	4.479	6.53	7.09
Year 1 Cash Inflow reinvested for 2 years (1.188 x 4.479)				5.32
Year 2 Cash Inflow reinvested for 1 year (1.090 x 6.53)				7.12
				19.53

$$MIRR = \sqrt[n]{\frac{\text{Terminal Cash Flow}}{\text{Initial Outlay}}} - 1 = \sqrt[5]{\frac{19.53}{15.625}} - 1 = 0.0772 \text{ say } 7.72\%$$

Question 5

A US company wants to setup a manufacturing plant in India which requires an initial outlay of ₹ 8 Million. It is expected to have a useful life of 5 years with a salvage value (after tax) of ₹ 2 Million. The company follows straight line method of depreciation. To support additional level of activity, investment would require one time additional working capital of ₹ 1 Million.

Since cost of production is lower in India, variable cost of production would be ₹ 30 per unit. Additional fixed cost per annum is estimated at ₹ 0.5 Million. The company is projecting its annual sales to 80,000 units at price of ₹ 100 per unit. Applicable tax rate to the company is 34% and its cost of capital is 8%.

Inflation rates in US and India are expected to be 8% and 9% respectively. The current exchange rate is ₹ 72 per US Dollar.

Assuming that all profit will be repatriated every year and there will be no withholding taxes, estimate the net present value of the proposed project in India and evaluate its feasibility.

PVF @ 8% for the five years are as under:

Rate	1 Year	2 Year	3 Year	4 Year	5 Year
8%	0.926	0.857	0.794	0.735	0.681

Note: Make calculations upto 2 decimals and also round off exchange rate in 2 decimals.

Answer

Working Notes:

(i) Initial Investment in US$

Particulars	Amount
Initial Outlay	₹ 80,00,000
Additional Working Capital	₹ 10,00,000
Total	₹ 90,00,000
Exchange Rate	₹ 72/US$
Initial Investment in US$	US$ 1,25,000

(ii) Expected Exchange Rates

Year		₹/USD
1	₹ 72.00 x (1 + 0.09)/(1 + 0.08)	72.67
2	₹ 72.67 x (1 + 0.09)/(1 + 0.08)	73.34
3	₹ 73.34 x (1 + 0.09)/(1 + 0.08)	74.02
4	₹ 74.02 x (1 + 0.09)/(1 + 0.08)	74.71
5	₹ 74.71 x (1 + 0.09)/(1 + 0.08)	75.40

(iii) Annual Cash Inflows

Particulars	Amount (₹)
Sales (80,000 x ₹ 100)	80,00,000

Less: Variable Cost (80,000 x ₹ 30)	24,00,000
Additional Fixed Cost	5,00,000
Depreciation [(₹ 80,00,000 – ₹ 20,00,000)/5]	12,00,000
Profit Before Tax (PBT)	39,00,000
Less: Tax @ 34%	13,26,000
	25,74,000
Add: Depreciation	12,00,000
	37,74,000

(iv) Amount repatriated each year in US$

Year		in ₹	Expected Exchange Rate (₹/US$)	in US$
1	Annual Cash Flow	37,74,000	72.67	51,933.40
2	Annual Cash Flow	37,74,000	73.34	51,458.96
3	Annual Cash Flow	37,74,000	74.02	50,986.22
4	Annual Cash Flow	37,74,000	74.71	50,513.33
5	Annual Cash Flow	37,74,000	75.40	50,053.05

(v) Release of Working Capital in US$ at the end (₹ 10,00,000/₹ 75.40) = US$ 13,262.60

(vi) Salvage Value of Project in US$ (₹ 20,00,000/₹ 75.40) = US$ 26,525.20

NPV of the proposed project

Particulars	Period	Cash Flows ($)	PVF @ 8%	PV ($)
Initial Outlay	0	(1,25,000.00)	1.000	(1,25,000.00)
Annual Cash Flow	1	51,933.40	0.926	48,090.33
Annual Cash Flow	2	51,458.96	0.857	44,100.33
Annual Cash Flow	3	50,986.22	0.794	40,483.06
Annual Cash Flow	4	50,513.33	0.735	37,127.30
Annual Cash Flow	5	50,053.05	0.681	34,086.13
Release of Working Capital	5	13,262.60	0.681	9,031.83
Salvage Value of the Project	5	26,525.20	0.681	18,063.66
				1,05,982.64

Since the NPV of the project is positive, it is feasible.

Question 6

A multinational company is planning to set up a subsidiary company in India (where hitherto it was exporting) in view of growing demand for its product and competition from other MNCs. The initial project cost (consisting of Plant and Machinery including installation) is estimated to be US$ 500 million. The working capital requirements are estimated at US$ 50 million. The company follows

straight line method of depreciation. Presently, the company is exporting two million units every year at a unit price of US$ 80, its variable cost per unit being US$ 40.

The Chief Financial Officer has estimated the following operating cost and other data in respect of proposed project:

(i) Variable operating cost will be US$ 20 per unit of production;

(ii) Additional cash fixed cost will be US$ 30 million p.a. and project's share of allocated fixed cost will be US$ 3 million p.a. based on principle of ability to share;

(iii) Production capacity of the proposed project in India will be 5 million units;

(iv) Expected useful life of the proposed plant is five years with no salvage value;

(v) Existing working capital investment for production & sale of two million units through exports was US$ 15 million;

(vi) Export of the product in the coming year will decrease to 1.5 million units in case the company does not open subsidiary company in India, in view of the presence of competing MNCs that are in the process of setting up their subsidiaries in India;

(vii) Applicable Corporate Income Tax rate is 35%, and

(viii) Required rate of return for such project is 12%.

Assuming that there will be no variation in exchange rate of currencies and profits will be repatriated, as there will be no withholding tax, estimate Net Present Value (NPV) of the proposed project in India.

Present Value Interest Factors (PVIF) @ 12% for five years are as below:

Year	1	2	3	4	5
PVIF	0.8929	0.7972	0.7118	0.6355	0.5674

Note: Make calculations in million upto 2 decimals.

Answer

Financial Analysis whether to set up the manufacturing units in India or not may be carried using NPV technique as follows:

1. Incremental Cash Outflows

	$ Million
Cost of Plant and Machinery	500.00
Working Capital	50.00
Release of existing Working Capital	(15.00)
	535.00

2. Incremental Cash Inflow after Tax (CFAT)

(a) Generated by investment in India for 5 years

	$ Million
Sales Revenue (5 Million x $ 80)	400.00
Less: Costs	

Variable Cost (5 Million x $ 20)	100.00
Fixed Cost	30.00
Depreciation ($ 500Million/5)	100.00
EBIT	170.00
Less: Taxes @ 35%	59.50
EAT	110.50
Add: Depreciation	100.00
CFAT (1-5 years)	210.50

(b) Cash flow at the end of the 5 years (Release of Working Capital) = $ 35.00 million

(c) Cash generation by exports (Opportunity Cost)

	$ Million
Sales Revenue (1.5 Million x $ 80)	120.00
Less: Variable Cost (1.5 Million x $ 40)	60.00
Contribution before tax	60.00
Less: Tax @ 35%	21.00
CFAT (1-5 years)	39.00

(d) Additional CFAT attributable to Foreign Investment

	$ Million
Through setting up subsidiary in India	210.50
Less: Through Exports in India	(39.00)
CFAT (1-5 years)	171.50

3. Determination of NPV

Year	**CFAT ($ Million)**	**PVF @ 12%**	**PV ($ Million)**
1-5	171.50	3.6048	618.22
5	35	0.5674	19.86
			638.08
Less: Initial Outflow			(535.00)
NPV			**103.08**

Since NPV is positive, the proposal should be accepted.

Question 7

Opus Technologies Ltd., an Indian IT company is planning to make an investment through a wholly owned subsidiary in a software project in China with a shelf life of two years. The inflation in China is estimated as 8%. Operating cash flows are received at the year end.

For the project, an initial investment of Chinese Yuan (CN¥) 30,00,000 will be in land. The land will be sold after the completion of project at estimated value of CN¥ 35,00,000. The project also requires an office complex at cost of CN¥ 15,00,000 payable at the beginning of project. The complex will be depreciated on straight-line basis over two years to a zero salvage value. This complex is expected to fetch CN¥ 5,00,000 at the end of project.

The company is planning to raise the required funds through GDR issue in Mauritius. Each GDR will have 5 common equity shares of the company as underlying security which are currently trading at ₹ 200 per share (Face Value = ₹ 10) in the domestic market. The company has currently paid the dividend of 25% which is expected to grow at 10% p.a. The total issue cost is estimated to be 1% of issue size.

The annual sales is expected to be 10,000 units at the rate of CN¥ 500 per unit. The price of unit is in current price terms (i.e. before allowing for inflation) and expected to rise at the rate of inflation. Variable operating costs are 40% of sales. Fixed operating costs will be CN¥ 22,00,000 per year in current price terms (i.e. before allowing for inflation) and expected to rise at the rate of inflation.

The tax rate applicable in China for income and capital gain is 25% and as per GOI Policy no further tax shall be payable in India. The current spot rate of CN¥ 1 is ₹ 9.50. The nominal interest rate in India and China is 12% and 10% respectively and the international parity conditions hold.

You are required to

(a) Identify expected future cash flows in China and determine NPV of the project in CN¥.

(b) Determine whether Opus Technologies should go for the project or not, assuming that neither there is restriction on the transfer of funds from China to India nor any charges/taxes payable on the transfer of funds.

Answer

Working Notes:

(i) Calculation of Cost of Capital (GDR)

Current Dividend (D_0)	2.50
Expected Dividend (D_1)	2.75
Net Proceeds (₹ 200 per share – 1%)	198.00
Growth Rate	10.00%

$$K_e = \frac{2.75}{198} + 0.10 = 0.1139 \text{ i.e. } 11.39\%$$

(ii) Calculation of Expected Exchange Rate as per Interest Rate Parity

Year		₹/CN¥
1	₹ 9.50 x (1 + 0.12)/(1 + 0.10)	9.67
2	₹ 9.67 x (1 + 0.12)/(1 + 0.10)	9.85

(iii) Realization on the disposal of Land net of Tax

	CN¥
Sale value at the end of project (A)	35,00,000
(–) Cost of Land	(30,00,000)

Capital Gain	5,00,000
Tax paid @ 25% (B)	1,25,000
Amount realized net of tax (A) – (B)	33,75,000

(iv) Realization on the disposal of Office Complex

	CN¥
Sale value at the end of project (A)	5,00,000
(–) WDV	0
Capital Gain	5,00,000
(–) Tax paid @ 25% (B)	1,25,000
Amount realized net of tax (A) – (B)	3,75,000

(v) Computation of Annual Cash Inflows

Year	1	2
Annual Units in crores	10,000	10,000
Price per bottle (CN¥)	540	583.20
Annual Revenue (CN¥)	54,00,000	58,32,000
Less: Expenses		
Variable operating cost (CN¥)	(21,60,000)	(23,32,800)
Depreciation (CN¥) [15 Lakhs/2]	(7,50,000)	(7,50,000)
Fixed Cost per annum (CN¥)	(23,76,000)	(25,66,080)
PBT (CN¥)	1,14,000	1,83,120
(–) Tax on Profit @ 25% (CN¥)	(28,500)	(45,780)
Net Profit (CN¥)	85,500	1,37,340
Add: Depreciation (CN¥)	7,50,000	7,50,000
Cash Flow	8,35,500	8,87,340

(a) Computation of NPV of the project in CN¥ **(CN¥)**

Year	0	1	2
Initial Investment	(45,00,000)		
Annual Cash Inflows		8,35,500	8,87,340
Realization on the disposal of Land net of Tax			33,75,000
Realization on the disposal of Office Complex			3,75,000
Total	(45,00,000)	8,35,500	46,37,340
PVF @ 11.39%	1.000	0.898	0.806
PV of Cash Flows	(45,00,000)	7,50,279	37,37,696

NPV (CN¥) = –12,025

(b) Evaluation of Project from Opus Point of View

Year	0	1	2
Cash Flows (CN¥)	(45,00,000)	8,35,500	46,37,340
Exchange Rate (₹/CN¥)	9.50	9.67	9.85
Cash Flows (₹)	(4,27,50,000)	80,79,285	4,56,77,799
PVF @ 12%	1.00	0.893	0.797
	(4,27,50,000)	72,14,802	3,64,05,206

NPV (₹) = 8,70,008

Though in terms of CN¥ the NPV of the project is negative but in ₹ it has positive NPV due to weakening of ₹ in comparison of CN¥. Thus, Opus can accept the project.

Question 8

Its Entertainment Ltd., an Indian Amusement Company is happy with the success of its Water Park in India. The company wants to repeat its success in Nepal also where it is planning to establish a Grand Water Park with world class amenities. The company is also encouraged by a marketing research report on which it has just spent ₹ 20,00,000.

The estimated cost of construction would be Nepali Rupee (NPR) 450 crores and it would be completed in one years' time. Half of the construction cost will be paid in the beginning and rest at the end of year. In addition, working capital requirement would be NPR 65 crores from the year end one. The after tax realizable value of fixed assets after four years of operation is expected to be NPR 250 crores. Under the Foreign Capital Encouragement Policy of Nepal, company is allowed to claim 20% depreciation allowance per year on reducing balance basis subject to maximum capital limit of NPR 200 crore.

The water park will have a maximum capacity of 20,000 visitors per day. On an average, it is expected to achieve 70% capacity for first operational four years. The entry ticket is expected to be NPR 220 per person. In addition to entry tickets revenue, the company could earn revenue from sale of food and beverages and fancy gift items. The average sales expected to be NPR 150 per visitor for food and beverages and NPR 50 per visitor for fancy gift items. The sales margin on food and beverages and fancy gift items is 20% and 50% respectively. The park would open for 360 days a year.

The annual staffing cost would be NPR 65 crores per annum. The annual insurance cost would be NPR 5 crores. The other running and maintenance costs are expected to be NPR 25 crores in the first year of operation which is expected to increase NPR 4 crores every year. The company would apportion existing overheads to the tune of NPR 5 crores to the park.

All costs and receipts (excluding construction costs, assets realizable value and other running and maintenance costs) mentioned above are at current prices (i.e. 0 point of time) which are expected to increase by 5% per year. Working capital is also expected to increase by 5% every year.

The tax rate in Nepal is 20%.

The average market return is 11% and interest rate on treasury bond is 8%. The company's current equity beta is 0.45. The company's funding ratio for the Water Park would be 55% equity and 45% debt. The company can raise loan for theme park in Nepal @ 9%.

Being a tourist Place, the amusement industry in Nepal is competitive and very different from its Indian

counterpart. The company has gathered the relevant information about its nearest competitor in Nepal. The competitor's market value of the equity is NPR 1,850 crores and the debt is NPR 510 crores and the equity beta is 1.35.

Determine NPV of the project in NPR and state whether Its Entertainment Ltd. should undertake Water Park project in Nepal or not.

Answer

Working Notes:

(i) Calculation of Cost of Funds/Discount Rate

Competing Company's Information	
Equity Market Value	1,850.00
Debt Market Value	510.00
Equity Beta	1.35

Assuming debt to be risk free i.e. beta is zero, the beta of competitor is un-geared as follows:

$$\text{Asset Beta} = \text{Equity Beta} \times \frac{E}{E + D\,(1-t)} = 1.35 \times \frac{1,850}{1,850 + 510\,(1 - 0.20)} = 1.106$$

Equity beta for Its Entertainment Ltd. in Nepal

Asset beta in Nepal	1.106
Ratio of funding in Nepal	
Equity	55.00%
Debt	45.00%

$$1.106 = \text{Equity Beta} \times \frac{55}{55 + 45\,(1 - 0.20)}$$

Equity Beta = 1.83

Cost of Equity as per CAPM

Market Return = 11.00%

Risk free return = 8.00%

Cost of Equity = Risk free return + β (Market Return – Risk free return)

= 8.00% + 1.83 (11.00% – 8.00%)

= 13.49%

WACC = 13.49% x 0.55 + 9% (1 – 0.20) x 0.45 = 10.66%

(ii) Present Value Factors at the discount rate of 10.66%

Year	**0**	**1**	**2**	**3**	**4**	**5**
PVIF	1.000	0.904	0.817	0.738	0.667	0.603

(iii) Calculation of Capital Allowances

Year	**1**	**2**	**3**	**4**

Opening Balance (NPR Crore)	200.00	160.00	128.00	102.40
Less: Depreciation (NPR Crore)	(40.00)	(32.00)	(25.60)	(20.48)
Closing Balance (NPR Crore)	160.00	128.00	102.40	81.92

Calculation of Present Value of Free Cash Flow

Year	0	1	2	3	4	5
Expected Annual visitors			50,40,000	50,40,000	50,40,000	50,40,000
Entry price per visitor (NPR)			242.55	254.68	267.41	280.78
Profit from sale of Food and Beverages per visitor (NPR)			33.08	34.73	36.47	38.29
Profit from sale of Fancy Gift Items per visitor (NPR)			27.56	28.94	30.39	31.91
Revenue per visitor (NPR)			303.19	318.35	334.27	350.98
Total Revenue (NPR crores) (A)			152.81	160.45	168.47	176.89
Less:						
Staffing Cost (NPR crores)			71.66	75.25	79.01	82.96
Insurance Costs (NPR crores)			5.51	5.79	6.08	6.38
Other running & maintenance costs (NPR crores)			25.00	29.00	33.00	37.00
Depreciation (NPR crores)			40.00	32.00	25.60	20.48
Total Expense (NPR crores) (B)			142.17	142.04	143.69	146.82
PBT (NPR crores) (A – B)			10.64	18.41	24.78	30.07
(–) Tax @ 20% (NPR crores)			2.13	3.68	4.96	6.01
Net Profit (NPR crores)			8.51	14.73	19.82	24.06
(+) Depreciation (NPR crores)			40	32	25.6	20.48
Park Construction Cost (NPR crores)	(225)	(225)				
After tax assets realisation value (NPR crores)						250
Working capital (NPR crores)		(65)	(3.25)	(3.41)	(3.58)	75.25
Net cash Flow (NPR crores)	(225)	(290)	45.26	43.32	41.84	369.79
PVF at discount rate	1.00	0.904	0.817	0.738	0.667	0.603
Present Values (NPR crores)	(225)	(262.16)	36.98	31.97	27.91	222.98

Net Present Value (NPR crores) = –167.32

Decision: Since NPV of the project is negative, Its Entertainment Ltd. should not undertake Water Park project in Nepal.

International Capital Budgeting Decision using Adjusted NPV

Question 9

The Management of a multinational company TL Ltd. is engaged in construction of Infrastructure Project. A proposal to construct a Toll Road in Nepal is under consideration of the Management.

The following information is available:

The initial investment will be in purchase of equipment costing USD 250 lakhs. The economic life of the equipment is 10 years. The depreciation on the equipment will be charged on straight line method.

EBIDTA to be collected from the Toll Road is projected to be USD 33 lakhs p.a. for a period of 20 years.

To encourage investment, Nepalese government is offering a 15 year term loan of USD 150 lakhs at an interest rate of 6% per annum. The interest is to be paid annually. The loan will be repaid at the end of 15 year in one tranche.

The required rate of return for the project under all equity financing is 12% per annum.

Post tax cost of debt is 5.6% per annum.

Corporate Tax Rate is 30%. All cash Flows will be in USD.

You are required to advise the management on the viability of the proposal by using Adjusted Net Present Value method.

Given: PVIFA (12%, 10) = 5.650, PVIFA (12%, 20) = 7.469, PVIFA (8%, 15) = 8.559

Note: Make calculations in USD lakh upto 3 decimals.

Answer

(i) Net Present Value (All Equity Financed) – Base NPV

Particulars	Period	USD Lakhs	PVF @ 12%	PV (USD Lakhs)
Initial Investment	0	(250)	1.000	(250.000)
EBIDTA	1 to 20	33	7.469	246.477
Tax (33 x 30%)	1 to 20	(9.90)	7.469	(73.943)
Depreciation (250 lakhs/10)	1 to 10	25		
Tax Saving on Dep (25 x 30%)	1 to 10	7.50	5.650	42.375
NPV				(35.091)

(ii) PV of Tax Shield on Interest

Particulars	Period	USD Lakhs	PVF @ 8%	PV (USD Lakhs)
Interest (150 lakhs x 6%)	1 to 15	9		
Tax Saving on Interest (9 x 30%)	1 to 15	2.70	8.559	23.109

Adjusted Present Value of the Project

= Base NPV + PV of Tax Shield on Interest

= –US$ 35.091 lakh + US$ 23.109 lakh = –US$ 11.982 lakh

Advise: Since APV is negative, TL Ltd. should not accept the project.

Other International Capital Budgeting Decisions

Question 10

A USA based company is planning to set up a software development unit in India. Software developed at the Indian unit will be bought back by US parent at a transfer price of US$ 10 million. The unit will remain in existence in India for one year; software is expected to get developed within this time frame.

The US based company will be subject to corporate tax of 30% and a withholding tax of 10% in India and will not be eligible for tax credit in the US. The software developed will be sold in the US market for US$ 12 million. Other estimates are as follows:

Rent for fully furnished unit with necessary hardware in India	₹ 15,00,000
Manpower cost (80 software professional will be working for 10 hour each day)	₹ 400 per man hour
Administrative and other costs	₹ 12,00,000

Advise the US Company on the financial viability of the project. The rupee-dollar rate is ₹ 48/$.

Note: Assume 365 days a year.

Answer

Proforma profit and loss account of the Indian software development unit

	₹	₹
Revenue (US$ 10 million x ₹ 48)		48,00,00,000
Less: Costs:		
Rent	15,00,000	
Manpower (₹ 400 x 80 x 10 x 365)	11,68,00,000	
Administrative and other costs	12,00,000	(11,95,00,000)
Earnings before tax		36,05,00,000
Less: Tax @ 30%		(10,81,50,000)
Earnings after tax		25,23,50,000
Less: Withholding tax (TDS) @ 10%		(2,52,35,000)
Repatriation amount (in rupees)		22,71,15,000
Repatriation amount (in dollars) [₹ 22,71,15,000/₹ 48]		$ 47,31,563

Advise: The cost of development software in India for US based company is $ 52,68,437 ($ 1,00,00,000 – $ 47,31,563). As the USA based Company is expected to sell the software in the US at $ 1,20,00,000, it is advised to develop the software in India.

Question 11

A USA based company is planning to set up a software development unit in India. Software developed at the Indian unit will be bought back by US parent at a transfer price of US$ 10 million. The unit will remain in existence in India for one year; software is expected to get developed within this time frame.

The US based company will be subject to corporate tax of 30% and a withholding tax of 10% in India and will be eligible for tax credit in India. The software developed will be sold in the US market and many companies are ready to acquire the same. Other estimates are as follows:

Rent for fully furnished unit with necessary hardware in India	₹ 18,75,000
Manpower cost (80 software professional will be working for 10 hour each day)	₹ 500 per man hour
Administrative and other costs	₹ 15,00,000

Advise the US Company the minimum amount it should charge from the prospective buyer. The rupee-dollar rate is ₹ 60/$.

Note: Assume 365 days a year.

Answer

Proforma profit and loss account of the Indian software development unit

	₹	₹
Revenue		60,00,00,000
Less: Costs:		
Rent	18,75,000	
Manpower (400 x 80 x 10 x 365)	14,60,00,000	
Administrative and other costs	15,00,000	(14,93,75,000)
Earnings before tax		45,06,25,000
Less: Tax @ 30%		(13,51,87,500)
Earnings after tax		31,54,37,500
Repatriation amount (in rupees)		31,54,37,500
Repatriation amount (in dollars)		$ 52,57,292

Advise: The USA based Company should charge minimum $ 47,42,708 ($ 1,00,00,000 – $ 52,57,292) from prospective buyer.

Note: Withholding tax is not deducted since company is eligible for tax credit.

Return on Investment in International Securities Market

Question 12

The price of a bond just before a year of maturity is $ 5,000. Its redemption value is $ 5,250 at the end of the said period. Interest is $ 350 p.a. The Dollar appreciates by 2% during the said period. Calculate the rate of return in following cases:

(i) If investor is from US.

(ii) If investor is from any other nation other than US.

Answer

First, we shall compute return on bond which will be common for both investors.

$$\text{Return} = \frac{(\text{Price at end} - \text{Price at beginning}) + \text{Interest}}{\text{Price at beginning}} \times 100$$

$$= \frac{(5{,}250 - 5{,}000) + 350}{5{,}000} \times 100$$

$$= \frac{250 + 350}{5{,}000} \times 100 = 12\%$$

(i) If investor is from US

For US investor the return shall be 12% and there will be no impact of appreciation in $.

(ii) If investor is from any other nation other than US

There will be impact of $ appreciation on his returns. If $ appreciate by 2%, then return for non-US investor shall be:

(1 + 0.12) (1 + 0.02) – 1 = 1.12 x 1.02 – 1 = 0.1424 i.e. 14.24%

Question 13

Mr. Mammen, an Indian investor invests in a listed bond in USA. If the price of the bond at the beginning of the year is USD 100 and it is USD 103 at the end of the year. The coupon rate is 3% payable annually.

Find the return on investment in terms of home country currency if:

(i) USD is Flat.

(ii) USD appreciates during the year by 3%.

(iii) USD depreciates during the year by 3%.

(iv) Indian Rupee appreciates during the year by 5%.

Answer

(i) If USD is flat

$$\text{Return} = \frac{(\text{Price at end} - \text{Price at beginning}) + \text{Interest}}{\text{Price at beginning}} \times 100$$

$$= \frac{(103 - 100) + 3}{100} \times 100$$

$$= \frac{3 + 3}{100} \times 100 = 6\%$$

(ii) If USD appreciates by 3%

(1 + 0.06) (1 + 0.03) – 1 = 1.06 x 1.03 – 1 = 0.0918 i.e. 9.18%

(iii) If USD depreciates by 3%

(1 + 0.06) (1 – 0.03) – 1 = 1.06 x 0.97 – 1 = 0.0282 i.e. 2.82%

(iv) If Indian Rupee is appreciated by 5%

(1 + 0.06) (1 – 0.05) – 1 = 1.06 x 0.95 – 1 = 0.007 i.e. 0.7%

Question 14

With relaxation of norms in India for investment in international market upto $ 2,50,000, Mr. X to hedge himself against the risk of declining Indian economy and weakening of Indian Rupee during last few years, decided to diversify in the International Market.

Accordingly, Mr. X invested a sum of ₹ 1.58 crore on 1.1.2025 in Standard & Poor Index. On 1.1.2026, Mr. X sold his investment. The other relevant data is given below:

	1.1.2025	1.1.2026
Index of Stock Market in India	7395	?
Standard & Poor Index	2028	1919
Exchange Rate (₹/$)	62.00/62.25	67.25/67.50

You are required to calculate:

(i) The return for a US investor.

(ii) Holding Period Return to Mr. X.

(iii) The value of Index of Stock Market in India as on 1.1.2026 at which Mr. X would be indifferent between investment in Standard & Poor Index and Indian Stock Market.

Answer

(i) Return of a US Investor

$$= \frac{\text{Ending Price} - \text{Initial Price}}{\text{Initial Price}} \times 100$$

$$= \frac{1919 - 2028}{2028} \times 100$$

$$= -5.37\%$$

(ii) Return of Mr. X

Initial Investment in ₹	(A)	₹ 1.58 Crore
Applicable Exchange Rate on 1.1.2025	(B)	₹ 62.25
Equivalent US$	(C) = A/B	US$ 2,53,815.26
Purchase Price of Standard & Poor Index	(D)	2028
No. of Standard & Poor Indices Purchased	(E) = C/D	125.16
Ending Price of Standard & Poor Index	(F)	1919
Proceeds realised in US$ on sale of Standard & Poor Index	(G) = E x F	US$ 2,40,182.04
Applicable Exchange Rate on 1.1.2026	(H)	₹ 67.25
Proceeds realised in ₹ on sale of Standard & Poor Index	(I) = G x H	₹ 1,61,52,242

$$\text{Rate of Return} = \frac{1,61,52,242 - 1,58,00,000}{1,58,00,000} \times 100 = 2.23\%$$

(iii) Rate of Return had the amount been invested in India

Initial Investment in ₹	(J)	₹ 1.58 Crore
Purchase Price of Indian Index	(K)	7395
No. of Indian Indices Purchased	(L) = J/K	2,136.58

Let Ending Price of Indian Index = X

Then, to be indifferent with return in International Market = $\frac{2136.58 \times X - 1.58}{1.58} \times 100 = 2.23$

Price of Indian Index to be indifferent = 7559.90 say 7560

Question 15

A US investor invested in Sensex for a period of one year. The relevant information is given below:

Size of investment ($)	20,00,000
Spot rate 1 year ago (₹/$)	42.50/60
Spot rate now (₹/$)	43.85/90
Sensex 1 year ago	3,256
Senex now	3,765
Inflation in US	5%
Inflation in India	9%

(i) Compute the nominal rate of return to the US investor.

(ii) Compute the real appreciation/depreciation of Rupee.

(iii) What should be the exchange rate if relevant purchasing power parity holds good?

(iv) What will be the real return to an Indian investor in Sensex?

Answer

(i) Nominal rate of return to the US investor

Size of investment in $	$ 20,00,000
Size of investment in ₹ ($ 20,00,000 x 42.50)	₹ 8,50,00,000
Sensex at T_0	3,256
No. of units of Sensex that can be purchased at T_0 (₹ 8,50,00,000/3,256)	26,105
Sensex at T_1	3,765
Sale of Sensex in ₹ (26,105 x 3,765)	₹ 9,82,85,325
US$ at T_1	₹ 43.90
Equivalent Amount in US$	$ 22,38,846
Gain in US$	$ 2,38,846
Nominal rate of return to US investor ($ 2,38,846/$ 20,00,000)	11.94%

(ii) Real Appreciation/Depreciation of Rupee

Real Exchange Rate (Buying) = $43.85 \times \frac{(1 + 0.05)}{(1 + 0.09)} = 42.24$

Real Appreciation of ₹ = $\frac{42.50 - 42.24}{42.50} \times 100 = 0.61\%$

Real Exchange Rate (Selling) = $43.90 \times \frac{(1 + 0.05)}{(1 + 0.09)} = 42.29$

Real Appreciation of ₹ = $\frac{42.60 - 42.29}{42.60} \times 100 = 0.73\%$

(iii) Exchange rate if relevant purchasing power parity holds

Buying Rate = $42.50 \times \frac{(1 + 0.09)}{(1 + 0.05)} = 44.12$

Selling Rate = $42.60 \times \frac{(1 + 0.09)}{(1 + 0.05)} = 44.22$

Exchange rate = 44.12/44.22

(iv) Real return to Indian Investor in Sensex

Nominal Return = $\frac{3,765 - 3,256}{3,256} \times 100 = 15.63\%$

Real Return = $\frac{1.1563}{1.09} - 1 = 0.0608$ or 6.08%

Section B – Theory Questions

Question 1

Write a short note on Instruments of International Finance.

Answer

There are various Instruments of International Finance as follows:

(i) Foreign Currency Convertible Bonds (FCCBs)

A type of convertible bond issued in a currency different than the issuer's domestic currency. In other words, the money being raised by the issuing company is in the form of a foreign currency.

(ii) Global Depository Receipts (GDRs)

A depository receipt is basically a negotiable certificate, denominated in a currency not native to the issuer, that represents the company's publicly traded local currency equity shares. Most GDRs are denominated in USD, while a few are denominated in Euro and Pound Sterling. The Depository Receipts issued in the US are called American Depository Receipts (ADRs), which anyway are denominated in USD and outside of USA, these are called GDRs. DRs (depository receipts) are created when the local currency shares of an Indian company are delivered to the depository's local custodian bank, against which the Depository bank (such as the Bank of New York) issues depository receipts in US dollar.

(iii) American Depository Receipts (ADRs)

Depository receipts issued by a company in the United States of America (USA) is known as American Depository Receipts (ADRs).

(iv) Euro-Convertible Bonds (ECBs)

A convertible bond is a debt instrument which gives the holders of the bond an option to convert the bond into a predetermined number of equity shares of the company.

(v) Other Sources

- **Euro-Convertible Zero Bonds:** These bonds are structured as a convertible bond. No interest is payable on bonds. But conversion of bonds takes place on maturity at pre-determined price.
- **Euro-bonds with Equity Warrants:** These bonds carry a coupon rate determined by the market rates. The warrants are detachable. Pure bonds are traded at a discount.
- **Syndicated bank loans:** One of the earlier ways of raising funds in form of large loans from banks with good credit rating, can be arranged in reasonably short time with few formalities.
- **Euro-bonds:** These are basically debt instruments denominated in a currency issued outside the country of that currency, for example Yen bond floated in France.
- **Foreign Bonds:** Foreign bonds are denominated in a currency which is foreign to the borrower and sold at the country of that currency.
- **Euro Commercial Papers:** These are short term money market securities usually issued at a discount, for maturities less than one year.
- **Credit Instruments:** Foreign exchange operations of banks consist primarily of purchase and sale of credit instruments.

Question 2

What is Foreign Currency Convertible Bonds? What are their advantages?

Answer

A type of **convertible bond issued in a currency different than the issuer's domestic currency**. In other words, the **money being raised by the issuing company** is **in** the form of a **foreign currency**. A convertible bond is a mix between a debt and equity instrument. It acts like a bond by making regular coupon and principal payments, but these bonds also give the bondholder the option to convert the bond into stock.

Advantages of FCCBs

(i) The convertible bond **gives the investor the flexibility to convert the bond into equity** at a price or redeem the bond at the end of a specified period, normally three years, if the price of the share has not met his expectations.

(ii) Companies prefer bonds as **it leads to delayed dilution of equity** and allows company to avoid any current dilution in earnings per share that a further issuance of equity would cause.

(iii) FCCBs are **easily marketable** as investors enjoys option of conversion into equity, if resulting to capital appreciation. Further investor is assured of a minimum fixed interest earnings.

Question 3

What is the impact of GDRs on Indian Capital Market?

Answer

Since the inception of GDRs a remarkable change in Indian capital market has been observed as follows:

(i) **Indian stock market** to some extent **is shifting from Bombay to Luxemburg**.

(ii) There is **arbitrage possibility** in GDR issues.

(iii) **Indian stock market is no longer independent** from the rest of the world. This puts additional strain on the investors as they now need to keep updated with worldwide economic events.

(iv) **Indian retail investors are completely sidelined**.

(v) As a result of introduction of GDRs, a considerable **foreign investment has flown into India**.

Question 4

List the main objectives of International Cash Management.

Answer

The main objectives of an effective system of international cash management are:

(i) To **minimise currency exposure risk**.

(ii) To **minimise overall cash requirements of the company** as a whole without disturbing smooth operations of the subsidiary or its affiliate.

(iii) To **minimise transaction costs**.

(iv) To **minimise country's political risk**.

(v) To take **advantage of economies of scale** as well as reap benefits of superior knowledge.

The objectives are conflicting in nature as minimising of transaction costs require cash balance to be kept in the currency in which they are received thereby contradicting both currency and political exposure requirements.

Also International Cash Management has two basic objectives:

(i) **Optimising Cash Flow movements.**

(ii) **Investing excess cash.**

CHAPTER - 12
Interest Rate Risk Management

Section A – Practical Questions

Forward Rate Agreements (FRA)

Question 1

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

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

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

(i) 9.60% p.a.

(ii) 8.80% p.a.

Answer

Final settlement amount shall be computed by using formula:

$$= \frac{(N)\ (RR - FR)\ (dtm/DY)}{[1 + RR\ (dtm/DY)]}$$

Where,

N = the notional principal amount of the agreement

RR = Reference Rate for the maturity specified by the contract prevailing on the contract settlement date

FR = Agreed-upon Forward Rate

dtm = maturity of the forward rate, specified in months

DY = Month count basis applicable to money market transaction

Accordingly,

(i) If actual rate of interest after 6 months happens to be 9.60%

$$= \frac{(₹\ 60\ crore) \times (0.096 - 0.093) \times (3/12)}{[1 + 0.096 \times (3/12)]}$$

$$= \frac{(₹\ 60\ crore) \times (0.00075)}{1.024} = ₹\ 4,39,453$$

Thus, banker will pay Parker & Co. a sum of ₹ 4,39,453.

(ii) If actual rate of interest after 6 months happens to be 8.80%

$$= \frac{(₹\ 60\ crore) \times (0.088 - 0.093) \times (3/12)}{[1 + 0.088 \times (3/12)]}$$

$$= \frac{(₹\ 60\ crore) \times (-0.00125)}{1.022} = -₹\ 7,33,855$$

Thus, Parker & Co. will pay banker a sum of ₹ 7,33,855.

Question 2

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

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

You are required to determine:

(a) Profit/Loss to TM Fincorp in terms of basis points.

(b) The settlement amount.

Answer

(a) TM will make a profit of 25 basis points since a 6 x 9 FRA is a contract on 3 month interest rate in 6 months, which turns out to be 5.50% (higher than FRA price).

(b) The settlement amount shall be calculated by using the following formula:

$$= \frac{(N)\ (RR - FR)\ (dtm/DY)}{[1 + RR\ (dtm/DY)]}$$

Where,

N = Notional Principal Amount

RR = Reference Rate

FR = Agreed upon Forward Rate

dtm = FRA period specified in months

DY = Month count basis applicable to money market transactions

Accordingly,

$$= \frac{₹\ 100\ crore \times (5.50\% - 5.25\%) \times (3/12)}{1 + 0.055 \times (3/12)} = ₹\ 6,16,523$$

Hence, there is profit of ₹ 6,16,523 to TM Fincorp.

Interest Rate Futures

Question 3

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

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

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

Spot	5.50% – 5.75%
3 x 6 FRA	5.59% – 5.82%
3 x 9 FRA	5.64% – 5.94%

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

You are required to:

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

(i) 4.5%

(ii) 6.5%

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

Answer

(a) Since firm is a borrower, it will like to off-set interest cost by profit on Future Contract.

Accordingly, if interest rate rises it will gain. Hence, it should sell interest rate futures.

$$\text{No. of Contracts} = \frac{\text{Amount of Borrowing}}{\text{Contract Size}} \times \frac{\text{Duration of Loan}}{\text{3 months}}$$

$$= \frac{£\ 2,50,00,000}{£\ 50,000} \times \frac{6}{3} = 1,000 \text{ Contracts}$$

The final outcome in the given two scenarios shall be as follows:

	If the interest rate turns out to be 4.5%	**If the interest rate turns out to be 6.5%**
Future Course Action:		
Sell to open	94.15	94.15
Buy to close	95.50 (100 – 4.5)	93.50 (100 – 6.5)
Loss/(Gain)	1.35%	(0.65%)
Cash Payment/(Receipt) for Future Settlement	£ 50,000 x 1,000 x 1.35% x 3/12 = £ 1,68,750	£ 50,000 x 1,000 x 0.65% x 3/12 = (£ 81,250)
Interest for 6 months on £ 50 million at actual rates	£ 25 million x 4.5% x 6/12 = £ 5,62,500	£ 25 million x 6.5% x 6/12 = £ 8,12,500
	£ 7,31,250	£ 7,31,250

Thus, the firm locked itself in interest rate = $\frac{£\ 7,31,250}{£\ 2,50,00,000} \times 100 \times \frac{12}{6} = 5.85\%$

(b) No, the interest cost shall not be less for Espace plc had it taken the route of FRA, as the 3 x 9 FRA contract are available at 5.64% – 5.94% i.e. borrowing rate of 5.94%. Hence, interest cost under this option shall be 5.94% which is more than interest rate under Future contract rate of 5.85%.

Question 4

In March 2025, SMD Bank sold 7% Interest Rate Futures underlying Notional 7.5% Coupon Bonds. The exchange provides following details of eligible securities that can be delivered:

Security	Quoted Spot Price of Bonds	Conversion Factor
6.55 GOI 2028	9,264	0.9060
6.80 GOI 2032	8,775	0.9195
6.85 GOI 2029	9,723	0.9643
8.44 GOI 2030	11,463	1.1734
8.85 GOI 2031	12,017	1.2428

Recommend the Cheapest to Deliver (CTD) security that should be delivered by SMD Bank if Future settlement price is 10,000.

Answer

The SMD Bank shall choose those CTD (Cheapest-to-Deliver) Bonds from the basket of deliverable Bonds which gives maximum profit computed as follows:

Profit = Future Settlement Price x Conversion Factor – Quoted Spot Price of Deliverable Bond

Accordingly, the profit of each bond shall be computed as follows:

Security (1)	Future Settlement Price (2)	Conversion Factor (3)	(4) = (2) x (3)	Quoted Price of Bonds (5)	Profit (6) = (4) – (5)
6.55 GOI 2028	10,000	0.9060	9,060	9,264	–204
6.80 GOI 2032	10,000	0.9195	9,195	8,775	420
6.85 GOI 2029	10,000	0.9643	9,643	9,723	–80
8.44 GOI 2030	10,000	1.1734	11,734	11,463	271
8.85 GOI 2031	10,000	1.2428	12,428	12,017	411

Since, maximum profit to the Bank is in case of 6.80 GOI 2032, same should be opted for.

Interest Rate Options

Question 5

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

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

Required:

(i) Identify at least one reason for difference in the Yield Curve for the companies.

(ii) Calculate the rate of interest DEF Bank would quote under 2V3 FRA, using the company's yield information as quoted above.

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

(a) 4.50%

(b) 5.50%

Note: Make calculations in ₹ crores.

Answer

(i) The difference in yield curve may due to the lower credit rating of ABC Ltd. compared to XYZ Ltd.

(ii) DEF Bank will fix interest rate for 2V3 FRA after 2 years as follows:

XYZ Ltd.

$(1 + r)\ (1 + 0.0420)^2 = (1 + 0.0448)^3$

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

$r = 5.04\%$

Bank will quote 5.04% for a 2V3 FRA.

ABC Ltd.

$(1 + r)\ (1 + 0.0548)^2 = (1 + 0.0578)^3$

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

$r = 6.38\%$

Bank will quote 6.38% for a 2V3 FRA.

(iii) Interest payable by XYZ Ltd. under two scenarios will be computed as follows:

	4.50% [Allow to Lapse]	**5.50% [Exercise*]**
Interest [₹ 100 crores x 4.50%]	₹ 4.50 crores	–
[₹ 100 crores x 5.04%]	–	₹ 5.04 crores
Premium (Option Cost) [₹ 100 crores x 0.1%]	₹ 0.10 crores	₹ 0.10 crores
	₹ 4.60 crores	₹ 5.14 crores

*Since after 2 years, 1 year interest rate turns out to be 5.50%, it will be beneficial for XYZ Ltd. to exercise its option.

Question 6

A textile manufacturer has taken floating interest rate loan of ₹ 40,00,000 on 1st April, 2025. The rate of interest at the inception of loan is 8.50% p.a. Interest is to be paid every year on 31st March, and the duration of loan is five years. In the month of October 2025, the Central bank of the country releases following projections about the interest rates likely to prevail in future.

(i) On 31st March, 2026, at 8.75%; on 31st March, 2027 at 10%; on 31st March, 2028 at 10.50% and on 31st March, 2029 at 7.75%. Show how the borrower can hedge the risk using Cap Option arising out of expected rise in rate of interest when he wants to peg his interest cost at 8.50% p.a.

(ii) Assume that the premium negotiated by both the parties is 0.75% to be paid at once on 1st October, 2025 and the actual rate of interest on the respective due dates happens to be as: on 31st March, 2026 at 10.20%; on 31st March, 2027 at 11.50%; on 31st March, 2028 at 9.25%; on 31st March, 2029 at 8.25%. Show how settlement will be executed on respective interest due dates.

Answer

(i) As borrower does not want to pay more than 8.50% p.a., on this loan where the rate of interest is likely to rise beyond this, hence, he has hedged the risk by entering into an agreement to buy interest rate caps with the following parameters:

- National Principal: ₹ 40,00,000
- Strike rate: 8.50% p.a.
- Reference rate: the rate of interest applicable to this loan
- Calculation and settlement date: 31st March every year
- Duration of the caps: till 31st March 2030
- Premium for caps: negotiable between both the parties

To purchase the caps this borrower is required to pay the premium upfront at the time of buying caps. The payment of such premium will entitle him with right to receive the compensation from the seller of the caps as soon as the rate of interest on this loan rises above 8.50%. The compensation will be at the rate of the difference between the rate of none of the cases the cost of this loan will rise above 8.50% calculated on ₹ 40,00,000. This implies that in none of the cases the cost of this loan will rise above 8.50%. This hedging benefit is received at the respective interest due dates at the cost of premium to be paid only once.

(ii) The premium to be paid on 1st October 2025 is 30,000 (₹ 40,00,000 x 0.75/100). The payment of this premium will entitle the buyer of the caps to receive the compensation from the seller of the caps whereas the buyer will not have obligation. The compensation received by the buyer of caps will be as follows:

On 31st March 2026

The buyer of the caps will not receive the compensation as the actual rate of interest is 8.50% whereas strike rate of caps is 8.50%. Hence, his interest liability shall not exceed 8.50%.

On 31st March 2027

The buyer of the caps will receive the compensation at the rate of 1.70% (10.20 – 8.50) to be calculated on ₹ 40,00,000, the amount of compensation will be ₹ 68,000 (40,00,000 x 1.70/100).

On 31st March 2028

The buyer of the caps will receive the compensation at the rate of 3.00% (11.50 – 8.50) to be calculated on ₹ 40,00,000, amount of compensation will be ₹ 1,20,000 (40,00,000 x 3.00/100).

On 31st March 2029

The buyer of the caps will receive the compensation at the rate of 0.75% (9.25 – 8.50) to be calculated on ₹ 40,00,000, the amount of compensation will be ₹ 30,000 (40,00,000 x 0.75/100).

On 31st March 2030

The buyer of the caps will not receive the compensation as the actual rate of interest is 8.25% whereas strike rate of caps is 8.50%. Hence, his interest liability shall not exceed 8.50%.

Thus, by paying the premium upfront buyer of the caps gets the compensation on the respective interest due dates without any obligations.

Question 7

MPD Ltd. issues a ₹ 50 Million Floating Rate Loan on 31st December 2022 with resetting of coupon rate every 6 Months equal to LIBOR + 50 bps.

MPD is interested in an Interest rate Collar Strategy of selling a Floor and buying a cap.

MPD buys the 3 years cap and sell 3 years Floor as per the following details on 31st December 2022:

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

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

Reset Date	**31/12/2022**	**30/06/2023**	**31/12/2023**	**30/06/2024**	**31/12/2024**	**30/06/2025**
LIBOR (%)	7.00	8.00	6.00	4.75	4.25	5.25

Using the above data, you are required to determine:

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

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

Answer

(i) The pay-off of each leg shall be computed as follows:

Cap Receipt

Max {0, [Notional principal x (LIBOR on Reset date – Cap Strike Rate) x (No. of days/365)}

Floor Pay-off

Max {0, [Notional principal x (Floor Strike Rate – LIBOR on Reset date) x (No. of days/365)}

Statement showing effective interest on each payment date

Reset Date	**LIBOR (%)**	**Date of Payment**	**Days**	**Interest Payment (₹) LIBOR + 0.50%**	**Cap Receipts (₹)**	**Floor Pay-off (₹)**	**Effective Interest (₹)**
31-12-2022	7.00	30-06-2023	181	18,59,589	0	0	18,59,589
30-06-2023	8.00	31-12-2023	184	21,42,466	0	0	21,42,466
31-12-2023	6.00	30-06-2024	182	16,16,120	0	0	16,16,120
30-06-2024	4.75	31-12-2024	184	13,19,672	0	62,842	13,82,514

31-12-2024	4.25	30-06-2025	181	11,77,740	0	1,85,959	13,63,699
30-06-2025	5.25	31-12-2025	184	14,49,315	0	0	14,49,315
Total			1096				98,13,703

(ii) Average Annual Effective Interest Rate shall be computed as follows:

$$\frac{98,13,703}{5,00,00,000} \times \frac{365}{1096} \times 100 = 6.54\%$$

Question 8

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

Reset Period	LIBOR
1	8.00%
2	9.00%
3	9.50%
4	10.00%

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

Note: Round off amount in whole number nearest to £

Answer

First of all, we shall calculate premium payable to bank as follows:

$$P = \frac{rp}{PVAF\ (i, t)} \times A$$

Where,

P = Premium

A = Principal Amount

rp = Rate of Premium

i = Fixed Rate of Interest

t = Time

$$P = \frac{0.01}{PVAF\ (3.5\%, 4)} \times £\ 1,50,00,000$$

$$P = \frac{0.01}{(0.966 + 0.933 + 0.901 + 0.871)} \times £\ 1,50,00,000$$

$$P = \frac{£\ 1,50,000}{3.671} = £\ 40,861$$

Now we see the net payment received from bank

Payment Period (1)	Additional interest due to rise in LIBOR (2)	Amount received from bank under Cap Option (3)	Premium paid to bank (4)	Net Amount received from bank (5) = (3) – (4)
1	–	–	£ 40,861	(£ 40,861)
2	£ 75,000	£ 75,000	£ 40,861	£ 34,139
3	£ 1,12,500	£ 1,12,500	£ 40,861	£ 71,639
4	£ 1,50,000	£ 1,50,000	£ 40,861	£ 1,09,139
Total	£ 3,37,500	£ 3,37,500	£ 1,63,444	£ 1,74,056

Thus, from above it can be seen that interest rate risk amount of £ 3,37,500 reduced by £ 1,74,056 by using of Cap option.

Interest Rate Swaps

Question 9

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

(i) Calculate semi-annual fixed payment.

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

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

Generic swap is based on 30/360 days basis.

Answer

(i) Semi-annual fixed payment

= (N) (AIC) (Period)

Where,

N = Notional Principal amount = ₹ 5,00,000

AIC = All-in-cost = 8% = 0.08

= 5,00,000 x 0.08 (180/360)

= 5,00,000 x 0.08 (0.5)

= 5,00,000 x 0.04 = ₹ 20,000

(ii) Floating Rate Payment

= (N) (LIBOR) (dt/360)

= 5,00,000 x 0.06 x 181/360

= 5,00,000 x 0.030166

= ₹ 15,083

(iii) Net Amount

= (i) – (ii)

= ₹ 20,000 – ₹ 15,083 = ₹ 4,917

Question 10

Derivative Bank entered into a swap arrangement on a principal of ₹ 10 crores and agreed to receive MIBOR overnight floating rate for a fixed payment on the principal. The swap was entered into on Monday, 19th August, 2025 and was to commence on 20th August, 2025 and run for a period of 7 days.

Respective MIBOR rates for Tuesday to Monday were: 8.15%, 7.98%, 7.95%, 8.12%, 8.15%, 7.75%.

If Fixed Rate of Interest is 8%, then evaluate

(i) the nature of this Swap arrangement

(ii) the Net Settlement amount

Note:

(a) Sunday is Holiday.

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

(c) Consider 365 days in a year.

Answer

(i) The given swap arrangement is Plain Vanilla Overnight Index Swap (OIS).

(ii) To compute the Net Settlement amount, we shall compute Interest as per floating rate as follows:

Day	Principal (₹)	MIBOR (%)	Interest (₹)
Tuesday	10,00,00,000	8.15	22,329
Wednesday	10,00,22,329	7.98	21,868
Thursday	10,00,44,197	7.95	21,790
Friday	10,00,65,987	8.12	22,261
Saturday & Sunday (*)	10,00,88,248	8.15	44,697
Monday	10,01,32,945	7.75	21,261
Total Interest @ Floating Rate		(A)	1,54,206
Total Interest @ Fixed Rate [10,00,00,000 x 8.00% x 7/365]		(B)	1,53,425
Net Settlement Amount Received		(A) – (B)	781

*Interest for two days

Question 11

Derivative Bank entered into a plain vanilla swap through on OIS (Overnight Index Swap) on a principal of ₹ 10 crores and agreed to receive MIBOR overnight floating rate for a fixed payment on the principal. The swap was entered into on Monday, 2nd August, 2025 and was to commence on 3rd August, 2025 and run for a period of 7 days.

Respective MIBOR rates for Tuesday to Monday were:

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

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

Note:

(a) Sunday is Holiday.

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

(c) Consider 365 days in a year.

Answer

Day	Principal (₹)	MIBOR (%)	Interest (₹)
Tuesday	10,00,00,000	7.75	21,233
Wednesday	10,00,21,233	8.15	22,334
Thursday	10,00,43,567	8.12	22,256
Friday	10,00,65,823	7.95	21,795
Saturday & Sunday (*)	10,00,87,618	7.98	43,764
Monday	10,01,31,382	8.15	22,358
Total Interest @ Floating Rate			1,53,740
Less: Net Settlement Amount Received			(317)
Total Interest @ Fixed Rate			1,53,423

*Interest for two days

Thus, Fixed Rate of Interest = $\frac{1,53,423}{10,00,00,000} \times \frac{365}{7}$ = 0.07999914 i.e. 8%

Question 12

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

Company	IB	Zaki
INR Floating rate	BPLR + 0.50%	BPLR + 2.50%
JPY Fixed rate	2%	2.25%

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

You are required to find out

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

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

Answer

(i) Though Company IB has an advantage in both the markets but it has comparative more advantage in the INR floating-rate market. Company Zaki has a comparative advantage in the JPY fixed interest rate market.

However, company IB wants to borrow in the JPY fixed interest rate market and company Zaki wants to borrow in the INR floating-rate market. This gives rise to the swap opportunity.

IB raises INR floating rate at BPLR + 0.50% and Zaki raises JPY at 2.25%.

Total Potential Gain = (INR interest differential) – (Yen rate differential) [(BPLR + 2.50% – BPLR + 0.50%) – (2.25% – 2%)]	1.75%
Less: Banker's commission (To be shared equally)	(0.25%)
Net gain (To be shared equally: 0.75% each)	1.50%

Yes, a beneficial swap can be arranged.

(ii) Since, the Net Benefit of 150 Basis Points to be shared equally among IB and Zaki, Interest rate for them shall be as follows:

IB

Borrowing from Market	2%
Less: Benefit from Swap	(0.75%)
Net Interest	1.25%

Zaki

Borrowing from Market	BPLR + 2.50%
Less: Benefit from Swap	(0.75%)
Net Interest	BPLR + 1.75%

Question 13

IF an Indian firm has its subsidiary in Singapore and SF a Singapore firm has its subsidiary in India and face the following interest rates:

Company	**IF**	**SF**
INR Floating Rate	BPLR + 0.5%	BPLR + 1.5%
SGD Fixed Rate	3%	3.50%

SF wishes to borrow Rupee loan at a floating rate and IF wishes to borrow SGD at a fixed rate. The amount of loan required by both the companies is same at the current exchange rate. A Bank arranges a swap and requires 50 basis points as its commission, which is to be shared equally. IF requires a minimum gain of 20 basis points and SF requires a minimum gain of 10 basis points for structuring the deal. The Bank is very keen to structure the deal, even if, it has to forego a part of its commission.

You are required to find out:

(i) Whether there are any advantages available to IF and SF?

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

(iii) What rate of interest will they end up paying? Show detailed working.

Answer

(i) Though firm IF has an advantage in both the markets but it has comparative more advantage in the INR floating-rate market. Firm SF has a comparative advantage in the SGD fixed interest rate market.

However, firm IF wants to borrow in the SGD fixed interest rate market and firm SF wants to borrow in the INR floating-rate market. This gives rise to the swap opportunity.

IF raises INR floating rate at BPLR + 0.50% and SF raises SGD at 3.50%.

Total Potential Gain = (INR interest differential) – (SGD rate differential) [(BPLR + 1.50% – BPLR + 0.50%) + (3% – 3.50%)]	0.50%
Less: Banker's commission* (To be shared equally)	(0.20%)
Net gain (To be shared as: 0.20% for IF and 0.10% for SF)	0.30%

*Since, bank's commission is 0.50% which constitutes the entire gain, and it is mentioned that bank will forego a part of its commission to structure the deal. Thus, it will forego the minimum gain required by IF and SF i.e. 0.20% and 0.10% respectively.

(ii) Yes, a beneficial swap can be arranged.

(iii) Since, IF requires gain of 20 basis points and SF requires gain of 10 basis points, Interest rate for them shall be as follows:

IF

Borrowing from Market	3%
Less: Benefit from Swap	(0.20%)
Net Interest	2.80%

SF

Borrowing from Market	BPLR + 1.50%
Less: Benefit from Swap	(0.10%)
Net Interest	BPLR + 1.40%

Section B – Theory Questions

Question 1

What is Net interest position risk and Price risk?

Answer

Net Interest Position Risk:

The size of non-paying liabilities is one of the significant factors contributing towards profitability of banks. Where banks have more earning assets than paying liabilities, **interest rate risk arises when the market interest rates adjust downwards. Thus, banks with positive net interest positions will experience a reduction in Net Interest Income (NII) as the market interest rate declines** and increases when interest rate rises. Thus, large float is natural hedge against variations in interest rates.

Price Risk:

Price risk **occurs when assets are sold before their stated maturities**. In the financial market, **bond prices and yields are inversely related**. The price risk is closely associated with the trading book, which is created for making profit out of short-term movements in interest rates.

Banks which have an active trading book should, therefore, formulate policies to limit the portfolio size, holding period, duration, defeasance period, stop loss limits, marking to market, etc.

Question 2

Explain various methods of hedging of interest rate risk.

Answer

Methods of Hedging of Interest Rate Risk can be broadly divided into following two categories:

(A) Traditional Methods: These methods can further be classified in following categories:

(i) Asset and Liability Management (ALM): ALM is a comprehensive and dynamic framework for measuring, monitoring and managing the market risk of a bank. It is the management of structure of Balance Sheet (liabilities and assets) in such a way that the net earnings from interest are maximized within the overall risk preference (present and future) of the institutions.

(ii) Forward Rate Agreement (FRA): Normally it is used by banks to fix interest costs on anticipated future deposits or interest revenues on variable-rate loans indexed to Benchmark Interest Rate e.g. LIBOR, MIBOR etc. A bank that sells an FRA agrees to pay the buyer the increased interest cost on some "notional" principal amount if Reference Rate of some specified maturity is above a stipulated "Forward Interest Rate" on the contract maturity or settlement date. Conversely, the buyer agrees to pay the seller any decrease in interest cost if Reference Rate fall below the forward rate.

(B) Modern Methods: These methods can further be classified in following categories:

(i) Interest Rate Futures (IRF): An interest rate future is a contract between the buyer and seller agreeing to the future delivery of any interest-bearing asset. The interest rate future allows buyer and seller to lock in the price of the interest-bearing asset for a future date.

(ii) **Interest Rate Options (IRO):** Also known as Interest Rate Guarantee (IRG) as option is a right not an obligation and acts as insurance by allowing businesses to protect themselves against adverse interest rate movements while allowing them to benefit from favourable movements.

It should be noted that the IRO is basically a series of FRAs which are exercisable at predetermined bench marked interest rates on each period say 3 months, 6 months etc.

(iii) **Interest Rate Swaps:** In an interest rate swap, the parties to the agreement, termed the swap counterparties, agree to exchange payments indexed to two different interest rates. Total payments are determined by the specified notional principal amount of the swap, which is never actually exchanged.

(iv) **Swaptions:** An interest rate swaption is simply an option on an interest rate swap. It gives the holder the right but not the obligation to enter into an interest rate swap at a specific date in the future, at a particular fixed rate and for a specified term.

Question 3

Briefly explain Asset and Liability Management (ALM).

Answer

Asset-Liability Management (ALM) is one of the important tools of risk management in commercial banks of India. Indian banking industry is exposed to a number of risks such as market risk, financial risk, interest rate risk etc. The net income of the banks is very sensitive to these factors or risks.

ALM is a comprehensive and dynamic **framework for measuring, monitoring and managing the market risk of a bank**. It is the **management of structure of Balance Sheet (liabilities and assets) in such a way that the net earnings from interest are maximized** within the overall risk preference (present and future) of the institutions. The ALM functions extend to liquidly risk management, management of market risk, trading risk management, funding and capital planning and profit planning and growth projection.

Banks and other financial institutions provide services which expose them to various kinds of risks like credit risk, interest risk, and liquidity risk. Asset liability management is an approach that provides institutions with protection that makes such risk acceptable. Asset-liability management **enable institutions to measure and monitor risk, and provide suitable strategies for their management**.

It is therefore appropriate for institutions to focus on asset-liability management when they face financial risks of different types. Asset-liability management includes not only a formalization of this understanding, but also a way to quantify and manage these risks.

In a sense, the various aspects of balance sheet management deal with planning as well as direction and control of the levels, changes and mixes of assets, liabilities, and capital.

Question 4

Write a short note on Forward Rate Agreements.

OR

What are the main features of Forward Rate Agreements (FRA)?

Answer

A Forward Rate Agreement (FRA) is an **agreement between two parties through which a borrower/lender protects itself from** the unfavourable **changes to the interest rate.** Unlike futures, FRAs are not traded on an exchange, thus are called OTC product.

Following are main features of FRA:

- Normally it is **used** by banks **to fix interest costs** on anticipated future deposits or interest revenues on variable-rate loans indexed to LIBOR.
- It is an **Off Balance Sheet instrument.**
- It does **not involve any transfer of principal.** The principal amount of the agreement is termed "notional" because, while it determines the amount of the payment, actual exchange of the principal never takes place.
- It is **settled at maturity in cash** representing the profit or loss. A bank that sells an FRA agrees to pay the buyer the increased interest cost on some "notional" principal amount if some specified maturity of LIBOR is above a stipulated "forward rate" on the contract maturity or settlement date. Conversely, the buyer agrees to pay the seller any decrease in interest cost if market interest rates fall below the forward rate.
- **Final settlement** of the amounts owed by the parties to an FRA is determined by the **formula**

$$\text{Final Settlement} = \frac{(N)\ (RR - FR)\ (dtm/DY)}{[1 + RR\ (dtm/DY)]}$$

Where,

N = the notional principal amount of the agreement;

RR = Reference Rate for the maturity specified by the contract prevailing on the contract settlement date; typically LIBOR or MIBOR

FR = Agreed-upon Forward Rate; and

dtm = maturity of the forward rate, specified in days (FRA Days)

DY = Day count basis applicable to money market transactions which could be 360 or 365 days.

If Reference Rate > FR, the seller owes the payment to the buyer and if Reference Rate < FR, the buyer owes the seller the absolute value of the payment amount determined by the above formula.

- The differential amount is discounted at post change (actual) interest rate as it is settled in the beginning of the period not at the end.

Question 5

Define Interest Rate Swaption. State its principal features.

Answer

An interest rate swaption is simply an **option on an interest rate swap. It gives the holder the right** but not the obligation **to enter into an interest rate swap at a specific date in the future, at a particular fixed rate and for a specified term.**

There are **two types of swaption contracts**:

- A **fixed rate payer swaption** (also called Call Swaption).
- A **fixed rate receiver swaption** (also called Put Swaption).

Principal Features of Swaptions

(i) A swaption is effectively an **option on a forward-start IRS**, where exact terms such as the fixed rate of interest, the floating reference interest rate and the tenor of the IRS are established upon conclusion of the swaption contract.

(ii) A 3-month into 5-year swaption would therefore be seen as an option to enter into a 5-year IRS, 3 months from now.

(iii) The **'option period' refers to the time** which elapses **between the transaction date and the expiry date.**

(iv) The **swaption premium is expressed as basis points.**

(v) Swaptions can be **cash-settled**; therefore, at expiry they are marked to market off the applicable forward curve at that time and the difference is settled in cash.

Question 6

What do you know about swaptions and their uses?

OR

Swaptions can be applied for speculation purposes or to hedge a portion of their swap books. What are the other areas of its application?

Answer

An interest rate swaption is simply an **option on an interest rate swap. It gives the holder the right** but not the obligation **to enter into an interest rate swap at a specific date in the future, at a particular fixed rate and for a specified term.**

There are **two types of swaption contracts**:

- A **fixed rate payer swaption** (also called Call Swaption).
- A **fixed rate receiver swaption** (also called Put Swaption).

Uses of Swaptions

(i) It can be **applied** in a variety of ways **for both active traders** as well as **corporate treasurers.**

(ii) Swap traders can **use** them **for speculation purposes** or to hedge a portion of their swap books.

(iii) It have become **useful tools for hedging** embedded optionality which is common to the natural course of many businesses.

(iv) It is **useful to borrowers targeting an acceptable borrowing rate.**

(v) It is also **useful to** those **businesses tendering for contracts.**

(vi) It also **provides protection on callable/puttable bond** issues.

CHAPTER - 13
Business Valuation

Section A – Practical Questions

Market Based Models, Asset Based Models, Income (Earning) Based Models

Question 1

The balance sheet of HK Ltd. is as follows:

	₹'000
Non-Current Assets	1,000
Current Assets	
Trade Receivables	500
Cash and cash equivalents	500
	2,000
Shareholders' funds	800
Long Term Debt	200
Current Liabilities and Provisions	1,000
	2,000

The shares are actively traded and Current Market Price is ₹ 12 per share. Shareholder funds represent 70,000 shares of ₹ 10 each and rest is retained earnings. Calculate the Enterprise Value of HK Ltd.

Answer

Shares outstanding	70,000
Current Market Price (CMP)	₹ 12
Market Capitalization	₹ 8,40,000
Add: Debt	₹ 2,00,000
Less: Cash & Cash equivalents	(₹ 5,00,000)
Enterprise Value (EV)	**₹ 5,40,000**

Question 2

Snake Ltd. is taking over Lizard Ltd, both are listed companies. The PE Ratio of Lizard Ltd. has been low as 4 and high as 7 and is currently 5. Lizard Ltd.'s previous year EPS was ₹ 3.40 and current expected EPS this year to be ₹ 4.00. Determine the different range of values of shares using P/E Ratio Model.

Answer

The range of values using P/E Ratio and EPS either historic or projected are as follows:

EPS	Value (₹)	P/E Ratio	Value	Value of Shares
Historic	3.40	Lowest	4	13.60
Historic	3.40	Current	5	17.00
Historic	3.40	Highest	7	23.80
Expected	4.00	Lowest	4	16.00
Expected	4.00	Current	5	20.00
Expected	4.00	Highest	7	28.00

Question 3

Sun Ltd. recently made a profit of ₹ 200 crore and paid out ₹ 80 crore (slightly higher than the average paid in the industry to which it pertains). The average PE ratio of this industry is 9. The estimated beta of Sun Ltd. is 1.2. As per Balance Sheet of Sun Ltd., the shareholder's fund is ₹ 450 crore and number of shares is 10 crore. In case the company is liquidated, building would fetch ₹ 200 crore more than book value and stock would realize ₹ 50 crore less.

The other data for the industry is as follows:

Projected Dividend Growth	4%
Risk Free Rate of Return	6%
Market Rate of Return	11%

Calculate the valuation of Sun Ltd. using

(a) P/E Ratio

(b) Dividend Growth Model

(c) Book Value

(d) Net Realizable Value

Note: Present calculations in ₹ crore

Answer

(a) ₹ 200 crore x 9 = ₹ 1,800 crore

(b) K_e = 6% + 1.2 (11% – 6%) = 12%

$$\text{Value of Sun Ltd.} = \frac{80 \text{ crore} \times 1.04}{0.12 - 0.04} = ₹\ 1{,}040 \text{ crore}$$

(c) ₹ 450 crore

(d) ₹ 450 crore + ₹ 200 crore – ₹ 50 crore = ₹ 600 crore

Question 4

ICL is proposing to take over SVL with an objective to diversify. ICL's profit after tax (PAT) is grown @ 18% p.a. and SVL's PAT is grown @ 15% p.a. Both the companies pay dividend regularly.

The summarised Profit & Loss Account of both the companies are as follows: **₹ in Crores**

Particulars	ICL	SVL
Net Sales	4,545	1,500
PBIT	2,980	720
Interest	750	25
Provision for Tax	1,440	445
PAT	790	250
Dividends (D_0)	235	125

The summarised Balance Sheet of both the companies are as follows: **₹ in Crores**

Particulars	ICL		SVL	
Fixed Assets				
Land & Building (Net)	720		190	
Plant & Machinery (Net)	900		350	
Furniture & Fixtures (Net)	30	1,650	10	550
Current Assets		775		580
Less: Current Liabilities				
Creditors	230		130	
Overdrafts	35		10	
Provision for Tax	145		50	
Provision for dividends	60	470	50	240
		1,955		890
Paid up Share Capital (₹ 10 per share)	250		125	
Reserves and Surplus	1,050	1,300	660	785
Borrowing		655		105
Capital Employed		1,955		890

Additional Information:

	ICL	SVL
Market Price Share (₹)	52	75

ICL's Land & Buildings are stated at current prices. SVL's Land & Buildings are revalued three years ago. There has been an increase of 30% per year in the value of Land & Buildings.

ICL's Management wants to determine the premium (%) on the shares over the current market price which can be paid on the acquisition of SVL.

You are required to determine the premium using:

(i) Net Worth (Net Asset Value) adjusted for the current value of Land & Buildings plus estimated average profit after tax (PAT) for the next five years.

(ii) The dividend growth formula (assuming SVL is expected to grow @ 18% each year after merger).

(iii) ICL will push forward which method during the course of negotiations?

Note: Present calculations in ₹ crores and round off upto 2 decimals.

Period (t)	1	2	3	4	5
FVIF (30%, t)	1.300	1.690	2.197	2.856	3.713
FVAF (15%, t)	1.15	2.4725	3.9938	5.7424	7.7537

Answer

(i) Computation of Premium (Net Worth Formula):

	Amount (₹ in Crores)
Total Assets (Fixed assets + Current Assets) = (₹ 550 + ₹ 580)	1,130
Less: Liabilities (Current Liabilities + Borrowings) = (₹ 240 + ₹ 105)	345
Net Asset Value	785
Current Value of Land after growing for three years @ 30% = ₹ 190 x 2.197	417.43
Less: Book Value	190.00
Increase in the Value of land	227.43
Adjusted Net Asset Value (₹ 785 + ₹ 227.43)	1,012.43
Current Profit after Tax @ 15 % for 5 years i.e. ₹ 250 x 7.7537	1,938.43
Average Profit for 1 year = ₹ 1,938.43/5 years	387.69
Total Value of Equity (₹ 1,012.43 + ₹ 387.69)	1,400.12
Total Market Value = No. of shares x MPS = 12.50 crore x ₹ 75	937.50
Premium (Total Value – Market Value)	462.62
Premium (%) = [₹ 462.62/₹ 937.50] x 100	49.35%

(ii) Computation of Premium (Dividend Growth Formula):

Existing Growth Rate	0.15
DPS = ₹ 125 crores/12.50 crore shares	₹ 10
MPS	₹ 75
Cost of Equity [$(D_1/MP) + g$)] = [(₹ 10 x 1.15/75) + 0.15]	0.3033
Expected growth rate after merger	0.18
Expected Market Price [(₹ 10 x 1.18)/(0.3033 – 0.18)]	₹ 95.70
Premium over current market price [(₹ 95.70 – ₹ 75)/₹ 75] x 100	27.60%

(iii) During the course of negotiations, ICL will push forward valuation based on Dividend Growth Method as it will lead to least cash outflow.

Question 5

Eagle Ltd. reported a profit of ₹ 77 lakhs after 30% tax for the financial year 2024-25. An analysis of the

accounts revealed that the income included extraordinary items of ₹ 8 lakhs and an extraordinary loss of ₹ 10 lakhs. The existing operations, except for the extraordinary items, are expected to continue in the future. In addition, the results of the launch of a new product are expected to be as follows:

	₹ in lakhs
Sales	70
Material costs	20
Labour costs	12
Fixed costs	10

You are required to:

(i) Calculate the value of the business, given that the capitalization rate is 14%.

(ii) Determine the market price per equity share, with Eagle Ltd.'s share capital being comprised of 1,00,000 at 13% preference shares of ₹ 100 each and 50,00,000 equity shares of ₹ 10 each and the P/E ratio being 10 times.

Note: Present calculations in ₹ lakh

Answer

(i) Computation of Business Value

		₹ Lakhs	₹ Lakhs
Profit before tax [77/(1 – 0.30)]			110
Less: Extraordinary income			(8)
Add: Extraordinary losses			10
			112
Profit from new product			
Sales		70	
Less: Material costs	20		
Labour costs	12		
Fixed costs	10	(42)	28
			140.00
Less: Taxes @ 30%			42.00
Future Maintainable Profit after taxes			98.00
Relevant Capitalisation Factor			0.14
Value of Business (₹ 98/0.14)			700

(ii) Determination of Market Price of Equity Share

Future maintainable profits (After Tax)	₹ 98,00,000
Less: Preference share dividends 1,00,000 shares of ₹ 100 @ 13%	₹ 13,00,000
Earnings available for Equity Shareholders	₹ 85,00,000

No. of Equity Shares	50,00,000
Earnings per share (₹ 85,00,000/50,00,000)	₹ 1.70
PE ratio	10
Market price per share	₹ 17

Question 6

H Ltd. agrees to buy over the business of B Ltd. effective 1st April, 2025. The summarized Balance Sheets of H Ltd. and B Ltd. as on 31st March, 2025 are as follows:

Balance sheet as at 31st March, 2025 **(in Crores of Rupees)**

Particulars	**H Ltd.**	**B Ltd.**
Liabilities		
Paid up Share Capital		
Equity Shares of ₹ 100 each	350.00	–
Equity Shares of ₹ 10 each	–	6.50
Reserve & Surplus	950.00	25.00
Total	**1,300.00**	**31.50**
Assets		
Net Fixed Assets	220.00	0.50
Net Current Assets	1,020.00	29.00
Deferred Tax Assets	60.00	2.00
Total	**1,300.00**	**31.50**

H Ltd. proposes to buy out B Ltd. and the following information is provided to you as part of the scheme of buying:

(1) The weighted average post tax maintainable profits of H Ltd. and B Ltd. for the last 4 years are ₹ 300 crores and ₹ 10 crores respectively.

(2) Both the companies envisage a capitalization rate of 8%.

(3) H Ltd. has a contingent liability of ₹ 300 crores as on 31st March, 2025.

(4) H Ltd. to issue shares of ₹ 100 each to the shareholders of B Ltd. in terms of the exchange ratio as arrived on a Fair Value basis. (Please consider weights of 1 and 3 for the value of shares arrived on Net Asset basis and Earnings capitalization method respectively for both H Ltd. and B Ltd.)

You are required to arrive at the value per share of both H Ltd. and B Ltd. under:

(i) Net Asset Value Method

(ii) Earnings Capitalisation Method

(iii) Exchange ratio of shares of H Ltd. to be issued to the shareholders of B Ltd. on a Fair value basis (taking into consideration the assumption mentioned in point 4 above)

Note: Present calculations in ₹ crore

Answer

(i) Net asset value

H Ltd.	₹ 1,300 Crores – ₹ 300 Crores / 3.50 Crores	= ₹ 285.71
B Ltd.	₹ 31.50 Crores / 0.65 Crores	= ₹ 48.46

Note: It has been assumed that the contingent liability will materialize at its full amount.

(ii) Earning capitalization value

H Ltd.	₹ 300 Crores/0.08 / 3.50 Crores	= ₹ 1071.43
B Ltd.	₹ 10 Crores/0.08 / 0.65 Crores	= ₹ 192.31

(iii) Fair value

H Ltd.	₹ 285.71 x 1 + ₹ 1071.43 x 3 / 4	= ₹ 875
B Ltd.	₹ 48.46 x 1 + ₹ 192.31 x 3 / 4	= ₹ 156.3475
Exchange ratio	₹ 156.3475 / ₹ 875	= 0.1787

H Ltd should issue its 0.1787 share for each share of B Ltd.

Cash Flow Based Models

Question 7

Following information are available in respect of XYZ Ltd. which is expected to grow at a higher rate for 4 years after which growth rate will stabilize at a lower level:

Base year information:	
Revenue	₹ 2,000 crores
EBIT	₹ 300 crores
Capital expenditure	₹ 280 crores
Depreciation	₹ 200 crores

Information for high growth and stable growth period are as follows:

	High Growth	**Stable Growth**
Growth in Revenue & EBIT	20%	10%
Growth in capital expenditure and depreciation	20%	Capital expenditure are offset by depreciation

Risk free rate	10%	9%
Equity beta	1.15	1
Market risk premium	6%	5%
Pre tax cost of debt	13%	12.86%
Debt equity ratio	1:1	2:3

For all time, working capital is 25% of revenue and corporate tax rate is 30%.

What is the value of the firm?

Note: Present all calculations in ₹ crore

Answer

High growth phase:

$k_e = 0.10 + 1.15 \times 0.06 = 0.169$ or 16.9%

$k_d = 0.13 \times (1 - 0.3) = 0.091$ or 9.1%

Cost of capital = $0.5 \times 0.169 + 0.5 \times 0.091 = 0.13$ or 13%

Stable growth phase:

$k_e = 0.09 + 1.0 \times 0.05 = 0.14$ or 14%

$k_d = 0.1286 \times (1 - 0.3) = 0.09$ or 9%

Cost of capital = $0.6 \times 0.14 + 0.4 \times 0.09 = 0.12$ or 12%

Determination of forecasted Free Cash Flow of the Firm (FCFF) **(₹ in crores)**

	Year 1	Year 2	Year 3	Year 4	Terminal Year
Revenue	2,400	2,880	3,456	4,147.20	4,561.92
EBIT	360	432	518.40	622.08	684.29
NOPAT	252	302.40	362.88	435.46	479.00
Capital Exp. – Dep.	(96)	(115.20)	(138.24)	(165.89)	–
Δ Working Capital	(100.00)	(120.00)	(144.00)	(172.80)	(103.68)
	56.00	67.20	80.64	96.77	375.32

Present Value (PV) of FCFF during the explicit forecast period is:

FCFF (₹ in crores)	PVF @ 13%	PV (₹ in crores)
56.00	0.885	49.56
67.20	0.783	52.62
80.64	0.693	55.88
96.77	0.613	59.32
		₹ 217.38

Terminal Value of Cash Flow = $\frac{375.32}{0.12 - 0.10}$ = ₹ 18,766.00 Crores

PV of the terminal value is:

$= ₹\ 18,766.00\ \text{Crores} \times \frac{1}{(1.13)^4} = ₹\ 18,766.00\ \text{Crore} \times 0.613 = ₹\ 11,503.56\ \text{Crore}$

The value of the firm is:

= ₹ 217.38 crore + ₹ 11,503.56 crore = ₹ 11,720.94 crore

Question 8

Following information is given in respect of WXY Ltd., which is expected to grow at a rate of 20% p.a. for the next three years, after which the growth rate will stabilize at 8% p.a. normal level, in perpetuity.

	For the year ended March 31, 2025
Revenues	₹ 7,500 Crores
Cost of Goods Sold (COGS)	₹ 3,000 Crores
Operating Expenses	₹ 2,250 Crores
Capital Expenditure	₹ 750 Crores
Depreciation (included in Operating Expenses)	₹ 600 Crores

During high growth period, Revenues & Earnings before Interest & Tax (EBIT) will grow at 20% p.a. and capital expenditure net of depreciation will grow at 15% p.a. From year 4 onwards, i.e. normal growth period, Revenues and EBIT will grow at 8% p.a. and incremental capital expenditure will be offset by the depreciation. During both high growth & normal growth period, net working capital requirement will be 25% of revenues.

The Weighted Average Cost of Capital (WACC) of WXY Ltd. is 15%.

Corporate Income Tax rate will be 30%.

Estimate the value of WXY Ltd. using Free Cash Flows to Firm (FCFF) & WACC methodology.

The PVIF @ 15 % for the three years are as below:

Year	t_1	t_2	t_3
PVIF	0.8696	0.7561	0.6575

Note: Present all calculations in ₹ crore

Answer

Determination of forecasted Free Cash Flow of the Firm (FCFF) **(₹ in crores)**

	Year 1	**Year 2**	**Year 3**	**Terminal Year**
Revenue	9,000.00	10,800.00	12,960.00	13,996.80
COGS	(3,600.00)	(4,320.00)	(5,184.00)	(5,598.72)
Operating Expenses excl. Dep.	(1,980.00)	(2,376.00)	(2,851.20)	(3,079.30)
Depreciation	(720.00)	(864.00)	(1,036.80)	(1,119.74)
EBIT	2,700.00	3,240.00	3,888.00	4,199.04

Tax @ 30%	(810.00)	(972.00)	(1,166.40)	(1,259.71)
NOPAT	1,890.00	2,268.00	2,721.60	2,939.33
Capital Exp. – Dep.	(172.50)	(198.38)	(228.13)	–
Δ Working Capital	(375.00)	(450.00)	(540.00)	(259.20)
Free Cash Flow (FCF)	1,342.50	1,619.62	1,953.47	2,680.13

Present Value (PV) of FCFF during the explicit forecast period is:

FCFF (₹ in crores)	PVF @ 15%	PV (₹ in crores)
1,342.50	0.8696	1,167.44
1,619.62	0.7561	1,224.59
1,953.47	0.6575	1,284.41
		3,676.44

PV of the terminal value is:

$= \frac{2,680.13}{0.15 - 0.08} \times \frac{1}{(1.15)^3}$ = ₹ 38,287.57 Crore x 0.6575 = ₹ 25,174.08 Crore

The value of the firm is:

= ₹ 3,676.44 Crores + ₹ 25,174.08 Crores = ₹ 28,850.52 Crores

Question 9

BRS Inc deals in computer and IT hardware and peripherals. The expected revenue for the next 8 years is as follows:

Years	Sales Revenue (₹ Million)
1	8
2	10
3	15
4	22
5	30
6	26
7	23
8	20

Summarized financial position relating to the year which has just ended was as follows:

Liabilities	Amount (₹ Million)	Assets	Amount (₹ Million)
Equity Stocks	12	Fixed Assets (Net)	17
12% Bonds	8	Current Assets	3
	20		20

Additional Information:

(a) Its variable expenses is 40% of sales revenue and fixed operating expenses (cash) are estimated to be as follows:

Period	Amount (₹ Million)
1-4 years	1.6
5-8 years	2

(b) An additional advertisement and sales promotion campaign shall be launched requiring expenditure as per following details:

Period	Amount (₹ Million)
1 year	0.50
2-3 years	1.50
4-6 years	3.00
7-8 years	1.00

(c) Fixed assets are subject to depreciation at 15% as per WDV method.

(d) The company has planned additional capital expenditures (in the beginning of each year) for the coming 8 years as follows:

Period	Amount (₹ Million)
1	0.50
2	0.80
3	2.00
4	2.50
5	3.50
6	2.50
7	1.50
8	1.00

(e) Working Capital requirement is estimated to be 20% of Revenue.

(f) Applicable tax rate for the company is 30%.

(g) Cost of Equity is estimated to be 16.07%.

(h) The Free Cash Flow of the firm is expected to grow at 5% per annum after 8 years.

With above information you are require to determine the:

(i) Value of Firm

(ii) Value of Equity

Note: Present calculations in ₹ million and round off upto 2 decimal points.

Year	1	2	3	4	5	6	7	8
PVF @ 13%	0.885	0.783	0.693	0.613	0.543	0.480	0.425	0.376

Answer

Working Notes:

(a) Determination of Weighted Average Cost of Capital

Sources of funds	Cost (%)	Proportions	Weights	Weighted Cost (%)
Equity Stock	16.07	12/20	0.60	9.64
12% Bonds	12% (1 – 0.30) = 8.40	8/20	0.40	3.36
				13

(b) Schedule of Depreciation ₹ Million

Year	Opening Fixed Assets	Addition during the year	Total	Depreciation @ 15%
1	17.00	0.50	17.50	2.63
2	14.87	0.80	15.67	2.35
3	13.32	2.00	15.32	2.30
4	13.02	2.50	15.52	2.33
5	13.19	3.50	16.69	2.50
6	14.19	2.50	16.69	2.50
7	14.19	1.50	15.69	2.35
8	13.34	1.00	14.34	2.15

(c) Determination of Change in Working Capital ₹ Million

Year	WC (Current Assets) Requirement [20% of Revenue]	Increase/(Decrease) in WC
0	3.00 (given)	
1	1.60	(1.40)
2	2.00	0.40
3	3.00	1.00
4	4.40	1.40
5	6.00	1.60
6	5.20	(0.80)
7	4.60	(0.60)
8	4.00	(0.60)

(d) Determination of Present Value of Cash Inflows ₹ Million

Particulars	Years							
	1	2	3	4	5	6	7	8
Revenue	8.00	10.00	15.00	22.00	30.00	26.00	23.00	20.00
Variable Costs	(3.20)	(4.00)	(6.00)	(8.80)	(12.00)	(10.40)	(9.20)	(8.00)
Fixed operating cost	(1.60)	(1.60)	(1.60)	(1.60)	(2.00)	(2.00)	(2.00)	(2.00)

Advertisement Cost	(0.50)	(1.50)	(1.50)	(3.00)	(3.00)	(3.00)	(1.00)	(1.00)
Depreciation	(2.63)	(2.35)	(2.30)	(2.33)	(2.50)	(2.50)	(2.35)	(2.15)
EBIT	0.07	0.55	3.60	6.27	10.50	8.10	8.45	6.85
Taxes @ 30%	(0.02)	(0.16)	(1.08)	(1.88)	(3.15)	(2.43)	(2.53)	(2.06)
NOPAT	0.05	0.39	2.52	4.39	7.35	5.67	5.92	4.79
Depreciation	2.63	2.35	2.30	2.33	2.50	2.50	2.35	2.15
Capital Expenditure	(0.50)	(0.80)	(2.00)	(2.50)	(3.50)	(2.50)	(1.50)	(1.00)
Change in WC	1.40	(0.40)	(1.00)	(1.40)	(1.60)	0.80	0.60	0.60
Free Cash Flow	3.58	1.54	1.82	2.82	4.75	6.47	7.37	6.54
PVF @ 13%	0.885	0.783	0.693	0.613	0.543	0.480	0.425	0.376
PV	3.17	1.21	1.26	1.73	2.58	3.11	3.13	2.46

Total present value = ₹ 18.65 million

(e) Determination of Present Value of Continuing Value (CV)

$$CV = \frac{FCFF_9}{k-g} = \frac{₹\ 6.54 \text{ million } (1.05)}{0.13 - 0.05} = \frac{₹\ 6.87}{0.08} = ₹\ 85.88 \text{ million}$$

Present Value of Continuing Value (CV) = ₹ 85.88 million x PVF (13%, 8)

= ₹ 85.88 million x 0.376 = ₹ 32.29 million

(i) Value of Firm

	₹ Million
Present Value of cash flow during explicit period	18.65
Present Value of Continuing Value	32.29
Total Value	**50.94**

(ii) Value of Equity

	₹ Million
Total Value of Firm	50.94
Less: Value of Debt	8.00
Value of Equity	**42.94**

Question 10

Mr. X, a financial analyst, intends to value the business of PQR Ltd. in terms of the future cash generating capacity. He has projected the following after tax cash flows:

Year:	1	2	3	4	5
Cash flows (₹ in lakh)	1,760	480	640	860	1,170

The Terminal Value of perpetual cash flow is estimated to be ₹ 92,340 lakh at the end of the 5th year.

Required:

(i) What is the value of the firm in terms of expected future cash flows, if the cost of capital of the firm is 20%.

(ii) The firm has outstanding debts of ₹ 3,620 lakh. Calculate the shareholder value per share if the number of outstanding shares is 151.50 lakh.

(iii) The firm has received a takeover bid from XYZ ltd. of ₹ 225 per share. Is it a good offer?

[Given: PVIF at 20% for Year 1 to Year 5: 0.833, 0.694, 0.579, 0.482, 0.402]

Note: Present all calculations in ₹ lakh

Answer

(i) Value of Firm

Year	Cash Flow (₹ in lakhs)	PVF	PV (₹ in lakhs)
1	1,760	0.833	1,466.08
2	480	0.694	333.12
3	640	0.579	370.56
4	860	0.482	414.52
5	1,170	0.402	470.34
PV of Cash flows upto year 5			3,054.62

Now, PV of Terminal Value = ₹ 92,340 x 0.402 = ₹ 37,120.68 Lakhs

So, Present Value of the firm = ₹ 3,054.62 + ₹ 37,120.68 = ₹ 40,175.30 Lakhs

(ii) Value per share

= (Value of Firm – Value of Debt)/No of shares

= (40,175.30 – 3,620)/151.50 = ₹ 241.29

(iii) Takeover bid of ₹ 225 per share seems to be not a good offer as it is lesser than the intrinsic value i.e. value per share of ₹ 241.29.

Question 11

The valuation of Hansel Limited has been done by an investment analyst. Based on an expected free cash flow of ₹ 54 lakhs for the following year and an expected growth rate of 9%, the analyst has estimated the value of Hansel Limited to be ₹ 1,800 lakhs. However, he committed a mistake of using the book values of debt and equity.

The book value weights employed by the analyst are not known, but you know that Hansel Limited has a cost of equity of 20% and post tax cost of debt of 10%.

The market value of equity is thrice its book value, whereas the market value of its debt is nine-tenths of its book value. What is the correct value of Hansel Ltd?

Note: Present calculations in ₹ lakh

Answer

Cost of capital by applying Free Cash Flow to Firm (FCFF) Model is as follows:

$$\text{Value of Firm} = V_0 = \frac{FCFF_1}{K_c - g_n}$$

Where

$FCFF_1$ = Expected FCFF in the year 1

K_c = Cost of capital

g_n = Growth rate forever

$$\text{Thus, ₹ 1,800 lakhs} = \frac{₹\ 54 \text{ lakhs}}{K_c - g_n}$$

Since g = 9%, then K_c = 12%

Now, let 'x' be the weight of debt and given cost of equity = 20% and cost of debt = 10%, then

20% (1 – x) + 10% x = 12%

Hence, x = 0.80, so book value weight for debt was 80%

∴ Correct weight should be 60 of equity and 72 of debt.

∴ Correct cost of capital (K_c) = 20% (60/132) + 10% (72/132) = 14.54%

$$\text{And correct firm's value} = \frac{₹\ 54 \text{ lakhs}}{0.1454 - 0.09} = ₹\ 974.73 \text{ lakhs}$$

Question 12

Calculate the value of share from the following information relating to the year which has just ended:

Profit after tax of the company	₹ 290 crores
Equity share capital of company	₹ 1,300 crores
Par value of share	₹ 40 each
Debt ratio of company [Debt/(Debt + Equity)]	27%
Long run growth rate of the company	8%
Beta of Equity	0.1
Risk free interest rate	8.7%
Market return	10.3%
Capital expenditure per share	₹ 47
Depreciation per share	₹ 39
Change (Increase) in Working capital per share	₹ 3.45

Note: Calculations to be done in 4 decimals and round off value of share upto 2 decimals.

Answer

$$\text{No. of Shares} = \frac{₹\ 1{,}300 \text{ crores}}{₹\ 40} = 32.5 \text{ Crores}$$

$$EPS = \frac{PAT}{No.\ of\ shares}$$

$$EPS = \frac{₹\ 290\ crores}{32.5\ crores} = ₹\ 8.9231$$

FCFE = Net income – [(1 – b) (capex – dep) + (1 – b) (Change in WC)]

FCFE = 8.9231 – [(1 – 0.27) (47 – 39) + (1 – 0.27) (3.45)]

= 8.9231 – [5.84 + 2.5185] = 0.5646

Cost of Equity = $R_f + ß\ (R_m - R_f)$

= 8.7 + 0.1 (10.3 – 8.7) = 8.86%

$$P_0 = \frac{FCFE\ (1+g)}{K_e - g} = \frac{0.5646\ (1.08)}{0.0886 - 0.08} = \frac{0.6098}{0.0086} = ₹\ 70.91$$

Question 13

ABC Company is considering acquisition of XYZ Ltd. which has 1.5 crores shares outstanding and issued. The market price per share is ₹ 400 at present. ABC's average cost of capital is 12%. Available information from XYZ indicates its expected cash accruals for the next 3 years as follows:

Year	₹ in Crore
1	250
2	300
3	400

Calculate the range of valuation (Value of equity per share and in total from the given methods) that ABC has to consider. (PV factors at 12% for years 1 to 3 respectively: 0.893, 0.797 and 0.712).

Note: Present calculations in ₹ crore

Answer

Valuation Based on Market Price

Market Price per share = ₹ 400

Thus, value of total equity is (₹ 400 x 1.5 crore) = ₹ 600 Crore

Valuation Based on Discounted Cash Flow

PV of cash flows = ₹ 250 crore x 0.893 + ₹ 300 crore x 0.797 + ₹ 400 crore x 0.712 = ₹ 747.15 Crore

Value of per share (₹ 747.15 crore/1.5 crore) = ₹ 498.10 per share

Range of Valuation

	Per Share (₹)	Total (₹ Crore)
Minimum	400.00	600.00
Maximum	498.10	747.15

Question 14

AB Ltd., is planning to acquire and absorb the running business of XY Ltd. The valuation is to be based on the recommendation of merchant bankers and the consideration is to be discharged in the form of equity shares to be issued by AB Ltd. As on 31.3.2025, the paid up capital of AB Ltd. consists of 80 lakhs shares of ₹ 10 each. The highest and the lowest market quotation during the last 6 months were ₹ 570 and ₹ 430. For the purpose of the exchange, the price per share is to be reckoned as the average of the highest and lowest market price during the last 6 months ended on 31.3.25.

XY Ltd.'s Balance Sheet as at 31.3.2025 is summarised below:

	₹ lakhs
Sources	
Share Capital	
20 lakhs equity shares of ₹ 10 each fully paid	200
10 lakhs equity shares of ₹ 10 each, ₹ 5 paid	50
Loans	100
	350
Uses	
Fixed Assets (Net)	150
Net Current Assets	200
	350

An independent firm of merchant bankers engaged for the negotiation, have produced the following estimates of cash flows from the business of XY Ltd.:

Year ended	By way of	₹ lakhs
31.3.26	after tax earnings for equity	105
31.3.27	Do	120
31.3.28	Do	125
31.3.29	Do	120
31.3.30	Do	100
	Terminal value estimate	200

It is the recommendation of the merchant banker that the equity of XY Ltd. may be valued on the basis of the average of (i) Aggregate of discounted cash flows at 8% and (ii) Net assets value.

Present value factors at 8% for years:

1-5	0.93	0.86	0.79	0.74	0.68

You are required to:

(i) Calculate the total value of the equity of XY Ltd.

(ii) The number of shares to be issued by AB Ltd.; and

(iii) The basis of allocation of the shares among the shareholders of XY Ltd.

Note: Present calculations in ₹ lakh

Answer

(i)

Value of equity of XY Ltd. based on future cash flow capitalization [(105 x 0.93) + (120 x 0.86) + (125 x 0.79) + (120 x 0.74) + (100 x 0.68) + (200 x 0.68)]	₹ 592.40 lakhs
Value of equity of XY Ltd. based on net assets (150 + 200 – 100)	₹ 250.00 lakhs
Average value [(592.40 + 250)/2]	₹ 421.20 lakhs

(ii) Price per share of AB Ltd. for determination of number of shares to be issued:

= (₹ 570 + ₹ 430)/2

= ₹ 500

No. of shares in AB Ltd to be issued = ₹ 4,21,20,000/₹ 500 = 84,240 shares

(iii) Basis of allocation of shares

Fully paid equivalent shares in XY Ltd. (20 lakhs + 5 lakhs)	25 lakh shares
Distribution to fully paid shareholders (84,240 x 20/25)	67,392 shares
Distribution to partly paid shareholders (84,240 – 67,392)	16,848 shares

Question 15

ABC Co. is considering a new sales strategy. They want to know the value of the new strategy. Following information relating to the year which has just ended, is available:

Income Statement	₹
Sales	20,000
Gross margin (20%)	4,000
Administration, Selling & distribution expense (10%)	2,000
PBT	2,000
Tax (30%)	600
PAT	1,400
Balance Sheet Information	₹
Fixed Assets	8,000
Current Assets	4,000
Equity	12,000

If it adopts the new strategy, sales will grow at the rate of 20% per year for three years. From 4th year onwards, cash flow will be stabilized. The net profit ratio, Assets turnover ratio and the income tax rate will remain unchanged.

Depreciation will be at 10% of value of net fixed assets at the beginning of the year.

The Company's target rate of return is 15%.

Determine the incremental value due to adoption of the strategy.

Answer

Projected Balance Sheet:

	Year 1	Year 2	Year 3	Terminal Year
Fixed Assets (40% of Sales)	9,600	11,520	13,824	13,824
Current Assets (20% of Sales)	4,800	5,760	6,912	6,912
Total Assets	14,400	17,280	20,736	20,736
Equity	14,400	17,280	20,736	20,736

Projected Cash Flows:

	Year 1	Year 2	Year 3	Terminal Year
Sales	24,000	28,800	34,560	34,560
PBT (10% of Sale)	2,400	2,880	3,456	3,456
PAT (70% of PBT)	1,680	2,016	2,419.20	2,419.20
Depreciation	800	960	1,152	1,382
Addition to Fixed Assets	(2,400)	(2,880)	(3,456)	(1,382)
Increase in Current Assets	(800)	(960)	(1,152)	–
Operating cash flow (FCFF)	(720)	(864)	(1,036.80)	2,419.20

Projected Cash Flows:

Present value of Projected Cash Flows:

Cash Flows	PVF at 15%	PV
–720	0.870	–626.40
–864	0.756	–653.18
–1,036.80	0.658	–682.21
		–1,961.79

Residual Value = 2,419.20/0.15 = 16,128

Present value of Residual value = $16,128/(1.15)^3$ = 16,128 x 0.658 = 10,612.22

Total shareholders' value = 10,612.22 – 1,961.79 = 8,650.43

Pre strategy value = 1,400/0.15 = 9,333.33

∴ Value of strategy = 8,650.43 – 9,333.33 = – 682.90

Conclusion: The strategy is not financially viable.

Relative Valuation Models

Question 16

A Ltd. made a Gross Profit of ₹ 10,00,000 and incurred Indirect Expenses of ₹ 4,00,000. The number of issued Equity Shares is 1,00,000. The company has a Debt of ₹ 3,00,000 and Surplus Funds (Cash) to the

tune of ₹ 5,00,000. The market related details are as follows:

Risk Free Rate of Return	4.5%
Market Rate of Return	12%
β of the Company	0.9

Determine:

(a) Per Share Earning Value of the Company.

(b) Equity Value of the company if applicable EBITDA multiple is 5. (Assume Profit as EBITDA)

Note: Present calculations in ₹'000

Answer

(a) Capitalization Rate using CAPM = 4.5% + 0.9 (12% – 4.5%) = 11.25%

Calculation of Earning Value Per Share

	(₹'000)
Gross Profit	1,000
Less: Indirect Expenses	(400)
Profit	600
Earning Value of Company (600/0.1125)	5,333.33
Number of Shares	1,00,000
Earning Value Per Share	₹ 53.33

(b) Equity Value of Company

	(₹'000)
EBITDA	600
EBITDA Multiple	5
Enterprise Value	3,000
Less: Debt	(300)
Add: Surplus Funds (Cash)	500
Equity Value	3,200

Question 17

There is a privately held company X Pvt. Ltd that is operating into the retail space, and is now scouting for angel investors. The details pertinent to valuing X Pvt. Ltd are as follows:

The company has achieved break even this year and has an EBITDA of ₹ 90. The unleveraged beta based on the industry in which it operates is 1.8, and the average debt to equity ratio is hovering at 40:60. The rate of return provided by risk free liquid bonds is 5%. The EV is to be taken at a multiple of 5 on EBITDA. The accountant has informed that the EBITDA of ₹ 90 includes an extraordinary gain of ₹ 10 for the year, and a potential write off of sales promotion costs of ₹ 20 are still pending.

The internal assessment of rate of market return for the industry is 11%. The FCFs for the next 3 years are as follows:

	Year 1	Year 2	Year 3
Future Cash flows (₹)	100	120	150

The pre-tax cost of debt will be 12%. Assume a tax regime of 30%.

What is the potential value to be placed on X Pvt. Ltd using following methods?

(i) EBITDA Multiple Method

(ii) FCFF Method

Answer

(i) The adjusted EBITDA would be = ₹ 90 – ₹ 10 – ₹ 20 = ₹ 60

The EV will be multiple of 5 on ₹ 60 obtained above = ₹ 300

(ii) The levered beta of the company will be = 1.8 [1 + (1 – 0.3) x (40/60)] = 2.64

The Cost of equity in accordance with CAPM = $R_f + \beta (R_m - R_f)$

= 5% + 2.64 (11% – 5%) = 20.84%

The WACC = Cost of Equity + Cost of Debt

= 20.84 (60/100) + 12.0 (1 – 0.3) (40/100) = 15.86%

Finally, the future cash flows can be discounted at the WACC obtained above as under

	Year 1	Year 2	Year 3
Future Cash flows (₹)	100	120	150
Discount factor	0.863	0.745	0.643
PVs of cash flows (₹)	86.30	89.40	96.45
Value of the Firm = ₹ 86.30 + ₹ 89.40 + ₹ 96.45 = ₹ 272.15			

Question 18

XY Ltd., a Cement manufacturing Company has hired you as a financial consultant of the company. The Cement Industry has been very stable for some time and the cement companies SK Ltd. & AS Ltd. are similar in size and have similar product market mix characteristic. Use comparable method to value the equity of XY Ltd. In performing analysis, use the following ratios:

(i) Market to book value

(ii) Market to replacement cost

(iii) Market to sales

(iv) Market to Net Income

The following data are available for your analysis:

	SK Ltd. (₹)	AS Ltd. (₹)	XY Ltd. (₹)
Market Value	450	400	

Book Value	400	300	250
Replacement Cost	600	550	500
Sales	550	450	500
Net Income	18	16	14

Note: Round off ratios upto 3 decimals and value of equity upto 2 decimals.

Answer

Estimation of Ratios

S. No.	Particulars	SK Ltd.	AS Ltd.	Average
(i)	Market to Book Value	450/400 = 1.125	400/300 = 1.333	1.229
(ii)	Market to Replacement Cost	450/600 = 0.750	400/550 = 0.727	0.739
(iii)	Market to Sales	450/550 = 0.818	400/450 = 0.889	0.854
(iv)	Market to Net Income	450/18 = 25	400/16 = 25	25

Application of Ratios to XY Ltd.

S. No.	Particulars	XY Ltd. (₹)	Average	Indicative Value of XY Ltd. (₹)
(i)	Book Value	250	1.229	250 x 1.229 = 307.25
(ii)	Replacement Cost	500	0.739	500 x 0.739 = 369.50
(iii)	Sales	500	0.854	500 x 0.854 = 427.00
(iv)	Net Income	14	25	14 x 25 = 350.00
Average				₹ 363.44

Value of Equity of XY Ltd. according to the comparable method is ₹ 363.44

Question 19

Using the chop-shop approach (or Break-up value approach), assign a value for Cornett GMBH. whose stock is currently trading at a total market price of € 4 million. For Cornett, the accounting data set forth in three business segments: consumer wholesaling, specialty services, and assorted centers. Data for the firm's three segments are as follows:

Business segment	Segment sales	Segment assets	Segment income
Consumer wholesaling	€ 15,00,000	€ 7,50,000	€ 1,00,000
Specialty services	€ 8,00,000	€ 7,00,000	€ 1,50,000
Assorted centers	€ 20,00,000	€ 30,00,000	€ 6,00,000

Industry data for "pure-play" firms have been compiled and are summarized as follows:

Business segment	Capitalization/sales	Capitalization/assets	Capitalization/operating income
Consumer wholesaling	0.75	0.60	10.00

Specialty services	1.10	0.90	7.00
Assorted centers	1.00	0.60	6.00

Answer

Cornett, GMBH. – Break-up valuation

Business Segment	Capital-to-Sales	Segment Sales	Theoretical Values
Consumer wholesaling	0.75	€ 15,00,000	€ 11,25,000
Specialty services	1.10	€ 8,00,000	€ 8,80,000
Assorted centers	1.00	€ 20,00,000	€ 20,00,000
Total value			€ 40,05,000

Business Segment	Capital-to-Assets	Segment Assets	Theoretical Values
Consumer wholesaling	0.60	€ 7,50,000	€ 4,50,000
Specialty services	0.90	€ 7,00,000	€ 6,30,000
Assorted centers	0.60	€ 30,00,000	€ 18,00,000
Total value			€ 28,80,000

Business Segment	Capital-to-Operating Income	Segment Income	Theoretical Values
Consumer wholesaling	10.00	€ 1,00,000	€ 10,00,000
Specialty services	7.00	€ 1,50,000	€ 10,50,000
Assorted centers	6.00	€ 6,00,000	€ 36,00,000
Total value			€ 56,50,000

Average theoretical value = $\frac{40,05,000 + 28,80,000 + 56,50,000}{3}$ = 41,78,333

Average theoretical value of Cornett GMBH. = € 41,78,333

Economic Value Added (EVA) and Market Value Added (MVA)

Question 20

RST Ltd.'s current financial year's income statement reported its net income after tax as ₹ 25,00,000. The applicable corporate income tax rate is 30%.

Following is the capital structure of RST Ltd. at the end of current financial year:

	₹
Debt (Coupon rate = 11%)	40 lakhs
Equity (Share Capital + Reserves & Surplus)	125 lakhs
Invested Capital	165 lakhs

Following data is given to estimate cost of equity capital:

Equity Beta of RST Ltd.	1.36
Risk-free rate i.e. current yield on Govt. bonds	8.5%
Average market risk premium (i.e. Excess of return on market portfolio over risk-free rate)	9%

Required:

(i) Estimate Weighted Average Cost of Capital (WACC) of RST Ltd.; and

(ii) Estimate Economic Value Added (EVA) of RST Ltd.

Answer

(i) Cost of Equity as per CAPM

$k_e = R_f + \beta \times$ Market Risk Premium

$= 8.5\% + 1.36 \times 9\%$

$= 8.5\% + 12.24\% = 20.74\%$

Cost of Debt

$k_d = 11\% (1 - 0.30) = 7.70\%$

$$WACC = k_e \times \frac{E}{E + D} + k_d \times \frac{D}{E + D}$$

$$WACC = 20.74 \times \frac{125}{125 + 40} + 7.70 \times \frac{40}{125 + 40}$$

$= 15.71 + 1.87 = 17.58\%$

(ii) Taxable Income $= ₹ 25,00,000/(1 - 0.30)$

$= ₹ 35,71,429$

Operating Income = Taxable Income + Interest

$= ₹ 35,71,429 + ₹ 4,40,000 = ₹ 40,11,429$

EVA = EBIT (1 – Tax Rate) – [WACC x Invested Capital]

$= ₹ 40,11,429 (1 - 0.30) - [17.58\% \times ₹ 1,65,00,000]$

$= ₹ 28,08,000 - ₹ 29,00,700 = - ₹ 92,700$

Question 21

STR Ltd.'s current financial year's income statement reported its net income after tax as ₹ 50 Crore.

Following is the capital structure of STR Ltd. at the end of current financial year:

	₹
Debt (Coupon rate = 11%)	80 Crore
Equity (Share Capital + Reserves & Surplus)	250 Crore
Invested Capital	330 Crore

Following data is given to estimate cost of equity capital:

Asset Beta of TSR Ltd.	1.11
Risk free Rate of Return	8.5%
Average market risk premium	9%

The applicable corporate income tax rate is 30%.

Estimate Economic Value Added (EVA) of STR Ltd. in ₹ lakh.

Answer

First of all, to calculate Cost of Equity we shall compute the Equity Beta of STR Ltd. as follows:

$$\beta_a = \beta_e \times \frac{E}{E + D\,(1 - t)}$$

$$1.11 = \beta_e \times \frac{250}{250 + 80\,(1 - 0.30)}$$

$$\beta_e = 1.36$$

then we shall compute the Cost of Equity as per CAPM as follows:

$k_e = R_f + \beta$ x Market Risk Premium

$= 8.5\% + 1.36 \times 9\%$

$= 8.5\% + 12.24\% = 20.74\%$

Cost of Debt (k_d) = 11% (1 – 0.30) = 7.70%

$$WACC = k_e \times \frac{E}{E + D} + k_d \times \frac{D}{E + D}$$

$$WACC = 20.74 \times \frac{250}{250 + 80} + 7.70 \times \frac{80}{250 + 80}$$

$= 15.71 + 1.87 = 17.58\%$

Taxable Income = ₹ 50 Crore/(1 – 0.30)

= ₹ 7,142.86 lakhs

Operating Income = Taxable Income + Interest

= ₹ 7,142.86 lakhs + ₹ 880 lakhs = ₹ 8,022.86 lakhs

EVA = EBIT (1 – Tax Rate) – [WACC x Invested Capital]

= ₹ 8,022.86 lakhs (1 – 0.30) – [17.58% x ₹ 330 Crore]

= ₹ 5,616.00 lakhs – ₹ 5,801.40 lakhs = – ₹ 185.40 lakhs

Question 22

With the help of the following information of Jatayu Limited compute the Economic Value Added:

Capital Structure	Equity capital ₹ 160 Lakhs
	Reserves and Surplus ₹ 140 lakhs
	10% Debentures ₹ 400 lakhs
Cost of equity	14%

Financial Leverage	1.5 times
Income Tax Rate	30%

Note: Present calculations in ₹ lakh

Answer

Financial Leverage = PBIT/PBT

1.5 = PBIT/(PBIT – Interest)

1.5 = PBIT/(PBIT – 40)

1.5 (PBIT – 40) = PBIT

1.5 PBIT – 60 = PBIT

1.5 PBIT – PBIT = 60

0.5 PBIT = 60

PBIT = 60/0.5 = ₹ 120 lakhs

NOPAT = PBIT – Tax = ₹ 120 lakhs (1 – 0.30) = ₹ 84 lakhs

Weighted Average Cost of Capital (WACC)

= 14% x (300/700) + (1 – 0.30) x (10%) x (400/700) = 10%

EVA = NOPAT – [WACC x Total Capital]

EVA = ₹ 84 lakhs – 0.10 x ₹ 700 lakhs

EVA = ₹ 14 lakhs

Question 23

The following information is given for 3 companies that are identical except for their capital structure:

	Orange	Grape	Apple
Total invested capital	1,00,000	1,00,000	1,00,000
Debt to invested capital ratio	0.8	0.5	0.2
Shares outstanding	6,100	8,300	10,000
Pre tax cost of debt	16%	13%	15%
Cost of equity	26%	22%	20%
Operating Income (EBIT)	25,000	25,000	25,000

The tax rate is uniform 35% in all cases.

(i) Compute the Weighted average cost of capital for each company.

(ii) Compute the Economic Valued Added (EVA) for each company.

(iii) Based on the EVA, which company would be considered for best investment? Give reasons.

(iv) If the industry PE ratio is 11x, estimate the price for the share of each company.

(v) Calculate the estimated market capitalization for each of the Companies.

Answer

(i) Working for calculation of WACC

	Orange	Grape	Apple
Total debt	80,000	50,000	20,000
Post tax Cost of debt	10.40%	8.45%	9.75%
Equity Fund	20,000	50,000	80,000

WACC

Orange: (10.4 x 0.8) + (26 x 0.2) = 13.52%

Grape: (8.45 x 0.5) + (22 x 0.5) = 15.225%

Apple: (9.75 x 0.2) + (20 x 0.8) = 17.95%

(ii) EVA of companies can be computed as follows:

	Orange	Grape	Apple
WACC	13.52	15.225	17.95
EVA [EBIT (1 – T) – (WACC x Invested Capital)]	2,730	1,025	–1,700

(iii) Orange would be considered as the best investment since the EVA of the company is highest and its weighted average cost of capital is the lowest.

(iv) Estimated Price of each company shares

	Orange	Grape	Apple
EBIT (₹)	25,000	25,000	25,000
Less: Interest (₹)	(12,800)	(6,500)	(3,000)
Taxable Income (₹)	12,200	18,500	22,000
Less: Tax @ 35% (₹)	(4,270)	(6,475)	(7,700)
Net Income (₹)	7,930	12,025	14,300
Shares	6,100	8,300	10,000
EPS (₹)	1.30	1.45	1.43
Stock Price (EPS x PE Ratio) (₹)	14.30	15.95	15.73

Since the three entities have different capital structures they would be exposed to different degrees of financial risk. The PE ratio should therefore be adjusted for the risk factor.

(v) Market Capitalisation

	Orange	Grape	Apple
Estimated Stock Price (₹)	14.30	15.95	15.73
No. of shares	6,100	8,300	10,000
Estimated Market Cap (₹)	87,230	1,32,385	1,57,300

Question 24

Tender Ltd has earned a net profit of ₹ 15 lacs after tax at 30%. Interest cost charged by financial institutions was ₹ 10 lacs. The invested capital is ₹ 95 lacs of which 55% is debt. The company maintains a weighted average cost of capital of 13%. Required

(a) Compute the operating income.

(b) Compute the Economic Value Added (EVA).

(c) Tender Ltd. has 6 lac equity shares outstanding. How much dividend can the company pay before the value of the entity starts declining?

Answer

(a) Taxable Income = ₹ 15 lac/(1 – 0.30)

= ₹ 21,42,857

Operating Income = Taxable Income + Interest

= ₹ 21,42,857 + ₹ 10,00,000

= ₹ 31,42,857

(b) EVA = EBIT (1 – Tax Rate) – [WACC x Invested Capital]

= ₹ 31,42,857 (1 – 0.30) – [13% x ₹ 95,00,000]

= ₹ 22,00,000 – ₹ 12,35,000 = ₹ 9,65,000

(c) EVA Dividend = $\frac{₹\ 9,65,000}{6,00,000}$ = ₹ 1.6083 or ₹ 1.61

Question 25

Delta Ltd.'s current financial year's income statement reports its net income as ₹ 15,00,000. Delta's marginal tax rate is 40% and its interest expense for the year was ₹ 15,00,000. The company has ₹ 1,00,00,000 of invested capital, of which 60% is debt. In addition, Delta Ltd. tries to maintain a Weighted Average Cost of Capital (WACC) of 12.6%.

(i) Compute the operating income or EBIT earned by Delta Ltd. in the current year.

(ii) What is Delta Ltd.'s Economic Value Added (EVA) for the current year?

(iii) Delta Ltd. has 2,50,000 equity shares outstanding. According to the EVA you computed in (ii), how much can Delta pay in dividend per share before the value of the company would start to decrease? If Delta does not pay any dividends, what would you expect to happen to the value of the company?

Answer

(i) Taxable income = Net Income /(1 – 0.40)

Taxable income = ₹ 15,00,000/(1 – 0.40) = ₹ 25,00,000

Again, taxable income = EBIT – Interest

EBIT = Taxable Income + Interest

= ₹ 25,00,000 + ₹ 15,00,000 = ₹ 40,00,000

(ii) EVA = EBIT (1 –T) – [WACC x Invested capital]

= ₹ 40,00,000 (1 – 0.40) – [0.126 x ₹ 1,00,00,000]

= ₹ 24,00,000 – ₹ 12,60,000 = ₹ 11,40,000

(iii) EVA Dividend = $\frac{₹\ 11,40,000}{2,50,000}$ = ₹ 4.56

If Delta Ltd. does not pay a dividend, we would expect the value of the firm to increase because it will achieve higher growth, hence a higher level of EBIT. If EBIT is higher, then all else equal, the value of the firm will increase.

Question 26

Herbal Gyan is a small but profitable producer of beauty cosmetics using the plant Aloe Vera. This is not a high-tech business, but Herbal's earnings have averaged around ₹ 12 lakh after tax, largely on the strength of its patented beauty cream for removing the pimples.

The patent has eight years to run, and Herbal has been offered ₹ 40 lakhs for the patent rights. Herbal's assets include ₹ 20 lakhs of working capital and ₹ 80 lakhs of property, plant, and equipment. The patent is not shown on Herbal's books. Suppose Herbal's cost of capital is 15%. What is its Economic Value Added (EVA)?

Note: Present all calculations in ₹ lakh

Answer

EVA = Income earned – [Cost of capital x Total Investment]

Total Investments

Particulars	**Amount**
Working capital	₹ 20 lakhs
Property, plant, and equipment	₹ 80 lakhs
Patent rights	₹ 40 lakhs
Total	**₹ 140 lakhs**

Cost of Capital = 15%

EVA = ₹ 12 lakh – [0.15 x ₹ 140 lakhs]

= ₹ 12 lakh – ₹ 21 lakh

= – ₹ 9 lakh

Thus, Herbal Gyan has a negative EVA of ₹ 9 lakhs.

Question 27

Constant Engineering Ltd. has developed a high tech product which has reduced the Carbon emission from the burning of the fossil fuel. The product is in high demand. The product has been patented and has a market value of ₹ 100 Crore, which is not recorded in the books. The Net Worth (NW) of Constant Engineering Ltd. is ₹ 200 Crore. Long term debt is ₹ 400 Crore. The product generates a revenue

(Profit) of ₹ 84 Crore. The rate on 365 days Government bond (Debt) is 10% per annum. Market portfolio generates a return of 12% per annum. The stock of the company moves in tandem with the market. Calculate Economic Value added of the company.

Note: Present calculations in ₹ crore

Answer

EVA = Income Earned – [Cost of Capital x Total Investment]

Total Investments

	Amount (₹ Crore)
Net Worth	200.00
Long Term Debts	400.00
Patent Rights	100.00
Total	**700.00**

$$\text{WACC } (k_o) = k_e \times \frac{E}{E+D} + k_d \times \frac{D}{E+D}$$

$$\text{WACC } (k_o) = 12 \times \frac{300}{300+400} + 10 \times \frac{400}{300+400}$$

$$= 5.14\% + 5.71\% = 10.85\%$$

EVA = Profit Earned – [WACC x Invested Capital]

= ₹ 84 crore – [10.85% x ₹ 700 crore]

= ₹ 8.05 crore

Question 28

Fragrance Ltd. has reported a Net Operating Profit after Tax (NOPAT) to Invested Capital as 2.5% plus Weighted Average Cost of Capital (WACC) for the year 31st March 2025. Economic Value added is ₹ 4 crore as on 31st March 2025.

You are required to calculate

(i) The amount of Invested Capital

(ii) NOPAT, if WACC is 10%

Note: Present calculations in ₹ crore

Answer

(i) EVA = NOPAT – [WACC x Invested Capital]

₹ 4 Crore = NOPAT – [WACC x Invested Capital]

₹ 4 Crore = [WACC + 0.025] Invested Capital – [WACC x Invested Capital]

₹ 4 Crore = Invested Capital [0.025]

Invested Capital = ₹ 160 Crore

(ii) NOPAT if WACC is 10%

₹ 4 Crore = NOPAT – 0.10 x ₹ 160 core

NOPAT = ₹ 20 crore

Question 29

Following is the information of M/s. DY Ltd. for the year ending 31/03/2025:

Sales	₹ 1,000 Lakh
Operating Expenses Including Interest	₹ 620 Lakh
8% Debentures	₹ 250 Lakh
Equity Share Capital (Face value of ₹ 10 each)	₹ 250 Lakh
Reserves and Surplus	₹ 250 Lakh
Market Value of DY Ltd.	₹ 900 Lakh
Corporate Tax Rate	30%
Risk free Rate of Return	7%
Market Rate of Return	12%
Equity Beta	1.4

You are required to

(i) Calculate Weighted Average Cost of Capital of DY Ltd.

(ii) Calculate Economic Value Added

(iii) Calculate Market Value Added

Note: Present all calculations in ₹ lakh

Answer

(i) Weighted Average Cost of Capital of DY Ltd.

Cost of Equity as per CAPM

$k_e = R_f + \beta$ x Market Risk Premium

= 7% + 1.4 x [12% – 7%]

= 7% + 7% = 14%

Cost of Debt (k_d) = 8% (1 – 0.30) = 5.60%

$$\text{WACC } (k_o) = k_e \times \frac{E}{E+D} + k_d \times \frac{D}{E+D} = 14.00 \times \frac{500}{750} + 5.60 \times \frac{250}{750}$$

= 9.33% + 1.87% = 11.20%

(ii) Economic Value Added (EVA) of DY Ltd.

	₹ Lakhs	₹ Lakhs
Sales		1,000
Operating Expenses Including Interest	620	

Less: Interest [₹ 250 Lakh x 8%]	(20)	(600)
EBIT		400
Less: Tax @ 30%		(120)
Net Operating Profit after Tax (NOPAT)		280

Calculation of Invested Capital

	₹ Lakhs
Equity Share Capital	250
Reserves & Surplus	250
8% Debentures	250
Total Invested Capital	750

EVA = NOPAT – [WACC x Total Capital]

EVA = ₹ 280 Lakh – 0.1120 x ₹ 750 lakhs

EVA = ₹ 196.00 lakhs

(iii) Determination of Market Value Added (MVA)

	₹ Lakh
Market value of DY Ltd.	900
Less: Invested Capital [₹ 250 Lakh + ₹ 250 Lakh + ₹ 250 Lakh]	(750)
Market Value Added	150

Question 30

Compute EVA of A Ltd. with the following information:

All figure are in ₹ lakh

Profit and Loss Statement		Balance Sheet	
Revenue	1,000	PPE	1,000
Direct Costs	(390)	Current Assets	300
Selling, General & Admin. Exp. (SGA)	(200)		**1,300**
EBIT	**410**	Equity	700
Interest	(10)	Reserves	100
EBT	**400**	Long Term Borrowings	100
Tax Expense	(120)	Current Liabilities & Provisions	400
EAT	**280**		**1,300**

Assume Bad Debts provision of ₹ 20 lakh is included in the SGA, and same amount is reduced from the trade receivables in current assets.

Also assume that the pre-tax Cost of Debt is 12%, Tax Rate is 30% and Cost of Equity (i.e. shareholder's

expected return) is 8.45%.

Also calculate MVA, if current market value of the firm is ₹ 1,000 lakh.

Note: Present all calculations in ₹ lakh

Answer

Computation of NOPAT

Particulars	₹ in lakh
EBIT	410
Less: Taxes	(123)
Add: Non-Cash Expenses	20
	307

Computation of Invested Capital

Particulars	₹ in lakh
Total Assets	1,300
Less: Current Liabilities	(400)
	900
Add: Non-Cash Expenses	20
	920

Computation of WACC

WACC = Cost of equity + Cost of debt

In this case, WACC = [(800/900) x 8.45%] + [(100/900) x 12% (1 – 0.30)] = 8.44%

Computation of Capital Charge

Capital Charge = Invested Capital x WACC = ₹ 920 lakh x 8.44% = ₹ 77.65 lakh

EVA = Adjusted NOPAT – Capital Charge = ₹ 307 lakh – ₹ 77.65 lakh = ₹ 229.35 lakh

MVA = Current Market Value of the firm – Invested Capital = ₹ 1,000 lakh – ₹ 920 lakh = ₹ 80 lakh

Question 31

The following data pertains to XYZ Inc. engaged in software consultancy business as on 31st December 2025

Statement of Profit & Loss **($ Million)**

Particulars	Amount
Income from consultancy	935.00
EBIT	180.00
Less: Interest on Loan	(18.00)
EBT	162.00

Less: Tax @ 35%	(56.70)
	105.30

Balance Sheet **($ Million)**

Liabilities	Amount	Assets		Amount
Equity Stock (10 million share @ $ 10 each)	100	Land and Building		200
Reserves & Surplus	325	Computers & Softwares		295
Loans	180	Current Assets:		
Current Liabilities	180	Debtors	150	
		Bank	100	
		Cash	40	290
	785			785

With the above information and following assumption, you are required to compute

(a) Economic Value Added

(b) Market Value Added

Assuming that:

(i) WACC is 12%

(ii) The share of company currently quoted at $ 50 each

Note: Present all calculations in $ million

Answer

(a) Determination of Economic value added (EVA)

Particulars	$ Million
EBIT	180.00
Less: Taxes @ 35%	(63.00)
Net Operating Profit after Tax	117.00
Less: Cost of Invested Capital [W. N. 1]	(72.60)
Economic Value Added	44.40

(b) Determination of Market value added (MVA)

Particulars	$ Million
Market value of Equity Stock [W. N. 2]	500
Equity Fund [W. N. 3]	425
Market Value Added	75

Working Notes:

(1) Total Invested Capital

	Equity Stock	$ 100 Million
	Reserve and Surplus	$ 325 Million
	Loan	$ 180 Million
		$ 605 Million
	WACC	12%
	Cost of Invested Capital ($ 605 Million x 12%)	$ 72.60 Million
(2)	Market Price per equity share (A)	$ 50
	No. of equity share outstanding (B)	10 Million
	Market value of equity stock [(A) x (B)]	$ 500 Million
(3)	Equity Fund	
	Equity Stock	$ 100 Million
	Reserves & Surplus	$ 325 Million
		$ 425 Million

Miscellaneous

Question 32

Simple Ltd. and Dimple Ltd. are planning to merge. The total value of the companies is dependent on the fluctuating business conditions. The following information is given for the total value (debt + equity) structure of each of the two companies.

Business Condition	Probability	Simple Ltd. (₹ Lacs)	Dimple Ltd. (₹ Lacs)
High Growth	0.20	820	1,050
Medium Growth	0.60	550	825
Slow Growth	0.20	410	590

The current debt of Dimple Ltd. is ₹ 65 lacs and of Simple Ltd. is ₹ 460 lacs.

Calculate the expected value of debt and equity separately for the merged entity.

Note: Present all calculations in ₹ lacs

Answer

Compute Value of Equity

Simple Ltd. **₹ in Lacs**

	High Growth	Medium Growth	Slow Growth
Debit + Equity	820	550	410
Less: Debt	(460)	(460)	(460)
Equity	360	90	(50)

Since the Company has limited liability, the value of equity cannot be negative, therefore the value of

equity under slow growth will be taken as zero because of insolvency risk and the value of debt is taken at ₹ 410 lacs. The expected value of debt and equity can then be calculated as:

Simple Ltd. **₹ in Lacs**

	High Growth		Medium Growth		Slow Growth		Expected Value
	Prob.	Value	Prob.	Value	Prob.	Value	
Debt	0.20	460	0.60	460	0.20	410	450
Equity	0.20	360	0.60	90	0.20	0	126
		820		550		410	576

Dimple Ltd. **₹ in Lacs**

	High Growth		Medium Growth		Slow Growth		Expected Value
	Prob.	Value	Prob.	Value	Prob.	Value	
Equity	0.20	985	0.60	760	0.20	525	758
Debt	0.20	65	0.60	65	0.20	65	65
		1,050		825		590	823

Expected Values

Equity	₹ in Lacs	Debt	₹ in Lacs
Simple Ltd.	126	Simple Ltd.	450
Dimple Ltd.	758	Dimple Ltd.	65
	884		515

Section B – Theory Questions

Question 1

Relative Valuation is the method to arrive at a 'relative' value using a 'comparative' analysis to its peers or similar enterprises. Elaborate this statement.

OR

Relative Valuation approach is a significant departure from Intrinsic Value approach. Explain.

Answer

Relative Valuation is the **method to arrive at a 'relative' value using a 'comparative' analysis to** its peers or **similar enterprises**. However, increasingly the contemporary **financial analysts are using relative valuation** in conjunction to other approaches **to validate the intrinsic value**.

In practical implementation of fair value within the valuation context, it would be better to identify assets that are similar to the ones held by the acquiree company so that the values can be compared. Trying to get a value that would be the nearest to the market price would mean that the valuation of a particular portfolio, would happen at an agreeable price that fits into the normal distribution.

In one sense, we are indeed using the relative valuation in a limited approach when we speak about expected market returns, or when we are adopting an index-based comparative. The more the asset pricing gets correlated to similar assets in market, more inclusive it gets. Thus, the closer the YTM of the bond to government index of return, more credible it gets when it comes to pricing.

The Relative valuation, **also referred to as 'Valuation by multiples', uses financial ratios to derive at** the desired metric (referred to as the **'multiple') and then compares the same to that of comparable firms**. Comparable firms would mean the ones having similar asset and risk dispositions and assumed to continue to do so over the comparison period. In the process, there may be extrapolations set to the desired range to achieve the target set.

Question 2

Differentiate between EVA and MVA.

Answer

Economic Value Added (EVA)

EVA is **holistic method of evaluating company's financial performance** in terms of its contribution to the society at large. The core concept behind EVA is that a **company generates 'value' only if** there is a **creation of wealth in terms of returns in excess of its cost of capital**. The formula is as below:

EVA = NOPAT – [Invested Capital x WACC] = NOPAT – Capital Charge

Market Value Added (MVA)

MVA means **Current Market Value of the firm minus Invested Capital**. It is an alternative **way to gauge performance efficiencies of an enterprise**, albeit from a market capitalization point of view, the logic being that the market will discount the efforts taken by the management fairly.

Hence, MVA is the true value added that is perceived by the market **while EVA is a derived value added** that is for the more discerning investor.

CHAPTER - 14
Mergers, Acquisitions & Corporate Restructuring

Section A – Practical Questions

Mergers & Acquisitions through Shares Offer

Question 1

The following information is provided relating to the acquiring company E Ltd., and the target company H Ltd:

Particulars	E Ltd.	H Ltd.
Number of shares (Face value ₹ 10 each)	20 Lakhs	15 Lakhs
Market Capitalization	₹ 1,000 Lakhs	₹ 1,500 Lakhs
P/E Ratio (times)	10.00	5.00
Reserves and surplus	₹ 600.00 Lakhs	₹ 330.00 Lakhs
Promoter's Holding (No. of shares)	9.50 Lakhs	10.00 Lakhs

The Board of Directors of both the companies have decided to give a fair deal to the shareholders. Accordingly, the weights are decided as 40%, 25% and 35% respectively for earnings (EPS), book value per share and market price of share of each company for swap ratio.

Calculate the following:

(i) Market price per share, earnings per share and Book Value per share.

(ii) Swap ratio.

(iii) Promoter's holding percentage after acquisition.

(iv) EPS of E Ltd. after acquisitions of H Ltd.

(v) Expected market price per share and market capitalization of E Ltd. after acquisition, assuming P/E ratio of E Ltd. remains unchanged.

(vi) Free float market capitalization of the merged firm.

Note: Present all calculations in lakh upto 2 decimals.

Answer

(i) Calculation of Market price per share, earnings per share and Book Value per share

	E Ltd.	H Ltd.
Market capitalization	₹ 1,000 lakh	₹ 1,500 lakh
No. of shares	20 lakh	15 lakh
Market Price per share	₹ 50	₹ 100
P/E ratio	10	5
EPS	₹ 5	₹ 20
Profit	₹ 100 lakh	₹ 300 lakh

Share capital (A)	₹ 200 lakh	₹ 150 lakh
Reserves and surplus (B)	₹ 600 lakh	₹ 330 lakh
Total (A + B)	₹ 800 lakh	₹ 480 lakh
Book Value per share	₹ 40	₹ 32

(ii) Calculation of Swap Ratio

EPS	4:1 i.e.	4.0 x 40%	1.6
Book value per share	0.8:1 i.e.	0.8 x 25%	0.2
Market price per share	2:1 i.e.	2.0 x 35%	0.7
			2.5

Swap ratio is for every one share of H Ltd., to issue 2.5 shares of E Ltd. Hence, total no. of shares to be issued = 15 lakh x 2.5 = 37.50 lakh shares

(iii) Promoter's holding after acquisition = 9.50 lakh + 25 lakh (10 lakh x 2.5) = 34.50 lakh shares

Promoter's holding % after acquisition = (34.50 lakh/57.50 lakh) x 100 = 60%

(iv) Calculation of EPS after merger

Total No. of shares = 20 lakh + 37.50 lakh = 57.50 lakh

$$\text{EPS} = \frac{\text{Total profit}}{\text{No. of shares}} = \frac{₹\ 100\ \text{lakh} + ₹\ 300\ \text{lakh}}{57.50\ \text{lakh}} = \frac{₹\ 400\ \text{lakh}}{57.50\ \text{lakh}} = ₹\ 6.96$$

(v) Calculation of Market price per share and Market capitalization after merger

Expected market price per share = EPS 6.96 x P/E 10 = ₹ 69.60

Market capitalization = ₹ 69.60 per share x 57.50 lakh shares

= ₹ 4,002 lakh

(vi) Free float market capitalization = ₹ 69.60 per share x (57.50 lakh x 40%) = ₹ 1,600.80 lakh

Question 2

The following information is provided relating to the acquiring company Efficient Ltd. and the target Company Healthy Ltd.

	Efficient Ltd.	**Healthy Ltd.**
No. of shares (F.V. ₹ 10 each)	10.00 lakhs	7.5 lakhs
Market capitalization	₹ 500.00 lakhs	₹ 750.00 lakhs
P/E ratio (times)	10.00	5.00
Reserves and Surplus	₹ 300.00 lakhs	₹ 165.00 lakhs
Promoter's Holding (No. of shares)	4.75 lakhs	5.00 lakhs

Board of Directors of both the Companies have decided to give a fair deal to the shareholders and accordingly for swap ratio the weights are decided as 40%, 25% and 35% respectively for Earnings per share, Book Value per share and Market Price of share of each company:

CHAPTER - 14
Mergers, Acquisitions & Corporate Restructuring

Section A – Practical Questions

Mergers & Acquisitions through Shares Offer

Question 1

The following information is provided relating to the acquiring company E Ltd., and the target company H Ltd:

Particulars	E Ltd.	H Ltd.
Number of shares (Face value ₹ 10 each)	20 Lakhs	15 Lakhs
Market Capitalization	₹ 1,000 Lakhs	₹ 1,500 Lakhs
P/E Ratio (times)	10.00	5.00
Reserves and surplus	₹ 600.00 Lakhs	₹ 330.00 Lakhs
Promoter's Holding (No. of shares)	9.50 Lakhs	10.00 Lakhs

The Board of Directors of both the companies have decided to give a fair deal to the shareholders. Accordingly, the weights are decided as 40%, 25% and 35% respectively for earnings (EPS), book value per share and market price of share of each company for swap ratio.

Calculate the following:

(i) Market price per share, earnings per share and Book Value per share.

(ii) Swap ratio.

(iii) Promoter's holding percentage after acquisition.

(iv) EPS of E Ltd. after acquisitions of H Ltd.

(v) Expected market price per share and market capitalization of E Ltd. after acquisition, assuming P/E ratio of E Ltd. remains unchanged.

(vi) Free float market capitalization of the merged firm.

Note: Present all calculations in lakh upto 2 decimals.

Answer

(i) Calculation of Market price per share, earnings per share and Book Value per share

	E Ltd.	H Ltd.
Market capitalization	₹ 1,000 lakh	₹ 1,500 lakh
No. of shares	20 lakh	15 lakh
Market Price per share	₹ 50	₹ 100
P/E ratio	10	5
EPS	₹ 5	₹ 20
Profit	₹ 100 lakh	₹ 300 lakh

Share capital (A)	₹ 200 lakh	₹ 150 lakh
Reserves and surplus (B)	₹ 600 lakh	₹ 330 lakh
Total (A + B)	₹ 800 lakh	₹ 480 lakh
Book Value per share	₹ 40	₹ 32

(ii) Calculation of Swap Ratio

EPS	4:1 i.e.	4.0 x 40%	1.6
Book value per share	0.8:1 i.e.	0.8 x 25%	0.2
Market price per share	2:1 i.e.	2.0 x 35%	0.7
			2.5

Swap ratio is for every one share of H Ltd., to issue 2.5 shares of E Ltd. Hence, total no. of shares to be issued = 15 lakh x 2.5 = 37.50 lakh shares

(iii) Promoter's holding after acquisition = 9.50 lakh + 25 lakh (10 lakh x 2.5) = 34.50 lakh shares

Promoter's holding % after acquisition = (34.50 lakh/57.50 lakh) x 100 = 60%

(iv) Calculation of EPS after merger

Total No. of shares = 20 lakh + 37.50 lakh = 57.50 lakh

$$\text{EPS} = \frac{\text{Total profit}}{\text{No. of shares}} = \frac{₹\ 100\ \text{lakh} + ₹\ 300\ \text{lakh}}{57.50\ \text{lakh}} = \frac{₹\ 400\ \text{lakh}}{57.50\ \text{lakh}} = ₹\ 6.96$$

(v) Calculation of Market price per share and Market capitalization after merger

Expected market price per share = EPS 6.96 x P/E 10 = ₹ 69.60

Market capitalization = ₹ 69.60 per share x 57.50 lakh shares

= ₹ 4,002 lakh

(vi) Free float market capitalization = ₹ 69.60 per share x (57.50 lakh x 40%) = ₹ 1,600.80 lakh

Question 2

The following information is provided relating to the acquiring company Efficient Ltd. and the target Company Healthy Ltd.

	Efficient Ltd.	**Healthy Ltd.**
No. of shares (F.V. ₹ 10 each)	10.00 lakhs	7.5 lakhs
Market capitalization	₹ 500.00 lakhs	₹ 750.00 lakhs
P/E ratio (times)	10.00	5.00
Reserves and Surplus	₹ 300.00 lakhs	₹ 165.00 lakhs
Promoter's Holding (No. of shares)	4.75 lakhs	5.00 lakhs

Board of Directors of both the Companies have decided to give a fair deal to the shareholders and accordingly for swap ratio the weights are decided as 40%, 25% and 35% respectively for Earnings per share, Book Value per share and Market Price of share of each company:

(i) Calculate the swap ratio and also calculate Promoter's holding % after acquisition.

(ii) What is the EPS of Efficient Ltd. after acquisition of Healthy Ltd.?

(iii) What is the expected market price per share and market capitalization of Efficient Ltd. after acquisition, assuming P/E ratio of Firm Efficient Ltd. remains unchanged.

(iv) Calculate free float market capitalization of the merged firm.

Note: Present all calculations in lakh upto 2 decimals.

Answer

Calculation of Market price per share, earnings per share and Book Value per share

	Efficient Ltd.	Healthy Ltd.
Market capitalization	₹ 500 lakh	₹ 750 lakh
No. of shares	10 lakh	7.5 lakh
Market Price per share	₹ 50	₹ 100
P/E ratio	10	5
EPS	₹ 5	₹ 20
Profit (EPS x No. of shares)	₹ 50 lakh	₹ 150 lakh
Share capital (A)	₹ 100 lakh	₹ 75 lakh
Reserves and surplus (B)	₹ 300 lakh	₹ 165 lakh
Total (A + B)	₹ 400 lakh	₹ 240 lakh
Book Value per share	₹ 40	₹ 32

(i) Calculation of Swap Ratio

EPS	4:1 i.e.	4.0 x 40%	1.6
Book value per share	0.8:1 i.e.	0.8 x 25%	0.2
Market price per share	2:1 i.e.	2.0 x 35%	0.7
			2.5

Swap ratio is for every one share of Healthy Ltd., to issue 2.5 shares of Efficient Ltd.

Hence, total no. of shares to be issued = 7.5 lakh x 2.5 = 18.75 lakh shares

Promoter's holding after acquisition = 4.75 lakh + 12.5 lakh (5 lakh x 2.5) = 17.25 lakh shares

Promoter's holding % after acquisition = (17.25 lakh/28.75 lakh) x 100 = 60%

(ii) Calculation of EPS after merger

Total No. of shares = 10 lakh + 18.75 lakh = 28.75 lakh

Total capital = 100 lakh + 187.5 lakh = ₹ 287.5 lakh

$$EPS = \frac{\text{Total profit}}{\text{No. of shares}} = \frac{₹\ 50\ \text{lakh} + ₹\ 150\ \text{lakh}}{28.75\ \text{lakh}} = \frac{₹\ 200\ \text{lakh}}{28.75\ \text{lakh}} = ₹\ 6.96$$

(iii) Calculation of Market price per share and Market capitalization after merger

Expected market price per share = EPS 6.96 x P/E 10 = ₹ 69.60

Market capitalization = ₹ 69.60 per share x 28.75 lakh shares
= ₹ 2,001 lakh

(iv) Free float of market capitalization = ₹ 69.60 per share x (28.75 lakh x 40%)
= ₹ 800.40 lakh

Question 3

Abhiman Ltd. is a subsidiary of Janam Ltd. and is acquiring Swabhiman Ltd. which is also a subsidiary of Janam Ltd. The following information is given:

	Abhiman Ltd.	Swabhiman Ltd.
% Shareholding of promoter	50%	60%
Share capital	₹ 200 lacs	100 lacs
Free Reserves and surplus	₹ 900 lacs	600 lacs
Paid up value per share	₹ 100	10
Free float market capitalization	₹ 500 lacs	156 lacs
P/E Ratio (times)	10	4

Janam Ltd., is interested in doing justice to both companies. The following parameters have been assigned by the Board of Janam Ltd., for determining the swap ratio:

Book value per share 25%

Earnings per share 50%

Market price per share 25%

You are required to compute

(i) The swap ratio.

(ii) The Book Value Per Share, Earning Per Share and Expected Market Price Per Share of Abhiman Ltd. after acquisition of Swabhiman Ltd. (assuming P/E Ratio of Abhiman remains the same and all assets and liabilities of Swabhiman Ltd. are taken over at book value.)

Note: Calculate swap ratio in 4 decimals and present all other calculations in lacs upto 2 decimals.

Answer

Calculation of Market price per share, earnings per share and Book Value per share

	Abhiman Ltd.	Swabhiman Ltd.
Share capital	₹ 200 lacs	₹ 100 lacs
Free reserves & surplus	₹ 900 lacs	₹ 600 lacs
Total	₹ 1,100 lacs	₹ 700 lacs
No. of shares	2 lacs	10 lacs
Book value per share	₹ 550	₹ 70
Promoters Holding	50%	60%

Non promoters holding (100% – Promoters Holding)	50%	40%
Free float market capitalization (Public)	₹ 500 lacs	₹ 156 lacs
Total Market Capitalization	₹ 1,000 lacs	₹ 390 lacs
No. of shares	2 lacs	10 lacs
Market Price per share	₹ 500	₹ 39
P/E ratio	10	4
EPS	₹ 50.00	₹ 9.75
Profits (EPS x No. of shares)	₹ 100 lacs	₹ 97.50 lacs

(i) Calculation of Swap Ratio

Book Value per share	0.1273:1 i.e.	0.1273 x 25%	0.0318
EPS	0.195:1 i.e.	0.195 x 50%	0.0975
Market Price per share	0.078:1 i.e.	0.078 x 25%	0.0195
			0.1488

Swap Ratio is 0.1488 shares of Abhiman Ltd. for every share of Swabhiman Ltd.

Total No. of shares to be issued = 10 lakh x 0.1488 = 1,48,800 shares

(ii) Calculation of Book Value per share, EPS & Expected Market Price per share after merger

Total No. shares = 2,00,000 + 1,48,800 = 3,48,800

Total capital = ₹ 200 lacs + ₹ 148.80 lacs = ₹ 348.80 lacs

Reserves = ₹ 900 lacs + ₹ 551.20 lacs = ₹ 1,451.20 lacs

$$\text{Book Value Per Share} = \frac{₹\ 348.80\ \text{lacs} + ₹\ 1,451.20\ \text{lacs}}{3,48,800} = ₹\ 516.05$$

$$\text{EPS} = \frac{\text{Total profit}}{\text{No. of shares}} = \frac{₹\ 100\ \text{lacs} + ₹\ 97.50\ \text{lacs}}{3,48,800} = ₹\ 56.62$$

Expected market price per share = EPS x P/E Ratio = ₹ 56.62 x 10 = ₹ 566.20

Question 4

The following information relating to the acquiring Company Abhiman Ltd. and the target Company Abhishek Ltd. are available. Both the Companies are promoted by Multinational Company, Trident Ltd. The promoter's holding is 50% and 60% respectively in Abhiman Ltd. and Abhishek Ltd.:

	Abhiman Ltd.	**Abhishek Ltd.**
Share Capital (₹)	200 lakh	100 lakh
Free Reserve and Surplus (₹)	800 lakh	500 lakh
Paid up Value per share (₹)	100	10
Free float Market Capitalization (₹)	400 lakh	128 lakh
P/E Ratio (times)	10	4

Trident Ltd. is interested to do justice to the shareholders of both the Companies. For the swap ratio weights are assigned to different parameters by the Board of Directors as follows:

Book Value per share	25%
Earnings per share	50%
Market Price per share	25%

(a) What is the swap ratio based on above weights?

(b) What is the Book Value per share, Earnings per share and Expected Market Price per share of Abhiman Ltd. after acquisition of Abhishek Ltd. (assuming P.E. ratio of Abhiman Ltd. remains unchanged and all assets and liabilities of Abhishek Ltd. are taken over at book value).

(c) Calculate promoter's revised holding in the Abhiman Ltd.

(d) Calculate free float market capitalization.

(e) Also calculate No. of Shares, Earnings per Share (EPS) and Book Value per share (BVPS), if after acquisition of Abhishek Ltd., Abhiman Ltd. decided to:

(i) Issue Bonus shares in the ratio of 1:2; and

(ii) Split the stock (share) as ₹ 5 each fully paid.

Note: Present all calculations in lakh upto 2 decimals.

Answer

Calculation of Market price per share, earnings per share and Book Value per share

	Abhiman Ltd.	Abhishek Ltd.
Share Capital	₹ 200 lakh	₹ 100 lakh
Free Reserves	₹ 800 lakh	₹ 500 lakh
Total	₹ 1,000 lakh	₹ 600 lakh
No. of Shares	2 lakh	10 lakh
Book Value per share	₹ 500	₹ 60
Promoter's holding	50%	60%
Non promoter's holding (100% – Promoters Holding)	50%	40%
Free Float Market Capitalization	₹ 400 lakh	₹ 128 lakh
Hence Total market Capitalization	₹ 800 lakh	₹ 320 lakh
No. of Shares	2 lakh	10 lakh
Market Price per share	₹ 400	₹ 32
P/E Ratio	10	4
EPS	₹ 40	₹ 8
Profits (₹ 40 x 2 lakh shares)	₹ 80 lakh	–
(₹ 8 x 10 lakh shares)	–	₹ 80 lakh

(a) Calculation of Swap Ratio

Book Value per share	0.12:1 i.e.	0.12 x 25%	0.03

EPS	0.2:1 i.e.	0.20 x 50%	0.10
Market Price per share	0.08:1 i.e.	0.08 x 25%	0.02
			0.15

Swap ratio is for every one share of Abhishek Ltd., to issue 0.15 shares of Abhiman Ltd.

Hence, Total no. of shares to be issued = 10 lakh x 0.15 = 1.50 lakh shares

(b) Book Value per share, EPS & Market Price per share

Total No. of Shares = 2 lakh + 1.5 lakh = 3.5 lakh

Total Capital = ₹ 200 lakh + ₹ 150 lakh = ₹ 350 lakh

Reserves = ₹ 800 lakh + ₹ 450 lakh = ₹ 1,250 lakh

$$\text{Book Value Per Share} = \frac{₹\ 350\ \text{lakh} + ₹\ 1,250\ \text{lakh}}{3.5\ \text{lakh}} = ₹\ 457.14\ \text{per share}$$

$$\text{EPS} = \frac{\text{Total profit}}{\text{No. of shares}} = \frac{₹\ 80\ \text{lakh} + ₹\ 80\ \text{lakh}}{3.5\ \text{lakh}} = \frac{₹\ 160\ \text{lakh}}{3.5\ \text{lakh}} = ₹\ 45.71$$

Expected Market Price per share = EPS x P/E Ratio = ₹ 45.71 x 10 = ₹ 457.10

(c) Promoter's Revised holding

Abhiman 50% i.e.	1.00 lakh shares
Abhishek 60% i.e.	0.90 lakh shares
Total	1.90 lakh shares

Promoter's revised holding % = (1.90/3.50) x 100 = 54.29%

(d) Free Float Market Capitalization

= (3.5 lakh – 1.9 lakh) x ₹ 457.10

= ₹ 731.36 lakh

(e) Calculation of No. of Shares, EPS and Book Value per share after acquisition

Revised Capital = ₹ 350 lakh + ₹ 175 lakh = ₹ 525 lakh

No. of Shares before Split (Face Value ₹ 100) = 5.25 lakh

No. of Shares after Split (Face Value ₹ 5) = 5.25 lakh x 20 = 105 lakh

$$\text{EPS} = \frac{₹\ 160\ \text{lakh}}{105\ \text{lakh shares}} = ₹\ 1.52$$

$$\text{Book Value Per Share} = \frac{₹\ 525\ \text{lakh} + ₹\ 1,075\ \text{lakh}}{105\ \text{lakh shares}} = ₹\ 15.24\ \text{per share}$$

Question 5

During the audit of the Weak Bank (W), RBI has suggested that the Bank should either merge with another bank or may close down. Strong Bank (S) has submitted a proposal of merger of Weak Bank with itself. For the swap ratio weights are assigned to different parameters and Balance Sheets of both the companies are as under:

Particulars	Weak Bank (W)	Strong Bank (S)	Assigned Weights (%)
Gross NPA (%) [NPA/Advances]	40	5	30
Capital Adequacy Ratio (CAR) [Total Book Value/Risk Weight Asset]	5	16	28
Market price per Share (MPS)	12	96	32
Book value per share			10
Trading on Stock Exchange	Irregular	Frequent	

Balance Sheet **(₹ in Lakhs)**

Particulars	Weak Bank (W)	Strong Bank (S)
Paid up Share Capital (₹ 10 per share)	150	500
Reserves & Surplus	80	5,500
Deposits	4,000	44,000
Other Liabilities	890	2,500
Total Liabilities	**5,120**	**52,500**
Cash in Hand & with RBI	400	2,500
Balance with Other Banks	–	2,000
Investments	1,100	19,000
Advances	3,500	27,000
Other Assets	70	2,000
Preliminary Expenses	50	–
Total Assets	**5,120**	**52,500**

You are required to

(a) Calculate Swap ratio based on the above weights.

(b) Ascertain the number of Shares to be issued to Weak Bank.

(c) Prepare Balance Sheet after merger.

(d) Calculate CAR and Gross NPA of Strong Bank after merger.

Note: Calculate swap ratio in 4 decimals and present all other calculations in lakh upto 2 decimals.

Answer

(a) Swap Ratio

Gross NPA	5:40 i.e.	0.125 x 30%	0.0375
CAR	5:16 i.e.	0.3125 x 28%	0.0875
Market Price	12:96 i.e.	0.125 x 32%	0.0400
Book Value Per Share*	12:120 i.e.	0.1 x 10%	0.0100
			0.1750

Thus, for every share of Weak Bank, 0.1750 share of Strong Bank shall be issued.

*Calculation of Book Value Per Share

Particulars	Weak Bank (W)	Strong Bank (S)
Share Capital (₹ Lakhs)	150	500
Reserves & Surplus (₹ Lakhs)	80	5,500
	230	6,000
Less: Preliminary Expenses (₹ Lakhs)	50	–
Net Worth or Book Value (₹ Lakhs)	180	6,000
No. of Outstanding Shares (Lakhs)	15	50
Book Value Per Share (₹)	12	120

(b) No. of equity shares to be issued

$$= \frac{₹\ 150\ lakh}{₹\ 10} \times 0.1750 = 2.625\ lakh\ shares$$

(c) Balance Sheet after Merger

Calculation of Capital Reserve

Book Value of Shares	₹ 180.00 lakh
Less: Value of Shares issued	₹ 26.25 lakh
Capital Reserve	₹ 153.75 lakh

Balance Sheet

	₹ lakh		₹ lakh
Paid up Share Capital	526.25	Cash in Hand & RBI	2,900.00
Reserves & Surplus	5,500.00	Balance with other banks	2,000.00
Capital Reserve	153.75	Investment	20,100.00
Deposits	48,000.00	Advances	30,500.00
Other Liabilities	3,390.00	Other Assets	2,070.00
	57,570.00		**57,570.00**

(d) Calculation CAR & Gross NPA % of Bank 'S' after merger

$$CAR/CRWAR = \frac{\text{Total Book Value}}{\text{Risky Weighted Assets}}$$

	Weak Bank	Strong Bank	Merged
CAR (Given)	5%	16%	
Total Book Value	₹ 180 lakh	₹ 6,000 lakh	₹ 6,180 lakh
Risky Weighted Assets	₹ 3,600 lakh	₹ 37,500 lakh	₹ 41,100 lakh

$$CAR/CRWAR = \frac{₹\ 6,180\ lakh}{₹\ 41,100\ lakh} = 15.04\%$$

$$\text{GNPA Ratio} = \frac{\text{Gross NPA}}{\text{Gross Advances}} \times 100$$

	Weak Bank	Strong Bank	Merged
GNPA (Given)	40%	5%	
Gross Advances	₹ 3,500 lakh	₹ 27,000 lakh	₹ 30,500 lakh
Gross NPA	₹ 1,400 lakh	₹ 1,350 lakh	₹ 2,750 lakh

$$\text{GNPA} = \frac{₹\ 2,750\ \text{lakh}}{₹\ 30,500\ \text{lakh}} \times 100 = 9.02\%$$

Thus, from above it can be analysed that CAR is slightly reduced from 16% to 15.04%. However, GNPA has been almost doubled.

Question 6

T Ltd. and E Ltd. are in the same industry. The former is in negotiation for acquisition of the latter. Important information about the two companies as per their latest financial statements is given below:

	T Ltd.	E Ltd.
₹ 10 Equity shares outstanding	12 lakhs	6 lakhs
Debt:		
10% Debentures (₹ lakhs)	580	–
12.5% Institutional Loan (₹ lakhs)	–	240
Earnings before interest, depreciation and tax (EBIDAT) (₹ lakhs)	400.86	115.71
Market Price per share (₹)	220.00	110.00

T Ltd. plans to offer a price for E Ltd., business as a whole which will be 7 times EBIDAT reduced by outstanding debt, to be discharged by own shares at market price.

E Ltd. is planning to seek one share in T Ltd. for every 2 shares in E Ltd. based on the market price. Tax rate for the two companies may be assumed as 30%.

Calculate and show the following under both alternatives – T Ltd.'s offer and E Ltd.'s plan:

(i) Net consideration payable.

(ii) No. of shares to be issued by T Ltd.

(iii) EPS of T Ltd. after acquisition.

(iv) Expected market price per share of T Ltd. after acquisition, assuming its PE multiple remains unchanged.

(v) State briefly the advantages to T Ltd. from the acquisition.

Note: Calculations may be rounded off to 2 decimals in lakhs.

Answer

As per T Ltd.'s Offer

	₹ in lakhs
(i) Net Consideration Payable	
7 times EBIDAT (7 x ₹ 115.71 lakh)	809.97
Less: Debt	240.00
	569.97
(ii) No. of shares to be issued by T Ltd.	
₹ 569.97 lakh/₹ 220 (Nos.)	2.59 lakh
(iii) EPS of T Ltd. after acquisition	
Total EBIDAT (₹ 400.86 lakh + ₹ 115.71 lakh)	516.57
Less: Interest (₹ 58 lakh + ₹ 30 lakh)	88.00
	428.57
Less: 30% Tax	128.57
Total earnings (PAT)	300.00
Total no. of shares outstanding (12 lakh + 2.59 lakh)	14.59 lakh
EPS (₹ 300 lakh/14.59 lakh)	₹ 20.56
(iv) Expected Market Price	
Pre-acquisition P/E multiple of T Ltd.:	
EBIDAT	400.86
Less: Interest (580 x 10%)	58.00
	342.86
Less: 30% Tax	102.86
EAT (₹ in lakh)	240.00
No. of shares (lakh)	12.00
EPS	₹ 20.00
Hence, PE multiple (₹ 220/₹ 20)	11
Expected market price after acquisition (₹ 20.56 x 11)	₹ 226.16

As per E Ltd's Plan

	₹ in lakhs
(i) Net consideration payable	
6 lakh shares x ₹ 110	660
(ii) No. of shares to be issued by T Ltd.	
₹ 660 lakh/₹ 220	3 lakh
(iii) EPS of T Ltd. after Acquisition	
PAT (as per earlier calculations)	300.00
Total no. of shares outstanding (12 lakh + 3 lakh)	15 lakh

Earnings Per Share (EPS) (₹ 300 lakh/15 lakh)	₹ 20.00
(iv) Expected Market Price (₹ 20 x 11)	220.00

(v) Advantages of Acquisition to T Ltd.

Since the two companies are in the same industry, the following advantages could accrue:

- Synergy, cost reduction and operating efficiency.
- Better market share.
- Avoidance of competition.

Question 7

Simpson Ltd. is considering a merger with Wilson Ltd. The data below are in the hands of both Board of Directors. The issue at hand is how many shares of Simpson should be exchanged for Wilson Ltd. Both boards are considering three possibilities 20,000, 25,000 and 30,000 shares. You are required to construct a table demonstrating the following in each scheme:

	Simpson Ltd.	Wilson Ltd.	Combined Post merger Firm
Current earnings per year	2,00,000	1,00,000	3,50,000
Shares outstanding	50,000	10,000	?
Earnings per share (₹)	4	10	?
Price per share (₹)	40	100	?
Price earnings ratio	10	10	10
Value of firm (₹)	20,00,000	10,00,000	35,00,000

Answer

The following table demonstrates the EPS & MPS of Post merger firm under the three possible schemes:

Number of Simpson Ltd.'s shares issued to shareholders of Wilson Ltd. (1)	Number of Simpson Ltd.'s shares after merger [50,000 + (1)] (2)	EPS of Post merger firm [₹ 3,50,000/(2)] (3)	MPS of Post merger firm [(3) x 10] (4)
20,000	70,000	5	50
25,000	75,000	4.67	46.70
30,000	80,000	4.38	43.80

Question 8

Company X is contemplating the purchase of Company Y, Company X has 3,00,000 shares having a market price of ₹ 30 per share, while Company Y has 2,00,000 shares selling at ₹ 20 per share. The EPS are ₹ 4.00 and ₹ 2.25 for Company X and Y respectively. Managements of both companies are discussing two alternative proposals for exchange of shares as indicated below:

(a) In proportion to the relative earnings per share of two companies.

(b) 0.5 share of Company X for one share of Company Y (0.5:1).

You are required to:

(i) Calculate the Earnings Per Share (EPS) after merger under both the alternatives.

(ii) Show the impact on EPS for the shareholders of two companies under both the alternatives.

Note: Round off calculations upto 4 decimals

Answer

Working Note:

Calculation of total earnings after merger

Particulars	Company X	Company Y	Total
Outstanding shares	3,00,000	2,00,000	
EPS (₹)	4	2.25	
Total earnings (₹)	12,00,000	4,50,000	16,50,000

(a) (i) Calculation of EPS when exchange ratio is in proportion to relative EPS of two companies

Total earnings after merger = ₹ 16,50,000

Total number of shares after merger = 3,00,000 + (2,00,000 x 2.25/4) = 4,12,500 shares

$$\text{EPS after merger} = \frac{₹\ 16,50,000}{4,12,500} = ₹\ 4.00$$

(ii) Impact of merger on EPS for shareholders of Company X and Company Y

Impact on Shareholders of Company X

	(₹)
EPS before merger	4.00
EPS after merger	4.00
Increase/Decrease in EPS	0.00

Impact on Shareholders of Company Y

	(₹)
EPS before merger	2.25
Equivalent EPS after merger (₹ 4 x 2.25/4)	2.25
Increase/Decrease in EPS	0.00

(b) (i) Calculation of EPS when share exchange ratio is 0.5:1

Total earnings after merger = ₹ 16,50,000

Total number of shares after merger = 3,00,000 + (2,00,000 x 0.5) = 4,00,000 shares

$$\text{EPS after merger} = \frac{₹\ 16,50,000}{4,00,000} = ₹\ 4.125$$

(ii) Impact of merger on EPS for shareholders of Company X and Company Y

Impact on Shareholders of Company X

	(₹)
EPS before merger	4.000
EPS after merger	4.125
Increase in EPS	0.125

Impact on Shareholders of Company Y

	(₹)
EPS before merger	2.2500
Equivalent EPS after merger (₹ 4.125 x 0.5)	2.0625
Decrease in EPS	0.1875

Question 9

B Ltd. is a highly successful company and wishes to expand by acquiring other firms. Its expected high growth in earnings and dividends is reflected in its PE ratio of 17. The Board of Directors of B Ltd. has been advised that if it were to take over firms with a lower PE ratio than its own, using a share-for-share exchange, then it could increase its reported earnings per share. C Ltd. has been suggested as a possible target for a takeover, which has a PE ratio of 10 and 1,00,000 shares in issue with a share price of ₹ 15. B Ltd. has 5,00,000 shares in issue with a share price of ₹ 12.

Calculate the change in earnings per share of B Ltd. if it acquires the whole of C Ltd. by issuing shares at its market price of ₹ 12. Assume the price of B Ltd. shares remains constant.

Answer

Total market value of C Ltd is = 1,00,000 x ₹ 15 = ₹ 15,00,000

PE ratio (given) = 10

Therefore, earnings of C Ltd. are = $\frac{₹\ 15,00,000}{10}$ = ₹ 1,50,000

Total market value of B Ltd. is = 5,00,000 x ₹ 12 = ₹ 60,00,000

PE ratio (given) = 17

Therefore, earnings of B Ltd. are = $\frac{₹\ 60,00,000}{17}$ = ₹ 3,52,941

Number of shares to be issued by B Ltd. = ₹ 15,00,000/12 = 1,25,000

Total number of shares of B Ltd. = 5,00,000 + 1,25,000 = 6,25,000

The EPS of the new firm is = $\frac{₹\ 3,52,941 + ₹\ 1,50,000}{6,25,000}$ = ₹ 0.80

The present EPS of B Ltd. is = $\frac{₹\ 3,52,941}{5,00,000}$ = ₹ 0.71

So, the EPS affirm B will increase from ₹ 0.71 to ₹ 0.80 as a result of merger.

Question 10

X Ltd. is studying the possible acquisition of Y Ltd. by way of merger. The following data are available in respect of both the companies.

Particulars	X Ltd.	Y Ltd.
Market Capitalization (₹)	75,00,000	90,00,000
Gross Profit Ratio	20%	20%
Inventory Turnover Ratio	5 times	4 times
Debtor Turnover Ratio	3 times	5 times
12% Debenture (₹)	10,00,000	–
10% Debenture (₹)	–	14,40,000
No. of Equity Shares	1,00,000	60,000
Operating Ratio	86%	78%
Corporate Tax Rate	30%	30%
Closing Stock (₹)	15,00,000	5,00,000
Debtors (₹)	10,00,000	8,00,000

You are required to calculate:

(i) Swap ratio based on EPS & MPS respectively as weightage of 40% and 60%

(ii) Post Merger EPS

(iii) Post Merger market price assuming same PE Ratio of X Ltd.

(iv) Post Merger gain or loss in EPS

Note: Swap ratio calculation to be done in 3 decimals and other calculations in 2 decimals.

Answer

Working Notes:

(1) Inventory Turnover Ratio = $\frac{\text{COGS}}{\text{Closing Stock}}$

X Ltd.

$$5 = \frac{\text{COGS}}{₹\ 15,00,000}$$

COGS = ₹ 75,00,000

Y Ltd.

$$4 = \frac{\text{COGS}}{₹\ 5,00,000}$$

COGS = ₹ 20,00,000

Gross Profit Ratio = 20% means COGS is 80% of Sales, then

$$\text{Sales} = \frac{₹\ 75,00,000 \times 100}{80} = ₹\ 93,75,000$$

$$\text{Sales} = \frac{₹\ 20,00,000 \times 100}{80} = ₹\ 25,00,000$$

(2) Statement of Profit & Loss

	X Ltd.	Y Ltd.
Sales	93,75,000	25,00,000
Less: COGS & Operating Expenses	80,62,500	19,50,000

EBIT	13,12,500	5,50,000
Less: Interest	1,20,000	1,44,000
EBT	11,92,500	4,06,000
Less: Tax @ 30%	3,57,750	1,21,800
EAT	8,34,750	2,84,200

(3) Calculation of Existing EPS, MPS and P/E Ratio

	X Ltd.	Y Ltd.
EAT	₹ 8,34,750	₹ 2,84,200
No. of Shares	1,00,000	60,000
EPS (EAT/No. of Shares)	₹ 8.34	₹ 4.74
Market Capitalization	₹ 75,00,000	₹ 90,00,000
MPS (Market Capitalization/No. of Shares)	₹ 75	₹ 150
PE Ratio (MPS/EPS)	8.99	31.65

(i) Swap Ratio = $\frac{\text{Target Co.}}{\text{Acquirer Co.}}$

EPS	4.74:8.34 i.e.	0.568 x 40%	0.227
MPS	150:75 i.e.	2.000 x 60%	1.200
			1.427

(ii) Post Merger EPS

$$= \frac{EAT_X + EAT_Y}{\text{No. of Shares in Merged Company}}$$

$$= \frac{₹\ 8,34,750 + ₹\ 2,84,200}{1,00,000 + (60,000 \times 1.427)}$$

$$= \frac{₹\ 11,18,950}{1,85,620} = ₹\ 6.03$$

(iii) Post Merger market price assuming same PE of X Ltd.

MPS = P/E Ratio x EPS

= 8.99 x ₹ 6.03 = ₹ 54.21

(iv) Post Merger gain or loss in EPS

	Pre Merger EPS	Post Merger EPS
X Ltd.	₹ 8.34	₹ 6.03
Y Ltd.	₹ 4.74	₹ 6.03 x 1.427 = ₹ 8.60

While Shareholders of X Ltd. will lose EPS of ₹ 2.31 (₹ 8.34 – ₹ 6.03) per share the shareholders of Y Ltd. stands to gain EPS of ₹ 3.86 (₹ 8.60 – ₹ 4.74) per share.

Question 11

You have been provided the following financial data of two companies:

	Krishna Ltd.	Rama Ltd.
Earnings after taxes	₹ 7,00,000	₹ 10,00,000
Equity shares (outstanding)	2,00,000	4,00,000
EPS	3.5	2.5
P/E ratio	10 times	14 times
Market price per share	₹ 35	₹ 35

Company Rama Ltd. is acquiring the company Krishna Ltd., exchanging its shares on a one-to-one basis for company Krishna Ltd. The exchange ratio is based on the market prices of the shares of the two companies.

Required:

(i) What will be the EPS subsequent to merger?

(ii) What is the change in EPS for the shareholders of companies Rama Ltd. and Krishna Ltd.?

(iii) Determine the market value of the post-merger firm. PE ratio is likely to remain the same.

(iv) Ascertain the profits accruing to shareholders of both the companies.

Answer

(i)	Exchange Ratio	1:1
	New Shares to be issued	2,00,000
	Total shares of Rama Ltd. (4,00,000 + 2,00,000)	6,00,000
	Total earnings (₹ 10,00,000 + ₹ 7,00,000)	₹ 17,00,000
	New EPS (₹ 17,00,000/6,00,000)	₹ 2.83
(ii)	Existing EPS of Rama Ltd.	₹ 2.50
	Increase in EPS of Rama Ltd (₹ 2.83 – ₹ 2.50)	₹ 0.33
	Existing EPS of Krishna Ltd.	₹ 3.50
	Decrease in EPS of Krishna Ltd. (₹ 3.50 – ₹ 2.83)	₹ 0.67
(iii)	P/E ratio of new firm (expected to remain same)	14 times
	New market price (14 x ₹ 2.83)	₹ 39.62
	Total No. of Shares	6,00,000
	Total market capitalization (6,00,000 x ₹ 39.62)	₹ 2,37,72,000

(iv) Profits accruing to shareholders of both the companies

	Rama Ltd.	Krishna Ltd	Total
No. of shares after merger	4,00,000	2,00,000	6,00,000
Market price	₹ 39.62	₹ 39.62	₹ 39.62
Total Mkt. Values	₹ 1,58,48,000	₹ 79,24,000	₹ 2,37,72,000

Existing Mkt. values	₹ 1,40,00,000	₹ 70,00,000	₹ 2,10,00,000
Gain to share holders	₹ 18,48,000	₹ 9,24,000	₹ 27,72,000

or ₹ 27,72,000 ÷ 3 = ₹ 9,24,000 to Krishna Ltd. and ₹ 18,48,000 to Rama Ltd. (in 2: 1 ratio)

Question 12

Reliable Industries Ltd. (RIL) is considering a takeover of Sunflower Industries Ltd. (SIL). The particulars of 2 companies are given below:

Particulars	Reliable Industries Ltd.	Sunflower Industries Ltd.
Earnings After Tax (EAT)	₹ 20,00,000	₹ 10,00,000
Equity shares outstanding	10,00,000	10,00,000
Earnings per share (EPS)	2	1
PE Ratio (Times)	10	5

Required:

(i) What is the market value of each Company before merger?

(ii) Assume that the management of RIL estimates that the shareholders of SIL will accept an offer of one share of RIL for four shares of SIL. What is the market value of the Post-merger RIL? What is the new price per share? Are the shareholders better or worse off than they were before the merger? PE ratio is likely to remain the same.

(iii) Due to synergic effects, the management of RIL estimates that the combined earnings will increase by 20%. What are the new post-merger EPS and Price per share? Will the shareholders be better off or worse off than before the merger?

Answer

(i) Market value of Companies before Merger

Particulars	RIL	SIL
EPS	₹ 2	₹ 1
P/E Ratio	10	5
Market Price Per Share	₹ 20	₹ 5
Equity Shares	10,00,000	10,00,000
Total Market Value	2,00,00,000	50,00,000

(ii) Post Merger Effects on RIL

Post merger earnings	₹ 30,00,000
Exchange Ratio (1:4)	
No. of equity shares outstanding (10,00,000 + 2,50,000)	12,50,000
EPS (₹ 30,00,000/12,50,000)	₹ 2.4
PE Ratio	10

Market Price Per Share (10 x ₹ 2.4)	₹ 24
Total Market Value (12,50,000 x ₹ 24)	₹ 3,00,00,000

Gains from Merger

		₹
Post-Merger Market Value of the Firm		3,00,00,000
Less: Pre-Merger Market Value		
RIL	₹ 2,00,00,000	
SIL	₹ 50,00,000	2,50,00,000
Total gains from Merger		50,00,000

Apportionment of Gains between the Shareholders

Particulars	RIL (₹)	SIL (₹)
Post Merger Market Value:		
10,00,000 x ₹ 24	2,40,00,000	–
2,50,000 x ₹ 24	–	60,00,000
Less: Pre-Merger Market Value	2,00,00,000	50,00,000
Gains from Merger	40,00,000	10,00,000

Thus, the shareholders of both the companies (RIL + SIL) are better off than before.

(iii) Post-Merger Earnings

Increase in Earnings by 20%	
New Earnings [₹ 30,00,000 x (1 + 0.20)]	₹ 36,00,000
No. of equity shares outstanding	12,50,000
EPS (₹ 36,00,000/12,50,000)	₹ 2.88
PE Ratio	10
Market Price Per Share (₹ 2.88 x 10)	₹ 28.80

∴ Shareholders will be better-off than before the merger situation.

Question 13

C Ltd. and P Ltd. both companies operating in same industry decided to merge and form a new entity. The relevant financial details of the two companies prior to merger announcement are as follows:

	C Ltd.	P Ltd.
Annual Earnings after Tax (₹ lakh)	10,000	5,800
No. Shares Outstanding (lakh)	4,000	1,000
PE Ratio (No. of Times)	8	10

The merger will be affected by means of stock swap (exchange) of 3 shares of C Ltd. for 1 share of P Ltd.

After the merger it is expected that due to synergy effects, Annual Earnings (Post Tax) are expected to be 8% higher than sum of the earnings of the two companies individually. Further, it is expected that P/E Ratio of new entity shall be average of P/E Ratios of two companies before the merger.

Evaluate the extent to which shareholders of P Ltd. will be benefitted per share from proposed merger.

Note: Calculate EPS in 3 decimals and present all other calculations in lakh upto 2 decimals.

Answer

Working Notes:

(i) Earnings after merger

	₹ lakh
Earnings of C Ltd.	10,000
Earnings of P Ltd.	5,800
	15,800
Growth	0.08
Earnings after merger (₹ 15,800 x 1.08)	17,064

(ii) Market Value after merger

	₹ lakh
Earnings after merger	17,064
P/E Ratio [(10 + 8)/2]	9
Market Value after merger	1,53,576

(iii) No. of shares after merger

No. of shares of C Ltd.	4,000 lakh
No. of shares issued to P Ltd.	3,000 lakh
No. of shares of C Ltd. after merger	7,000 lakh

Gain to Shareholders of P Ltd.

Share of Shareholders of P Ltd. in merged entity [(3,000/7,000) x ₹ 1,53,576]	₹ 65,818.29 lakh
Market Value of P Ltd. before merger (₹ 5,800 x 10)	₹ 58,000.00 lakh
Gains to Shareholders of P Ltd.	₹ 7,818.29 lakh
No. of Shares of P Ltd. (before merger)	1,000 lakh
Gain Per Share	₹ 7.82

Question 14

A Ltd. wants to acquire T Ltd. and has offered a swap ratio of 1:2 (0.5 shares for every one share of T Ltd.). Following information is provided:

	A Ltd.	T Ltd.
Profit after tax	₹ 18,00,000	₹ 3,60,000
Equity shares outstanding (Nos.)	6,00,000	1,80,000
EPS	₹ 3	₹ 2
PE Ratio	10 times	7 times
Market Price per share	₹ 30	₹ 14

Required:

(i) The number of equity shares to be issued by A Ltd. for acquisition of T Ltd.

(ii) What is the EPS of A Ltd. after the acquisition?

(iii) Determine the equivalent earnings per share of T Ltd.

(iv) What is the expected market price per share of A Ltd. after the acquisition, assuming its PE multiple remains unchanged?

(v) Determine the market value of the merged firm.

(vi) If you are the shareholder of T Ltd. and holding 100 shares, will you be interested to sell your stake? Why?

Answer

(i) The number of shares to be issued by A Ltd.:

The Exchange ratio is 0.5

So, New Shares = 1,80,000 x 0.5 = 90,000 shares

(ii) EPS of A Ltd. after the acquisition:

Total Earnings (₹ 18,00,000 + ₹ 3,60,000)	₹ 21,60,000
No. of Shares (6,00,000 + 90,000)	6,90,000
EPS (₹ 21,60,000/6,90,000)	₹ 3.13

(iii) Equivalent EPS of T Ltd.:

No. of new Shares	0.5
EPS	₹ 3.13
Equivalent EPS (₹ 3.13 x 0.5)	₹ 1.57

(iv) New Market Price of A Ltd. (P/E remaining unchanged):

Present P/E Ratio of A Ltd.	10 times
Expected EPS after merger	₹ 3.13
Expected Market Price (₹ 3.13 x 10)	₹ 31.30

(v) Market Value of merged firm:

Total number of Shares	6,90,000
Expected Market Price	₹ 31.30
Total value (6,90,000 x 31.30)	₹ 2,15,97,000

(vi)	Present market Value of share of T Ltd. (100 x ₹ 14)	₹ 1,400
	Revised market price of each share of A Ltd. after Merger	₹ 31.30
	Equivalent No. of A Ltd. share in exchange of T Ltd. (100 x 0.5)	50
	Equivalent Value of A Ltd. share in exchange of T Ltd. (50 x ₹ 31.30)	₹ 1,565
	Increase in Market Value (₹ 1,565 – ₹ 1,400)	₹ 165

No, I am not agreed to sell the stake as there is increase in market value.

Question 15

The following information is provided related to the acquiring Firm Mark Limited and the target Firm Mask Limited:

	Firm Mark Limited	**Firm Mask Limited**
Earning after tax (₹)	2,000 lakhs	400 lakhs
Number of shares outstanding	200 lakhs	100 lakhs
P/E ratio (times)	10	5

Required:

(i) What is the Swap Ratio based on current market prices?

(ii) What is the EPS of Mark Limited after acquisition?

(iii) What is the expected market price per share of Mark Limited after acquisition, assuming P/E ratio of Mark Limited remains unchanged?

(iv) Determine the market value of the merged firm.

(v) Calculate gain/loss for shareholders of the two independent companies after acquisition.

Note: Present all calculations in crore upto 2 decimals.

Answer

Particulars	**Mark Ltd.**	**Mask Ltd.**
EPS	₹ 2,000 Lakhs/200 lakhs = ₹ 10	₹ 400 lakhs/100 lakhs = ₹ 4
Market Price per share	₹ 10 x 10 = ₹ 100	₹ 4 x 5 = ₹ 20

(i) The Swap ratio based on current market price is

₹ 20/₹ 100 = 0.2 or 1 share of Mark Ltd. for 5 shares of Mask Ltd.

No. of shares to be issued = 100 lakh x 0.2 = 20 lakhs

(ii) EPS after merger

$$= \frac{₹\ 2{,}000 \text{ lakhs} + ₹\ 400 \text{ lakhs}}{200 \text{ lakhs} + 20 \text{ lakhs}} = ₹\ 10.91$$

(iii) Expected market price after merger assuming P/E 10 times

= ₹ 10.91 x 10 = ₹ 109.10

(iv) Market value of merged firm

= ₹ 109.10 x 220 lakhs shares = ₹ 240.02 crores

(v) Gain from the merger

Post merger market value of the merged firm		₹ 240.02 crores
Less: Pre merger market value		
Mark Ltd. (200 Lakhs x ₹ 100)	₹ 200 crores	
Mask Ltd. (100 Lakhs x ₹ 20)	₹ 20 crores	₹ 220.00 crores
Gain from merger		₹ 20.02 crores

Appropriation of gains from the merger among shareholders

	Mark Ltd.	Mask Ltd.
Post merger value	₹ 218.20 crores	₹ 21.82 crores
Less: Pre merger market value	₹ 200.00 crores	₹ 20.00 crores
Gain to Shareholders	₹ 18.20 crores	₹ 1.82 crores

Question 16

Following information is provided relating to the acquiring company Mani Ltd. and the target company Ratnam Ltd:

	Mani Ltd.	Ratnam Ltd.
Earnings after tax (₹ lakhs)	2,000	4,000
No. of shares outstanding (lakhs)	200	1,000
P/E ratio (No. of times)	10	5

Required:

(i) What is the swap ratio based on current market prices?

(ii) What is the EPS of Mani Ltd. after the acquisition?

(iii) What is the expected market price per share of Mani Ltd. after the acquisition, assuming its P/E ratio is adversely affected by 10%?

(iv) Determine the market value of the merged Co.

(v) Calculate gain/loss for the shareholders of the two independent entities, due to the merger.

Note: Present all calculations in crore upto 2 decimals.

Answer

(i) Swap ratio based on current market prices

EPS before acquisition:

Mani Ltd. (₹ 2,000 lakhs/200 lakhs) ₹ 10

Ratnam Ltd. (₹ 4,000 lakhs/1,000 lakhs) ₹ 4

Market price before acquisition:

Mani Ltd. (₹ 10 x 10)	₹ 100
Ratnam Ltd. (₹ 4 x 5)	₹ 20
Swap ratio (20/100 or 1/5) i.e.	0.20

(ii) EPS after acquisition

$$= \frac{₹ (2,000 + 4,000) \text{ Lakhs}}{(200 + 200) \text{ Lakhs}} = ₹ 15.00$$

(iii) Market Price after acquisition

EPS after acquisition	₹ 15.00
P/E ratio after acquisition (10 x 0.9)	9
Market price of share (₹ 15 x 9)	₹ 135.00

(iv) Market value of the merged Co.

= ₹ 135 x 400 lakhs shares = ₹ 540.00 crores

(v) Gain/loss per share

	Mani Ltd.	Ratnam Ltd.
Total market value before acquisition	₹ 200 crores	₹ 200 crores
Market value after acquisition	₹ 270 crores	₹ 270 crores
Gain (Total)	₹ 70 crores	₹ 70 crores
No. of shares (pre merger) (lakhs)	200	1,000
Gain per share	₹ 35	₹ 7

Question 17

R Ltd. and S Ltd. are companies that operate in the same industry. The financial statements of both the companies for the current financial year are as follows:

Balance Sheet

Particulars	R Ltd. (₹)	S Ltd. (₹)
Equity & Liabilities		
Shareholders Fund		
Equity Capital (₹ 10 each)	20,00,000	16,00,000
Retained earnings	4,00,000	–
Non-current Liabilities		
16% Long term Debt	10,00,000	6,00,000
Current Liabilities	14,00,000	8,00,000
Total	**48,00,000**	**30,00,000**
Assets		

Non-current Assets	20,00,000	10,00,000
Current Assets	28,00,000	20,00,000
Total	**48,00,000**	**30,00,000**

Income Statement

Particulars	**R Ltd. (₹)**	**S Ltd. (₹)**
Net Sales	69,00,000	34,00,000
Less: Cost of Goods sold	55,20,000	27,20,000
Gross Profit	13,80,000	6,80,00
Less: Operating Expenses	4,00,000	2,00,000
Less: Interest	1,60,000	96,000
Earnings before taxes	8,20,000	3,84,000
Less: Taxes @ 35%	2,87,000	1,34,400
Earnings After Tax (EAT)	5,33,000	2,49,600

Additional Information:

No. of equity shares	2,00,000	1,60,000
Dividend payment Ratio (D/P)	20%	30%
Market price per share	₹ 50	₹ 20

Assume that both companies are in the process of negotiating a merger through exchange of Equity shares. You are required to:

(i) Decompose the share price of both the companies into EPS & P/E components. Also segregate their EPS figures into Return on Equity (ROE) and Book Value per share components.

(ii) Estimate future EPS growth rates for both the companies.

(iii) Based on expected operating synergies, R Ltd. estimated that the intrinsic value of S Ltd.'s Equity share would be ₹ 25 per share on its acquisition. You are required to develop a range of justifiable Equity Share Exchange ratios (on the basis of intrinsic value and market price) that can be offered by R Ltd. to the shareholders of S Ltd. Based on your analysis on parts (i) and (ii), would you expect the negotiated terms to be closer to the upper or the lower exchange ratio limits and why? Assume intrinsic value of R Ltd.'s share is same as its market price.

Answer

(i) Determination of EPS, P/E Ratio, ROE and BVPS of R Ltd. & S Ltd.

	R Ltd.	**S Ltd.**
EAT	₹ 5,33,000	₹ 2,49,600
No. of equity shares (N)	2,00,000	1,60,000
EPS (EAT ÷ N)	₹ 2.665	₹ 1.56
Market Price Per Share	₹ 50	₹ 20

PE Ratio (MPS/EPS)	18.76	12.82
Equity Fund (Equity Value)	₹ 24,00,000	₹ 16,00,000
BVPS (Equity Value ÷ N)	12	10
ROE [(EAT ÷ EF) x 100]	22.21%	15.60%

(ii) Determination of Growth Rate of EPS of R Ltd.& S Ltd.

	R Ltd.	S Ltd.
Retention Ratio (1 – D/P Ratio)	0.80	0.70
Growth Rate (ROE x Retention Ratio)	17.77%	10.92%

(iii) Justifiable equity share exchange ratio

(a) Market Price Based = MPS_S/MPS_R = ₹ 20/₹ 50 = 0.40:1 (lower limit)

(b) Intrinsic Value Based = ₹ 25/₹ 50 = 0.50:1 (upper limit)

Since R Ltd. has higher EPS, PE, ROE and higher growth expectations the negotiated term would be expected to be closer to the lower limit, based on existing share price.

Question 18

BA Ltd. and DA Ltd. both the companies operate in the same industry. The Financial statements of both the companies for the current financial year are as follows:

Balance Sheet

Particulars	BA Ltd. (₹)	DA Ltd. (₹)
Current Assets	14,00,000	10,00,000
Fixed Assets (Net)	10,00,000	5,00,000
Total (₹)	**24,00,000**	**15,00,000**
Equity capital (₹10 each)	10,00,000	8,00,000
Retained earnings	2,00,000	–
14% long-term debt	5,00,000	3,00,00
Current liabilities	7,00,000	4,00,000
Total (₹)	**24,00,000**	**15,00,000**

Income Statement

Particulars	BA Ltd. (₹)	DA Ltd. (₹)
Net Sales	34,50,000	17,00,000
Less: Cost of Goods sold	27,60,000	13,60,000
Gross profit	6,90,000	3,40,000
Less: Operating expenses	2,00,000	1,00,000
Less: Interest	70,000	42,000

Earnings before taxes	4,20,000	1,98,00
Less: Taxes @ 50%	2,10,000	99,000
Earnings after taxes (EAT)	**2,10,000**	**99,000**

Additional Information:

No. of Equity shares	1,00,000	80,000
Dividend payment ratio (D/P)	40%	60%
Market price per share	₹ 40	₹ 15

Assume that both companies are in the process of negotiating a merger through an exchange of equity shares. You have been asked to assist in establishing equitable exchange terms and are required to:

(i) Decompose the share price of both the companies into EPS and P/E components; and also segregate their EPS figures into Return on Equity (ROE) and book value per share components.

(ii) Estimate future EPS growth rates for each company.

(iii) Based on expected operating synergies BA Ltd. estimates that the intrinsic value of DA's equity share would be ₹ 20 per share on its acquisition. You are required to develop a range of justifiable equity share exchange ratios (on the basis of intrinsic value and market price) that can be offered by BA Ltd. to the shareholders of DA Ltd. Based on your analysis in part (i) and (ii), would you expect the negotiated terms to be closer to the upper, or the lower exchange ratio limits and why? Assume intrinsic value of BA's share is same as its market price.

(iv) Calculate the post merger EPS based on an exchange ratio of 0.40:1 being offered by BA Ltd. and indicate the immediate EPS accretion or dilution, if any that will occur for each group of shareholders.

(v) Based on a 0.40:1 exchange ratio and assuming that BA Ltd.'s pre merger P/E ratio will continue after the merger, estimate the post merger market price. Also show the resulting accretion or dilution in pre merger market prices.

Note: Exchange ratio calculation to be done in 3 decimals and other calculations in 2 decimals.

Answer

Market price per share (MPS) = EPS x P/E ratio or P/E ratio = MPS/EPS

(i) Determination of EPS, P/E ratio, ROE and BVPS of BA Ltd. and DA Ltd.

	BA Ltd.	**DA Ltd.**
Earnings After Tax (EAT)	₹ 2,10,000	₹ 99,000
No. of Shares (N)	1,00,000	80,000
EPS (EAT/N)	₹ 2.10	₹ 1.24
Market price per share (MPS)	40	15
P/E Ratio (MPS/EPS)	19.05	12.12
Equity Funds (EF)	₹ 12,00,000	₹ 8,00,000
BVPS (EF/N)	12	10
ROE [(EAT/EF) x 100]	17.50%	12.37%

(ii) Estimation of growth rates in EPS for BA Ltd. and DA Ltd.

	R Ltd.	S Ltd.
Retention Ratio (1 – D/P Ratio)	0.60	0.40
Growth Rate (ROE x Retention Ratio)	10.50%	4.95%

(iii) Justifiable equity shares exchange ratio

(a) Intrinsic value based = ₹ 20/₹ 40 = 0.50:1 (upper limit)

(b) Market price based = MPS_{DA}/MPS_{BA} = ₹ 15/₹ 40 = 0.375:1 (lower limit)

Since, BA Ltd. has a higher EPS, ROE, P/E ratio and even higher EPS growth expectations, the negotiable terms would be expected to be closer to the lower limit, based on the existing share prices.

(iv) Calculation of Post merger EPS and its effects

Particulars		BA Ltd.	DA Ltd.	Combined
EAT (₹)	(i)	2,10,000	99,000	3,09,000
Share outstanding	(ii)	1,00,000	80,000	1,32,000*
EPS (₹)	(i)/(ii)	2.10	1.24	2.34
EPS Accretion/(Dilution) (₹)		0.24	(0.30)**	

(v) Estimation of Post merger Market price and other effects

Particulars		BA Ltd.	DA Ltd.	Combined
EPS (₹)	(i)	2.10	1.24	2.34
P/E Ratio	(ii)	19.05	12.12	19.05
MPS (₹)	(i)/(ii)	40	15	44.58
MPS Accretion (₹)		4.58	2.83***	

*Shares outstanding (combined) = 1,00,000 shares + (0.40 x 80,000) = 1,32,000 shares

Equivalent EPS of DA Ltd. (EPS claim per old share) = ₹ 2.34 x 0.40 = ₹ 0.94

**EPS dilution of DA Ltd. = ₹ 1.24 – ₹ 0.94 = ₹ 0.30

Equivalent MPS of DA Ltd. (MPS claim per old share) = ₹ 44.58 x 0.40 = ₹ 17.83

***MPS accretion of DA Ltd. = ₹ 17.83 – ₹ 15 = ₹ 2.83

Question 19

Elrond Limited plans to acquire Doom Limited. The relevant financial details of the two firms prior to the merger announcement are:

	Elrond Limited	Doom Limited
Market price per share	₹ 50	₹ 25
Number of outstanding shares	20 lakhs	10 Lakh

The merger is expected to generate gains, which have a present value of ₹ 200 lakhs. The exchange ratio agreed to is 0.5.

What is the true cost of the merger from the point of view of Elrond Limited?

Note: Present all calculations in lakh

Answer

Shareholders of Doom Ltd. will get 5 lakh share (10 lakh share x 0.5) of Elrond Limited, so they will get

$= \frac{5 \text{ lakh}}{20 \text{ lakh} + 5 \text{ lakh}} = 20\%$ shares of Elrond Limited

The value of Elrond Ltd. after merger will be

= ₹ 50 x 20 lakh + ₹ 25 x 10 lakh + ₹ 200 lakh

= ₹ 1,000 lakh + ₹ 250 + ₹ 200 lakh

= ₹ 1,450 lakh

True Cost of Merger will be

= [₹ 1,450 x 20%] – ₹ 250 Lakhs

= ₹ 290 Lakh – ₹ 250 Lakhs

= ₹ 40 Lakhs

Question 20

P Ltd. is considering the takeover of R Ltd. by the exchange of four new shares in P Ltd. for every five shares in R Ltd. The relevant financial details of the two companies prior to merger announcement are as follows:

	P Ltd.	R Ltd.
Profit before Tax (₹ Crore)	15	13.50
No. of Shares (Crore)	25	15
P/E Ratio	12	9

Corporate Tax Rate is 30%.

You are required to determine:

(i) Market value of both the companies

(ii) Value of original shareholders

(iii) Price per share after merger

(iv) Effect on share price (in %) of both the companies

The Directors of P Ltd. expect their own pre-merger P/E ratio to be applied to the combined earnings.

Note: Present calculations in crore

Answer

	P Ltd.	R Ltd.

Profit before Tax (₹ in crore)	15	13.50
Less: Tax @ 30% (₹ in crore)	4.50	4.05
Profit after Tax (₹ in crore)	10.50	9.45
Earnings per Share (₹)	10.50/25 = ₹ 0.42	9.45/15 = ₹ 0.63
Price of Share before Merger (EPS x P/E Ratio)	₹ 0.42 x 12 = ₹ 5.04	₹ 0.63 x 9 = ₹ 5.67

(i) Market Value of both the companies

P Ltd. = ₹ 5.04 x 25 crore = ₹ 126 crore

R Ltd. = ₹ 5.67 x 15 crore = ₹ 85.05 crore

(ii) Value of Original Shareholders

Combined Value of Entity (₹ 126 crore + ₹ 85.05 crore)	₹ 211.05 crore
No. of shares after Merger [25 crore + 12 crore (15 crore x 4/5)]	37 crore
Value Per Share of Original Shareholder	₹ 5.704
Value of P Ltd. Shareholders (25 crores x ₹ 5.704)	₹ 142.60 crore
Value of R Ltd. Shareholders (12 crores x ₹ 5.704)	₹ 68.45 crore

(iii) Price per Share after Merger

$$EPS = \frac{₹\ 10.50\ crore + ₹\ 9.45\ crore}{37\ crore} = \frac{₹\ 19.95\ crore}{37\ crore} = ₹\ 0.539\ per\ share$$

P/E Ratio = 12

Market Value Per Share = ₹ 0.539 x 12 = ₹ 6.47

(iv) Effect on Share Price

P Ltd.

Gain/loss per share = ₹ 6.47 – ₹ 5.04 = ₹ 1.43

$$i.e.\ \frac{6.47 - 5.04}{5.04} \times 100 = 0.2837\ or\ 28.37\%$$

∴ Share price would rise by 28.37%

R Ltd.

Equivalent MPS = 6.47 x 4/5 = ₹ 5.18

Gain/loss per share = ₹ 5.18 – ₹ 5.67 = – ₹ 0.49

$$i.e.\ \frac{5.18 - 5.67}{5.67} \times 100 = -0.0864\ or\ -8.64\%$$

∴ Share Price would decrease by 8.64%

Question 21

XYZ Ltd., is considering merger with ABC Ltd. XYZ Ltd.'s shares are currently traded at ₹ 20. It has 2,50,000 shares outstanding and its earnings after taxes (EAT) amount to ₹ 5,00,000. ABC Ltd., has 1,25,000 shares outstanding; its current market price is ₹ 10 and its EAT are ₹ 1,25,000. The merger

will be effected by means of a stock swap (exchange). ABC Ltd., has agreed to a plan under which XYZ Ltd., will offer the current market value of ABC Ltd.'s shares:

(i) What are the pre merger earnings per share (EPS) and P/E ratios of both the companies?

(ii) If ABC Ltd.'s P/E ratio is 6.4, what is its current market price per share? What is the exchange ratio? What will XYZ Ltd.'s post merger EPS be?

(iii) What should be the exchange ratio if XYZ Ltd.'s pre merger and post merger EPS are to be same?

Answer

(i) Pre merger EPS and P/E ratios of XYZ Ltd. and ABC Ltd.

Particulars	XYZ Ltd.	ABC Ltd.
Earnings after taxes	₹ 5,00,000	₹ 1,25,000
Number of shares outstanding	2,50,000	1,25,000
EPS	₹ 2	₹ 1
Market Price per share	₹ 20	₹ 10
P/E Ratio (times)	10	10

(ii) Current Market Price per share of ABC Ltd. if P/E ratio is 6.4 = ₹ 1 x 6.4 = ₹ 6.40

Exchange ratio = 6.40/20 = 0.32

Post Merger EPS of XYZ Ltd.

$$= \frac{₹\ 5,00,000 + ₹\ 1,25,000}{2,50,000 + (1,25,000 \times 0.32)}$$

$$= \frac{₹\ 6,25,000}{2,90,000} = ₹\ 2.16$$

(iii) Desired Exchange Ratio

Total number of shares in post-merged company

$$= \frac{\text{Post merger earnings}}{\text{Pre merger EPS of XYZ Ltd.}} = \frac{₹\ 6,25,000}{2} = 3,12,500$$

Number of shares required to be issued = 3,12,500 – 2,50,000 = 62,500

Therefore, the exchange ratio is 62,500:1,25,000

$$= \frac{62,500}{1,25,000} = 0.50$$

Question 22

Big Ltd. (BL), a listed company, is enjoying a price earnings ratio (PER) of 15 on an Earnings Per Share (EPS) of ₹ 5. The Total number of outstanding shares are 2,00,000.

BL is proposing to acquire Small Pvt. Ltd. (SPL) an unlisted company by issuing shares in the ratio 4:5 i.e. for 5 shares of SPL 4 shares of BL will be issued. The outstanding shares of SPL are 50,000. SPL will be listed before the actual merger to discover its value. The EPS of the merged entity will be 5.5.

No other information is available for SPL. You are required to calculate:

(i) Pre merger EPS of SPL.

(ii) Expected Market Price per Share of SPL at the time of listing, if it expects a PER of 10.

(iii) Number of shares of BL to be issued to SPL if pre merger EPS of BL is to be maintained.

Answer

(i) Pre Merger EPS

No. of shares to be issued by BL to SPL (50,000 x 4/5)	40,000
Existing number of shares of BL	2,00,000
Total no. of shares Post Merger	2,40,000
EPS (Post Merger)	₹ 5.50
Post Merger (Total Earning)	₹ 13,20,000
Less: Pre Merger Earning of BL (2,00,000 x 5)	₹ 10,00,000
Pre Merger Earning of SPL	₹ 3,20,000
Number of shares of SPL (Existing)	50,000
EPS (₹ 3,20,000/50,000)	₹ 6.40

(ii) Expected Market Price of SPL share at the day of listing

= EPS x PE Ratio

= 6.40 x 10 = ₹ 64.00

(iii) Number of shares to be issued to SPL to maintain Pre Merger EPS

$$₹ 5.00 = \frac{₹ 13,20,000}{2,00,000 + x}$$

10,00,000 + 5x = 13,20,000

x = 64,000 shares

Thus, 64,000 shares to be issued by BL to SPL to maintain pre merger EPS.

Alternatively, it can also be computed as follows:

Swap Ratio if EPS before merger is maintained by BL = 6.4/5 = 1.28

Number of shares of BL is to be issued to SPL is 50,000 shares x 1.28 = 64,000 shares

Question 23

Longitude Limited is in the process of acquiring Latitude Limited on a share exchange basis. Following relevant data are available:

	Longitude Limited	Latitude Limited
Profit after Tax (PAT) (₹ in Lakhs)	120	80
Number of Shares (Lakhs)	15	16
Earnings per Share (EPS) (₹)	8	5

Price Earnings Ratio (P/E Ratio) (Ignore Synergy)	15	10

You are required to determine:

(i) Pre-merger Market Value per Share

(ii) The maximum exchange ratio Longitude Limited can offer without the dilution of

(1) EPS and

(2) Market Value per Share

Note: Calculate exchange ratio in 4 decimals and present all other calculations in lakh upto 2 decimals.

Answer

(i) Pre Merger Market Value Per Share = P/E Ratio x EPS

Longitude Ltd. = ₹ 8 x 15 = ₹ 120.00

Latitude Ltd. = ₹ 5 x 10 = ₹ 50.00

(ii) **(1)** Maximum exchange ratio without dilution of EPS

Pre Merger PAT of Longitude Ltd.	₹ 120 Lakhs
Pre Merger PAT of Latitude Ltd.	₹ 80 Lakhs
Combined PAT	₹ 200 Lakhs
Longitude Ltd. 's EPS	₹ 8
Maximum number of shares of Longitude after merger (₹ 200 lakhs/₹ 8)	25 Lakhs
Existing number of shares	15 Lakhs
Maximum number of shares to be exchanged	10 Lakhs

Maximum share exchange ratio 10:16 or 5:8 or 0.625:1

(2) Maximum exchange ratio without dilution of Market Value Per Share

Pre Merger Market Capitalization of Longitude Ltd. (₹ 120 x 15 Lakhs)	₹ 1,800 Lakhs
Pre Merger Market Capitalization of Latitude Ltd. (₹ 50 x 16 Lakhs)	₹ 800 Lakhs
Combined Market Capitalization	₹ 2,600 Lakhs
Current Market Price of share of Longitude Ltd.	₹ 120
Maximum number of shares to be exchanged of Longitude (surviving company) (₹ 2,600 Lakhs/₹ 120)	21.67 Lakhs
Current Number of Shares of Longitude Ltd.	15.00 Lakhs
Maximum number of shares to be exchanged (Lakhs)	6.67 Lakhs

Maximum share exchange ratio 6.67:16 or 0.4169:1

Question 24

XYZ Ltd. wants to purchase ABC Ltd. by exchanging 0.7 of its share for each share of ABC Ltd. Relevant

financial data are as follows:

	XYZ Ltd.	ABC Ltd.
Equity shares outstanding	10,00,000	4,00,000
EPS (₹)	40	28
Market price per share (₹)	250	160

(i) Illustrate the impact of merger on EPS of both the companies.

(ii) The management of ABC Ltd. has quoted a share exchange ratio of 1:1 for the merger. Assuming that P/E ratio of XYZ Ltd. will remain unchanged after the merger, what will be the gain from merger for ABC Ltd.?

(iii) What will be the gain/loss to shareholders of XYZ Ltd. if the exchange ratio is 1:1?

(iv) Determine the maximum exchange ratio acceptable to shareholders of XYZ Ltd.

Answer

Working Notes:

(a) P/E Ratio

	XYZ Ltd.	ABC Ltd.
Equity shares outstanding (Nos.)	10,00,000	4,00,000
EPS	₹ 40	₹ 28
Profit (EPS x No. of shares)	₹ 4,00,00,000	₹ 1,12,00,000
Market price per share	₹ 250	₹ 160
PE Ratio (MPS/EPS)	6.25	5.71

(b) EPS after merger

No. of shares to be issued (4,00,000 x 0.70)	2,80,000
Exiting Equity shares outstanding of XYZ Ltd.	10,00,000
Equity shares outstanding after merger	12,80,000
Total Profit (₹ 4,00,00,000 + ₹ 1,12,00,000)	₹ 5,12,00,000
EPS	₹ 40

(i) Impact of merger on EPS of both the companies

	XYZ Ltd.	ABC Ltd.
EPS after Merger	₹ 40	₹ 28*
EPS before Merger	₹ 40	₹ 28
	Nil	Nil

*Equivalent EPS = ₹ 40 x 0.70 = ₹ 28

(ii) Gain from the Merger if exchange ratio is 1: 1

No. of shares to be issued	4,00,000

Exiting Equity shares outstanding of XYZ Ltd.	10,00,000
Equity shares outstanding after merger	14,00,000
Total Profit (₹ 4,00,00,000 + ₹ 1,12,00,000)	₹ 5,12,00,000
EPS	₹ 36.57
Market Price of Share (₹ 36.57 x 6.25)	₹ 228.56
Market Price of Share before Merger	₹ 160.00
Impact (Increase)	₹ 68.56

(iii) Gain/loss from the Merger to the shareholders of XYZ Ltd.

Market Price of Share	₹ 228.56
Market Price of Share before Merger	₹ 250.00
Loss from the merger (per share)	₹ 21.44

(iv) Maximum Exchange Ratio acceptable to XYZ Ltd. shareholders

Earning after Merger (₹ 40 x 10,00,000 + ₹ 28 x 4,00,000)	₹ 5,12,00,000
PE Ratio of XYZ Ltd.	6.25
Market Value of Firm after Merger (₹ 5,12,00,000 x 6.25)	₹ 32,00,00,000
Existing Value of Shareholders of XYZ Ltd.	₹ 25,00,00,000
Value of Merged entity available to Shareholders of ABC Ltd.	₹ 7,00,00,000
Market Price per Share	₹ 250
Total No. of shares to be issued	2,80,000

Thus, maximum acceptable ratio shall be 2.80:4.00 i.e. 0.70 share of XYZ Ltd. for one share of ABC Ltd.

Question 25

ABC Ltd. is intending to acquire XYZ Ltd. by way of merger and the following information is available in respect of these companies:

	ABC Ltd.	XYZ Ltd.
Total Earnings (in lakh)	₹ 1,200	₹ 400
Number of outstanding shares (in lakh)	400	200
Price earnings ratio (P/E)	8	7

(a) Determine the maximum exchange ratio acceptable to the shareholders of ABC Ltd., if the P/E ratio of the combined firm is expected to be 8?

(b) Determine the minimum exchange ratio acceptable to the shareholders XYZ Ltd., if the P/E ratio of the combined firm is expected to be 10?

Note: Make calculation in lakh multiples and compute ratio upto 4 decimal points.

Answer

(a) Maximum exchange ratio acceptable to the shareholders of ABC Ltd.

Market Price of share of ABC Ltd. (₹ 3 x 8)	₹ 24
No. of Equity Shares	400 lakh
Market Capitalization of ABC Ltd. (₹ 24 x 400 lakh)	₹ 9,600 lakh
Combined Earnings (₹ 1,200 lakh + ₹ 400 lakh)	₹ 1,600 lakh
Combined Market Capitalization (₹ 1,600 lakh x 8)	₹ 12,800 lakh
Market Capitalization of ABC Ltd. (₹ 24 x 400 lakh)	₹ 9,600 lakh
Balance for XYZ Ltd.	₹ 3,200 lakh

Let D be the no. of equity shares to be issued to XYZ Ltd. then,

$$\frac{₹\ 3{,}200\ \text{lakh}}{\left(\frac{₹\ 1{,}600\ \text{lakh}}{D + 400}\right) \times 8} = D$$

D = 133.333 lakh shares

Exchange Ratio = 133.333/200 = 0.6666:1

(b) Minimum exchange ratio acceptable to the shareholders of XYZ Ltd.

Market Price of share of XYZ Ltd. (₹ 2 x 7)	₹ 14.00
No. of Equity Shares	200 lakh
Market Capitalization of XYZ Ltd. (₹ 14.00 x 200 lakh)	₹ 2,800 lakh
Combined Earnings (₹ 1,200 lakh + ₹ 400 lakh)	₹ 1,600 lakh
Combined Market Capitalization (₹ 1,600 lakh x 10)	₹ 16,000 lakh
Balance for ABC Ltd.	₹ 13,200 lakh

Let D be the no. of equity shares to be issued to XYZ Ltd. then,

$$\frac{₹\ 2{,}800\ \text{lakh}}{\left(\frac{₹\ 1{,}600\ \text{lakh}}{D + 400}\right) \times 10} = D$$

D = 84.8485 lakh shares

Exchange Ratio = 84.8485/200 = 0.4242:1

Question 26

ABC Ltd. is intending to acquire XYZ Ltd. by merger and the following information is available in respect of the companies:

	ABC Ltd.	XYZ Ltd.
Number of equity shares	10,00,000	6,00,000
Earnings after tax (₹)	50,00,000	18,00,000
Market value per share (₹)	42	28

Required:

(i) What is the present EPS of both the companies?

(ii) If the proposed merger takes place, what would be the new earning per share for ABC Ltd.? Assume that the merger takes place by exchange of equity shares and the exchange ratio is based on the current market price.

(iii) What should be exchange ratio, if XYZ Ltd. wants to ensure the earnings to members are as before the merger takes place?

Answer

(i) Earnings per share = $\frac{\text{Earnings after tax}}{\text{No. of equity shares}}$

ABC Ltd. = $\frac{₹\ 50,00,000}{10,00,000} = ₹\ 5$

XYZ Ltd. = $\frac{₹\ 18,00,000}{6,00,000} = ₹\ 3$

(ii) Number of Shares XYZ Limited's shareholders will get in ABC Ltd. based on market value per share = 6,00,000 x ₹ 28/42 = 4,00,000 shares

Total no. of equity shares of ABC Ltd. after merger = 10,00,000 + 4,00,000 = 14,00,000 shares

Earnings per share after merger = $\frac{₹\ (50,00,000 + 18,00,000)}{14,00,000} = ₹\ 4.86$

(iii) Calculation of exchange ratio to ensure shareholders of XYZ Ltd. to earn the same as was before merger:

Shares to be exchanged based on EPS = (₹ 3/₹ 5) x 6,00,000 = 3,60,000 shares

EPS after merger = $\frac{₹\ (50,00,000 + 18,00,000)}{13,60,000} = ₹\ 5$

Total earnings in ABC Ltd. available to shareholders of XYZ Ltd. = 3,60,000 x ₹ 5 = ₹ 18,00,000

Thus, to ensure that earning to members are same as before, the ratio of exchange should be 0.6 share for 1 share.

Question 27

M Co. Ltd. is studying the possible acquisition of N Co. Ltd., by way of merger. The following data are available in respect of the companies:

Particulars	M Co. Ltd.	N Co. Ltd.
Earnings after tax (₹)	80,00,000	24,00,000
No. of equity shares	16,00,000	4,00,000
Market value per share (₹)	200	160

(i) If the merger goes through by exchange of equity and the exchange ratio is based on the current market price, what is the new earning per share for M Co. Ltd.?

(ii) N Co. Ltd. wants to be sure that the earnings available to its shareholders will not be diminished by the merger. What should be the exchange ratio in that case?

Answer

(i) Calculation of new EPS of M Co. Ltd.

No. of equity shares to be issued to N Co. Ltd. = 4,00,000 shares x (₹ 160/₹ 200) = 3,20,000 shares

Total no. of shares in M Co. Ltd. after acquisition of N Co. Ltd. = 16,00,000 + 3,20,000 = 19,20,000

Total earnings after tax [after acquisition] = ₹ 80,00,000 + ₹ 24,00,000 = ₹ 1,04,00,000

$$\text{EPS} = \frac{₹\ 1,04,00,000}{19,20,000 \text{ equity shares}} = ₹\ 5.42$$

(ii) Calculation of exchange ratio which would not diminish the EPS of N Co. Ltd. after its merger with M Co. Ltd.

Current EPS

$$\text{M Co. Ltd.} = \frac{₹\ 80,00,000}{16,00,000 \text{ equity shares}} = ₹\ 5$$

$$\text{N Co. Ltd.} = \frac{₹\ 24,00,000}{4,00,000 \text{ equity shares}} = ₹\ 6$$

Exchange ratio = 6/5 = 1.20

No. of new shares to be issued by M Co. Ltd. to N Co. Ltd. = 4,00,000 x 1.20 = 4,80,000 shares

Total number of shares of M Co. Ltd. after acquisition = 16,00,000 + 4,80,000 = 20,80,000 shares

$$\text{EPS [after merger]} = \frac{₹\ 1,04,00,000}{20,80,000 \text{ shares}} = ₹\ 5$$

Total earnings in M Co. Ltd. available to shareholders of N Co. Ltd. = 4,80,000 x ₹ 5 = ₹ 24,00,000

Recommendation: Exchange ratio 1.2 (6 for 5) based on earnings is beneficial to shareholders of 'N' Co. Ltd.

Question 28

A Ltd. is studying the possible acquisition of B Ltd. by way of merger. The following data are available:

Firm	After-tax earnings (₹)	No. of equity shares	Market price per share (₹)
A Ltd.	₹ 10,00,000	2,00,000	₹ 75
B Ltd.	₹ 3,00,000	50,000	₹ 60

(i) If the merger goes through by exchange of equity shares and the exchange ratio is set according to the current market prices, what is the new earnings per share for A Ltd.

(ii) B Ltd. wants to be sure that its earnings per share is not diminished by the merger. What exchange ratio is relevant to achieve the objective?

Answer

(i) The current market price is the basis of exchange of equity shares, in the proposed merger,

shareholders of B Ltd. will get only 40,000 shares in all or 4 shares of A Ltd. for every 5 shares held by them, i.e.,

$$\frac{50,000 \times 60}{75} = 40,000 \text{ shares}$$

The total number of shares in A Ltd. will then be 2,40,000 and, ignoring any synergistic effect, the profit will be ₹ 13,00,000. The new earning per share (EPS) of A Ltd. will be ₹ 5.42, i.e., ₹ 13,00,000/2,40,000.

(ii) The present earnings per share of B Ltd. is ₹ 6 (₹ 3,00,000/50,000) and that of A Ltd. is ₹ 5 (₹ 10,00,000/2,00,000). If B Ltd. wants to ensure that, even after merger, the earning per share of its shareholders should remain unaffected, then the exchange ratio will be 1.2 (6 shares for every 5 shares).

The total number of shares of A Ltd. that will produce ₹ 3,00,000 profit is 60,000, (3,00,000/5), to be distributed among, shareholders of B Ltd., giving a ratio of 6 shares in A for 5 shares in B.

Proof:

The shareholders of B Ltd. will get in all 60,000 shares for 50,000 shares. It means after merger, their earning per share will be ₹ 5 (₹ 13,00,000/2,60,000).

In all they will get ₹ 3,00,000 (60,000 x 5) as before.

Question 29

MK Ltd. is considering acquiring NN Ltd. The following information is available:

Company	Earning after Tax (₹)	No. of Equity Shares	Market Value Per Share (₹)
MK Ltd.	60,00,000	12,00,000	200.00
NN Ltd.	18,00,000	3,00,000	160.00

Exchange of equity shares for acquisition is based on current market value as above. There is no synergy advantage available.

(i) Find the earning per share for company MK Ltd. after merger.

(ii) Find the exchange ratio so that shareholders of NN Ltd. would not be at a loss in EPS.

Answer

(i) Earnings per share of company MK Ltd after merger:

Exchange ratio 160:200 = 4:5 i.e., 4 shares of MK Ltd. for every 5 shares of NN Ltd.

∴ Total number of shares to be issued = 3,00,000 x 4/5 = 2,40,000 Shares

∴ Total number of shares of MK Ltd. and NN Ltd. = 12,00,000 + 2,40,000 = 14,40,000 Shares

Total profit after tax = ₹ 60,00,000 (MK Ltd.) + ₹ 18,00,000 (NN Ltd.) = ₹ 78,00,000

∴ EPS (Earning Per Share) of MK Ltd. after merger = ₹ 78,00,000/14,40,000 = ₹ 5.42 per share

(ii) To find the exchange ratio so that shareholders of NN Ltd. would not be at a Loss:

Present earning per share for company MK Ltd. = ₹ 60,00,000/12,00,000 = ₹ 5.00

Present earning per share for company NN Ltd. = ₹ 18,00,000/3,00,000 = ₹ 6.00

∴ Exchange ratio should be 6 shares of MK Ltd. for every 5 shares of NN Ltd.

∴ Shares to be issued to NN Ltd. = 3,00,000 x 6/5 = 3,60,000 shares

Now, Total No. of shares of MK Ltd. and NN Ltd. = 12,00,000 + 3,60,000 = 15,60,000 shares

∴ EPS after merger = ₹ 78,00,000/15,60,000 = ₹ 5.00 per share

Total earnings available to shareholders of NN Ltd. after merger = 3,60,000 x ₹ 5.00 = ₹ 18,00,000

This is equal to earnings prior merger for NN Ltd.

∴ Exchange ratio 1.2 (6 for 5) on the basis of earnings per share is recommended.

Mergers & Acquisitions through Cash Offer

Question 30

AFC Ltd. wishes to acquire BCD Ltd. The shares issued by the two companies are 10,00,000 and 5,00,000 respectively:

(i) Calculate the increase in the total value of BCD Ltd. resulting from the acquisition on the basis of the following conditions:

Current expected growth rate of BCD Ltd.	7%
Expected growth rate under control of AFC Ltd., (without any additional capital investment and without any change in risk of operations)	8%
Current Market price per share of AFC Ltd.	₹ 100
Current Market price per share of BCD Ltd.	₹ 20
Expected Dividend per share of BCD Ltd.	₹ 0.60

(ii) On the basis of aforesaid conditions, calculate the gain or loss to shareholders of both the companies, if AFC Ltd. were to offer one of its shares for every four shares of BCD Ltd.

(iii) Calculate the gain to the shareholders of both the Companies, if AFC Ltd. pays ₹ 22 for each share of BCD Ltd., assuming the P/E Ratio of AFC Ltd. does not change after the merger. EPS of AFC Ltd. is ₹ 8 and that of BCD is ₹ 2.50. It is assumed that AFC Ltd. invests its cash to earn 10%.

Answer

(i) The cost of capital of BCD Ltd. may be calculated by using the following formula

$$= \frac{\text{Dividend}}{\text{Price}} + \text{Growth \%}$$

Cost of Capital i.e., $K_e = \frac{₹\ 0.60}{₹\ 20} + 0.07 = 0.10$

After acquisition g (i.e., growth) becomes 0.08

Therefore, price per share after acquisition = $\frac{₹\ 0.60}{0.10 - 0.08} = ₹\ 30$

The increase in value therefore is = ₹ (30 – 20) x 5,00,000 = ₹ 50,00,000

(ii) Price of share of AFC Ltd. after merger which they should undertake

Value of AFC Ltd. (10,00,000 shares x ₹ 100)	₹ 10,00,00,000
Value of BCD Ltd. (5,00,000 shares x ₹ 30)	₹ 1,50,00,000
Value of AFC Ltd. after merger	₹ 11,50,00,000
No. of shares after merger [10,00,000 + 1,25,000 (5,00,000 x 1/4)]	11,25,000 shares
∴ Value per share (₹ 11,50,00,000/11,25,000 shares)	₹ 102.22

Gain per share to shareholders of BCD Ltd. = ₹ 25.55 (₹ 102.22 x 1/4) – ₹ 20 = ₹ 5.55

[Alternatively, gain to shareholders of BCD Ltd. (on every 4 shares that are required to get 1 share of AFC Ltd.) = ₹ 102.22 – ₹ (20 x 4) = ₹ 22.22]

Gain per share to shareholders of AFC Ltd. = ₹ 102.22 – ₹ 100.00 = ₹ 2.22

(iii) Gain to shareholders if AFC Ltd. pays ₹ 22 for each share of BCD Ltd.

Post Merger Earnings (10,00,000 x ₹ 8 + 5,00,000 x ₹ 2.5 – 11,00,000)	₹ 81,50,000
EPS after Merger (₹ 81,50,000/10,00,000)	₹ 8.15
P/E Ratio	12.50
Post Merger Price of Share (₹ 8.15 x 12.50)	₹ 101.88
Less: Price before merger	₹ 100.00
Gain per share to the shareholders of AFC Ltd.	₹ 1.88

Gain per share to the shareholders of BCD Ltd. = ₹ 22 – ₹ 20 = ₹ 2

Question 31

Long Ltd., is planning to acquire Tall Ltd., with the following data available for both the companies:

	Long Ltd.	**Tall Ltd.**
Expected EPS	₹ 12	₹ 5
Expected DPS	₹ 10	₹ 3
No. of Shares	30,00,000	18,00,000
Current Market Price of Share	₹ 180	₹ 50

As per an estimate, Tall Ltd. is expected to have steady growth of earnings and dividends to the tune of 6% per annum. However, under the new management the growth rate is likely to be enhanced to 8% per annum without additional investment.

You are required to:

(i) Calculate the net cost of acquisition by Long Ltd., if ₹ 60 is paid for each share of Tall Ltd.

(ii) If the agreed exchange ratio is one share of Long Ltd., for every three shares of Tall Ltd., in lieu of the cash acquisition as per (i) above, what will be the net cost of acquisition?

(iii) Calculate Gain from acquisition in (ii) above.

Answer

(i) Net cost of acquisition shall be computed as follows:

Cash Paid for the shares of Tall Ltd. (₹ 60 x 18,00,000)	₹ 10,80,00,000
Less: Value of Tall Ltd. as a separate entity (18,00,000 x ₹ 50)	₹ 9,00,00,000
Net Cost of acquisition of Tall Ltd.	₹ 1,80,00,000

(ii) Net Cost of acquisition in case of exchange of shares:

Exchange ratio = 1 share of long Ltd for every 3 shares of Tall Ltd.

Number of shares to be issued in Long Ltd. = 18,00,000/3 = 6,00,000 shares

Total no. of shares in Long Ltd. after merger = 30,00,000 + 6,00,000 = 36,00,000 shares

Calculation of cost of Equity of Tall Ltd. $= \frac{D_1}{P_0} + g$

$$= \frac{₹\ 3}{₹\ 50} + 0.06 = 12\%$$

Growth rate under new management after acquisition = 8%

Value of merged company = [₹ 180 x 30,00,000] + $\frac{₹\ 3}{0.12 - 0.08}$ x 18,00,000

= ₹ 54,00,00,000 + (₹ 75 x 18,00,000)

= ₹ 67,50,00,000

Value per share of merged company = ₹ 67,50,00,000/36,00,000 = ₹ 187.50 per share

Calculation of net cost of acquisition

Gross cost of acquisition (6,00,000 x ₹ 187.50)	₹ 11,25,00,000
Less: Value of Tall Ltd. as a separate entity (18,00,000 x ₹ 50)	₹ 9,00,00,000
Net Cost of acquisition of Tall Ltd.	₹ 2,25,00,000

(iii) Calculation of gain from acquisition

Value of Long Ltd. after acquisition		₹ 67,50,00,000
Less: Value of two companies separately		
Long Ltd. (₹ 180 x 30,00,000)	₹ 54,00,00,000	
Tall Ltd. (₹ 50 x 18,00,000)	₹ 9,00,00,000	₹ 63,00,00,000
Gain from Acquisition		₹ 4,50,00,000

Question 32

Given is the following information:

	Day Ltd.	Night Ltd.
Net Earnings	₹ 5 crores	₹ 3.5 crores
No. of Equity Shares	10,00,000	7,00,000

The shares of Day Ltd. and Night Ltd. trade at 20 and 15 times their respective P/E ratios.

Day Ltd. considers taking over Night Ltd. By paying ₹ 55 crores considering that the market price of

Night Ltd. reflects its true value. It is considering both the following options:

(i) Takeover is funded entirely in cash.

(ii) Takeover is funded entirely in stock.

You are required to calculate the cost of the takeover and advise Day Ltd. on the best alternative.

Note: Present all calculations in crore upto 2 decimals.

Answer

Working Notes:

	Day Ltd.	Night Ltd.
Net Earnings	₹ 5 crores	₹ 3.5 crores
No. of Equity Shares	10,00,000	7,00,000
EPS	50	50
P/E	20 times	15 times
MPS	₹ 1,000	₹ 750
Market Value	1,00,00,00,000	52,50,00,000

(i) If takeover is funded by Cash

Since Market Price of Night Ltd. reflects its full value,

Cost of takeover to Day Ltd. is = ₹ 55 crore – 52.50 crore = ₹ 2.5 crore

(ii) If the takeover is funded by stock

Number of shares to be issued to Night Ltd.= $\frac{₹\ 55\ crore}{₹\ 1,000}$ = 5,50,000 shares

Market Value of Merged Firm = ₹ 1,00,00,00,000 + ₹ 52,50,00,000 = ₹ 152.50 crore

Proportion that Night Ltd.'s shareholders get in Day Ltd.'s Capital Structure will be

$= \frac{5.5\ Lakhs}{5.5\ Lakhs + 10\ Lakhs} = 0.3548$

True Cost of Merger = ₹ 152.50 crore x 0.3548 – ₹ 52.50 crore = ₹ 1.61 crore

Since true cost is less in case of funding from stock, Day Ltd. would better off by funding the takeover by stock.

Question 33

The CEO of a company thinks that shareholders always look for EPS. Therefore, he considers maximization of EPS as his company's objective. His company's current Net Profits are ₹ 80.00 lakhs and P/E multiple is 10.5. He wants to buy another firm which has current income of ₹ 15.75 lakhs & P/E multiple of 10.

(i) What is the maximum exchange ratio which the CEO should offer so that he could keep EPS at the current level, given that the current market price of both the acquirer and the target company are ₹ 42 and ₹ 105 respectively?

(ii) If the CEO borrows funds at 15% and buys out Target Company by paying cash, how much should he offer to maintain his EPS? Assume tax rate of 30%.

Note: Present all calculations in lakh upto 4 decimals.

Answer

(i) To advise the maximum exchange ratio which CEO of the Acquirer Company should offer to shareholders of Target Company, we shall compute the EPS of each company as follows:

	Acquirer Company	Target Company
Net Profit	₹ 80 lakhs	₹ 15.75 lakhs
PE Multiple	10.50	10.00
Market Capitalization	₹ 840 lakhs	157.50 lakhs
Market Price	₹ 42	₹ 105
No. of Shares	20 lakhs	1.50 lakhs
EPS	₹ 4	₹ 10.50

Maximum Exchange Ratio = 10.50:4 or 2.625:1

Thus, for every one share of Target Company 2.625 shares of Acquirer Company.

(ii) Let x lakhs be the amount paid by Acquirer company to Target Company to maintain same EPS i.e. ₹ 4, then the number of shares to be issued will be

$$\frac{₹ (80 \text{ lakhs} + 15.75 \text{ lakhs}) - 0.70 \times 15\% \times x}{20 \text{ lakhs}} = ₹ 4$$

$$\frac{95.75 - 0.105\,x}{20} = ₹ 4$$

x = ₹ 150 lakhs

Thus, ₹ 150 lakhs shall be offered in cash to Target Company to maintain same EPS.

Question 34

The equity shares of XYZ Ltd. are currently being traded at ₹ 24 per share in the market. XYZ Ltd. has total 10,00,000 equity shares outstanding in number and promoters' equity holding in company is 40%.

PQR Ltd. wishes to acquire XYZ Ltd. because of likely synergies. The estimated present value of these synergies is ₹ 80,00,000.

Further PQR feels that management of XYZ Ltd. has been over paid. Better motivation, lower salaries and fewer perks for the top management, will lead to savings of ₹ 4,00,000 p.a. Top management with their families are promoters of XYZ Ltd. Present value of these savings would add ₹ 30,00,000 in value to the acquisition.

Following additional information is available regarding PQR Ltd.:

Earnings per share	₹ 4
Total number of equity shares outstanding	15,00,000
Market price of equity share	₹ 40

Required:

(i) What is the maximum price per equity share which PQR Ltd. can offer to pay for XYZ Ltd.?

(ii) What is the minimum price per equity share at which the management of XYZ Ltd. will be willing to offer their controlling interest (promoters holding)?

Answer

(i) Calculation of maximum price per share at which PQR Ltd. can offer to pay for XYZ Ltd.'s share

Market Value (10,00,000 x ₹ 24)	₹ 2,40,00,000
Synergy Gain	₹ 80,00,000
Saving of Overpayment	₹ 30,00,000
	₹ 3,50,00,000
Maximum Price (₹ 3,50,00,000/10,00,000)	₹ 35

(ii) Calculation of minimum price per share at which the management of XYZ Ltd.'s will be willing to offer their controlling interest (promoters holding)

Value of XYZ Ltd.'s Promoters Holding [(40% of 10,00,000) x ₹ 24]	₹ 96,00,000
Add: PV of loss of remuneration to top management (promoters)	₹ 30,00,000
	₹ 1,26,00,000
No. of Shares	4,00,000
Minimum Price (₹ 1,26,00,000/4,00,000)	₹ 31.50

Value of Acquisition & Financial Feasibility of Acquisition

Question 35

Yes Ltd. wants to acquire No Ltd. and the cash flows of Yes Ltd. and the merged entity are given below:

₹ in lakhs

Year	1	2	3	4	5
Yes Ltd.	175	200	320	340	350
Merged Entity	400	450	525	590	620

Earnings would have witnessed 5% constant growth rate without merger and 6% with merger on account of economies of operations after 5 years in each case. The cost of capital is 15%.

The number of shares outstanding in both the companies before the merger is the same and the companies agree to an exchange ratio of 0.5 shares of Yes Ltd. for each share of No Ltd.

PV factor at 15% for years 1-5 are 0.870, 0.756, 0.658, 0.572, 0.497 respectively.

You are required to:

(i) Compute the Value of Yes Ltd. before and after merger.

(ii) Value of Acquisition.

(iii) Gain to shareholders of Yes Ltd.

Note: Present all calculations in lakh upto 2 decimals.

Answer

(i) Working Notes:

Present Value of Cash Flows (CF) upto 5 years

Year End	CF of Yes Ltd. (₹ lakhs)	PVF @ 15%	PV of CF (₹ lakhs)	CF of Merged Entity (₹ lakhs)	PV of CF of Merged Entity (₹ lakhs)
1	175	0.870	152.25	400	348.00
2	200	0.756	151.20	450	340.20
3	320	0.658	210.56	525	345.45
4	340	0.572	194.48	590	337.48
5	350	0.497	173.95	620	308.14
			882.44		1,679.27

PV of Cash Flows of Yes Ltd. after the forecast period

$$TV_5 = \frac{CF_5 (1 + g)}{K_e - g} = \frac{₹\ 350 \text{ lakh } (1 + 0.05)}{0.15 - 0.05} = \frac{₹\ 367.50 \text{ lakh}}{0.10} = ₹\ 3,675 \text{ Lakhs}$$

PV of TV_5 = ₹ 3,675 lakhs x 0.497 = ₹ 1,826.48 lakhs

PV of Cash Flows of Merged Entity after the forecast period

$$TV_5 = \frac{CF_5 (1 + g)}{K_e - g} = \frac{₹\ 620 \text{ lakh } (1 + 0.06)}{0.15 - 0.06} = \frac{₹\ 657.20 \text{ lakh}}{0.09} = ₹\ 7,302.22 \text{ Lakhs}$$

PV of TV_5 = ₹ 7,302.22 lakhs x 0.497 = ₹ 3,629.20 lakhs

Value of Yes Ltd. before and after merger

	Before merger (₹ lakhs)	After merger (₹ lakhs)
PV of CF (1-5 years)	882.44	1,679.27
Add: PV of TV_5	1,826.48	3,629.20
	2,708.92	5,308.47

(ii) Value of Acquisition

= Value of Merged Entity – Value of Yes Ltd.

= ₹ 5,308.47 lakhs – ₹ 2,708.92 lakhs = ₹ 2,599.55 lakhs

(iii) Gain to Shareholders of Yes Ltd.

Share of Yes Ltd. in merged entity = ₹ 5,308.47 lakhs x (1/1.5) = ₹ 3,538.98 lakhs

Gain to shareholders = Share of Yes Ltd. in merged entity – Value of Yes Ltd. before merger

= ₹ 3,538.98 lakhs – ₹ 2,708.92 lakhs = ₹ 830.06 lakhs

Question 36

M/s Tiger Ltd. wants to acquire M/s. Leopard Ltd. The balance sheet of Leopard Ltd. as on 31st March, 2025 is as follows:

Liabilities	₹	Assets	₹
Equity Capital (70,000 shares)	7,00,000	Cash	50,000
Retained earnings	3,00,000	Debtors	70,000
12% Debentures	3,00,000	Inventories	2,00,000
Creditors and other liabilities	3,20,000	Plants & Equipments	13,00,000
	16,20,000		**16,20,000**

Additional Information:

(i) Shareholders of Leopard Ltd. will get one share in Tiger Ltd. for every two shares. Shares of Tiger Ltd. would be issued at its current price of ₹ 15 per share. External liabilities are expected to be settled at ₹ 5,00,000. Debenture holders will get 13% convertible debentures in the purchasing company for the same amount. Debtors and inventories are expected to realize ₹ 2,00,000.

(ii) Tiger Ltd. has decided to operate the business of Leopard Ltd. as a separate division. The division is likely to give cash flows (after tax) to the extent of ₹ 5,00,000 per year for 6 years. Tiger Ltd. has planned that, after 6 years, this division would be disposed of for ₹ 2,00,000.

(iii) The company's cost of capital is 16%.

Make a report to the Board of the company advising them about the financial feasibility of this acquisition.

Present values @ 16% for ₹ 1 are as follows:

Years	1	2	3	4	5	6
PVF @ 16%	0.862	0.743	0.641	0.552	0.476	0.410

Answer

Calculation of Purchase Consideration

	₹
Issue of Share (70,000 x 1/2 x ₹ 15)	5,25,000
External Liabilities settled	5,00,000
13% Debentures	3,00,000
	13,25,000
Less: Realization of Debtors and Inventories	2,00,000
Cash	50,000
	10,75,000

Net Present Value = PV of Cash Inflow + PV of disposal value – Cash Outflow

= ₹ 5,00,000 x PVAF (16%, 6) + ₹ 2,00,000 x PVF (16%, 6) – ₹ 10,75,000

= ₹ 5,00,000 x 3.684 + ₹ 2,00,000 x 0.410 – ₹ 10,75,000

= ₹ 18,42,000 + ₹ 82,000 – ₹ 10,75,000

= ₹ 8,49,000

Since, NPV of the decision is positive it is advantageous to acquire Leopard Ltd.

Demerger

Question 37

The following information is relating to Fortune India Ltd. having two division, viz. Pharma Division and Fast Moving Consumer Goods Division (FMCG Division). Paid up share capital of Fortune India Ltd. is consisting of 3,000 Lakhs equity shares of ₹ 1 each. Fortune India Ltd. decided to demerge Pharma Division as Fortune Pharma Ltd. w.e.f. 1.4.2025. Details of Fortune India Ltd. as on 31.3.2025 and of Fortune Pharma Ltd. as on 1.4.2025 are given below:

Particulars	Fortune Pharma Ltd. (₹)	Fortune India Ltd. (₹)
Outside Liabilities		
Secured Loans	400 lakh	3,000 lakh
Unsecured Loans	2,400 lakh	800 lakh
Current Liabilities & Provisions	1,300 lakh	21,200 lakh
Assets		
Fixed Assets	7,740 lakh	20,400 lakh
Investments	7,600 lakh	12,300 lakh
Current Assets	8,800 lakh	30,200 lakh
Loans & Advances	900 lakh	7,300 lakh
Deferred Tax	60 lakh	(200) lakh

Board of Directors of the Company have decided to issue necessary equity shares of Fortune Pharma Ltd. of ₹ 1 each, without any consideration to the shareholders of Fortune India Ltd. For that purpose, following points are to be considered:

(a) Transfer of Liabilities & Assets at Book value.

(b) Estimated Profit for the year 2025-26 is ₹ 11,400 Lakh for Fortune India Ltd. & ₹ 1,470 lakhs for Fortune Pharma Ltd.

(c) Estimated Market Price of Fortune Pharma Ltd. is ₹ 24.50 per share.

(d) Average P/E Ratio of FMCG sector is 42 & Pharma sector is 25, which is to be expected for both the companies.

Calculate:

(i) Ratio in which shares of Fortune Pharma are to be issued to shareholders of Fortune India Ltd.

(ii) Expected Market price of Fortune India (FMCG) Ltd.

(iii) Book Value per share of both the Companies immediately after Demerger.

Note: Present all calculations in lakh upto 2 decimals.

Answer

Shareholders' funds **₹ Lakhs**

Particulars	Fortune India Ltd.	Fortune Pharma Ltd.	Fortune India (FMCG) Ltd.
Assets	70,000	25,100	44,900
Outside liabilities	25,000	4,100	20,900
Net worth	45,000	21,000	24,000

(i) Calculation of Shares of Fortune Pharma to be issued to shareholders of Fortune India Ltd.

	Fortune Pharma Ltd.
Estimated Profit	₹ 1,470 lakhs
Estimated market price	₹ 24.5
Estimated P/E	25
Estimated EPS	₹ 0.98
No. of shares	1,500 lakh shares

Hence, Ratio is 1 share of Fortune Pharma Ltd. for 2 shares of Fortune India Ltd. (OR for 0.50 share of Fortune Pharma Ltd. for 1 share of Fortune India Ltd.)

(ii) Expected market price of Fortune India (FMCG) Ltd.

	Fortune India (FMCG) Ltd.
Estimated Profit	₹ 11,400 lakhs
No. of equity shares	3,000 lakh shares
Estimated EPS	₹ 3.8
Estimated P/E	42
Expected market price	₹ 159.60

(iii) Book value per share

	Fortune Pharma Ltd.	Fortune India (FMCG) Ltd.
Net worth	₹ 21,000 lakhs	₹ 24,000 lakhs
No. of shares	1,500 lakh shares	3,000 lakh shares
Book value per share	₹ 14	₹ 8

Reconstruction (Financial Restructuring)

Question 38

The following is the Balance sheet of XYZ Ltd. as on 31st March, 2025. ₹ in lakh

Liabilities	Amount	Assets	Amount
6 lakh Equity shares of ₹ 100 each	600	Land and Building	200

2 lakh 14% preference shares of ₹ 100 each	200	Plant and Machinery	300
13% Debentures	200	Furniture and Fixtures	50
Debenture Interest accrued and payable	26	Inventory	150
Loan from Bank	74	Sundry Debtors	70
Trade Creditors	300	Cash at Bank	130
		Preliminary Expenses	10
		Cost of Issue of Debentures	5
		Profit & Loss A/c	485
	1,400		1,400

The Company did not perform well and has suffered sizable losses during the last few years. However, it is now felt that the company can be nursed back to health by proper financial restructuring and consequently the following scheme of reconstruction has been devised:

(i) Equity shares are to be reduced to ₹ 25 per share, fully paid up.

(ii) Preference shares are to be reduced (with Dividend rate of 10%) to equal number of shares of ₹ 50 each, fully paid up.

(iii) Debenture holders have agreed to forego interest accrued to them. Beside this, they have agreed to accept new debentures carrying a coupon rate of 9%.

(iv) Trade creditors have agreed to forego 25% of their existing claim; for the balance sum they have agreed to convert their claims into equity shares of ₹ 25 each.

(v) In order to make payment for bank loan and augment the working capital, the company issues 6 lakh equity shares at ₹ 25 each; the entire sum is required to be paid on application. The existing shareholders have agreed to subscribe to the new issue.

(vi) While Land and Building is to be revalued at ₹ 250 lakh, Plant & Machinery is to be written down to ₹ 104 lakh. A provision amounting to ₹ 5 lakh is to be made for bad and doubtful debts.

You are required to show the impact of financial restructuring/reconstruction. Also, prepare the new balance sheet assuming the scheme of reconstruction is implemented in letter and spirit.

Note: Present all calculations in lakhs

Answer

(a) Impact of Financial Restructuring

Benefits to XYZ Ltd.

		₹ in lakhs
(a)	Reduction of liabilities payable	
	Reduction in Equity Share capital (6 lakh shares x ₹ 75 per share)	450
	Reduction in Preference Share capital (2 lakh shares x ₹ 50 per share)	100
	Waiver of outstanding Debenture Interest	26
	Waiver from Trade Creditors (₹ 300 lakhs x 0.25)	75
		651

(b)	Revaluation of Assets	
	Appreciation of Land and Building (₹ 250 lakhs – ₹ 200 lakhs)	50
		701

Amount of ₹ 701 lakhs utilized to write off losses, fictious assets and overvalued assets.

	₹ in lakhs
Writing off Profit and Loss account	485
Cost of issue of debentures	5
Preliminary expenses	10
Provision for bad and doubtful debts	5
Revaluation of Plant and Machinery (₹ 300 lakhs – ₹ 104 lakhs)	196
	701

(b) Balance sheet of XYZ Ltd. as at 31st March, 2025 (after reconstruction) **₹ in lakhs**

Liabilities	Amount	Assets	Amount
21 lakhs Equity Shares of ₹ 25 each	525	Land & Building	250
2 lakhs 10% Preference shares of ₹ 50 each	100	Plant & Machinery	104
9% Debentures	200	Furnitures & Fixtures	50
		Inventory	150
		Sundry Debtors (70 – 5)	65
		Cash at Bank (B/f)*	206
	825		825

*Cash at Bank

	₹ in lakhs
Opening Balance	130
(+) Sale proceeds from issue of new equity shares (6 lakh shares x ₹ 25)	150
(–) Payment of bank loan of ₹ 74 lakhs	(74)
	206

Bonus Issue

Question 39

Intel Ltd., promoted by a Trans National Company, is listed on the stock exchange holding 80%.

The value of the floating stock is ₹ 45 crores. The Market Price per Share (MPS) is ₹ 150.

The capitalization rate [Return on equity (ROE)] is 20%.

The promoters holding is to be restricted to 75% as per the norms of listing requirement. The Board of

Directors have decided to fall in line to restrict the Promoters' holding to 75% by issuing Bonus Shares to minority shareholders while maintaining the same Price Earnings Ratio (P/E).

You are required to calculate:

(i) Bonus Ratio

(ii) MPS after issue of Bonus Shares

(iii) Free float Market capitalization after issue of Bonus Shares

Note: Present all calculations in lacs

Answer

(i) No. of Bonus Shares to be issued:

Free Float Capitalization = ₹ 45 crore

Market Price Per Share = ₹ 150

$$\text{Shares of Minority} = \frac{₹\ 45\ \text{crore}}{₹\ 150} = 30\ \text{lacs}$$

Minority Share Holding (100% – 80%) = 20%

$$\text{Hence Total Shares} = \frac{30\ \text{lacs}}{0.20} = 150\ \text{lacs}$$

Promoters holding of 80% = 120 lac shares

Shares remains the same, but holding % to be taken as 75%

$$\text{Hence Total Shares} = \frac{120\ \text{lacs}}{0.75} = 160\ \text{lacs}$$

Shares of Minority = 160 lacs – 120 lacs = 40 lacs

Bonus 10 lacs for 30 lacs i.e., 1 share for 3 shares held.

(ii) Market price after Bonus issue:

Let us compute PE with given ROE as follows:

$$\text{PE} = \frac{1}{\text{ROE}} = \frac{1}{0.20} = 5$$

Market Price Given = ₹ 150

$$\text{Hence EPS will be} = \frac{₹\ 150}{5} = ₹\ 30$$

Total No. of shares before bonus issue = 150 lacs

Accordingly, Total PAT shall be = ₹ 30 x 150 lacs = ₹ 4,500 lacs

Total No. of shares after bonus issue = 150 lacs + 10 lacs = 160 lacs

$$\text{EPS after Bonus Issue} = \frac{₹\ 4{,}500\ \text{lacs}}{160\ \text{lacs}} = ₹\ 28.13$$

Market Price After Bonus Issue = ₹ 28.13 x 5 = ₹ 140.65

(iii) Free Float Capitalization after Bonus Issue

= ₹ 140.65 x 40 lacs = ₹ 5,626 lacs

Equity Buyback (Ownership Restructuring)

Question 40

Eager Ltd. has market capitalization of ₹ 1,500 crores and current market price of its share is ₹ 1,500. It made a PAT of ₹ 200 crores and the Board is considering a proposal to buyback 20% of the shares at a premium of 10% to the current market price. It plans to fund this through a 16% bank loan. The company's corporate tax rate is 30%. Calculate the post buyback Earnings Per Share (EPS).

Note: Present all calculations in crore upto 4 decimals.

Answer

Existing No. of Equity Shares = $\frac{₹\ 1,500\ \text{crore}}{₹\ 1,500}$ = 1 crore

No. of shares to be bought back = 1 Crore x 0.20 = 20 lakh

Price at which share to be bought back = ₹ 1,500 + 10% of ₹ 1,500 = ₹ 1,650

Amount required for Buyback of Shares = ₹ 1,650 x 20 lakh shares = ₹ 330 crore

Amount of Loan @ 16% = ₹ 330 crore

Statement showing Post Buyback EPS

Profit before tax (₹ 200 crore/0.70)	₹ 285.7143 crore
Less: Interest on Loan (₹ 330 crore x 16%)	₹ 52.8000 crore
Profit before Tax	₹ 232.9143 crore
Less: Tax	₹ 69.8743 crore
Profit after Tax (PAT)	₹ 163.0400 crore
No. of Shares Post buyback	80 lakh
EPS Post Buyback (₹ 163.0400 crore/80.00 lakh)	₹ 203.80

Question 41

High Growth Ltd. (HGL) was having an excellent growth over a number of years. The Board of Directors is considering a proposal to reward its shareholders by buying back 20% shares at a premium. The amount of buyback is to be paid by raising loan from the Bank. The interest on loan is to be serviced by internal accruals as supported by financials of HGL. The company has market capitalization of ₹ 15,000 crore and the current Earnings Per Share (EPS) is ₹ 600 with a Price Earnings Ratio (PER) of 25. The Board expects a post buyback Market Price per Share (MPS) of ₹ 10,000. The PER, post buyback, will remain the same. The loan can be availed at an interest rate of 10% p.a.

Applicable corporate tax rate is 30%. You are required to calculate:

(i) The interest amount which can be paid for availing the bank loan.

(ii) The loan amount to be raised.

(iii) Buyback premium per share and percentage premium paid over the current MPS.

Note: Present all calculations in crore

Answer

(i) The interest amount which can be paid for availing the bank loan

Current Market Price per Share = ₹ 600 x 25 = ₹ 15,000

$$\text{No. of Shares before Buyback} = \frac{\text{Market capitalization}}{\text{Market price of share}}$$

$$= \frac{₹\ 15{,}000 \text{ crore}}{₹\ 15{,}000} = 1 \text{ crore}$$

No. of Shares proposed to Buyback = 20% of 1 crore = 20 lakh

Total No. of Share after Buyback = 1 crore – 20 lakh = 80 lakh

Post Buyback Market Price per Share (₹) = ₹ 10,000

PE Ratio = 25

$$\text{Post Buyback EPS} = \frac{₹\ 10{,}000}{25} = ₹\ 400$$

Post Buyback Earning = ₹ 400 x 80 lakh = ₹ 320 crore

Pre Buyback Earning = ₹ 600 x 1 Crore = ₹ 600 crore

Post Tax Earning available for interest payment = ₹ 600 crore – ₹ 320 crore = ₹ 280 crore

$$\text{Pre Tax amount of Interest} = \frac{₹\ 280 \text{ crore}}{1 - 0.30} = ₹\ 400 \text{ crore}$$

(ii) $\text{Loan Amount raised} = \frac{₹\ 400 \text{ crore}}{0.10} = ₹\ 4{,}000 \text{ crore}$

(iii) Buyback Premium per Share

Amount of Loan	(A)	₹ 4,000 crore
No. of Shares to be bought back	(B)	20 lakh
Buyback Price Per Share to be paid	(C) = (A)/(B)	₹ 20,000
Current Market Price per Share	(D)	₹ 15,000
Buyback Premium per share	(E) = (C) – (D)	₹ 5,000
% Premium over current market price	(E)/(D)	33.33%

Question 42

Rahul Ltd. has surplus cash of ₹ 100 lakhs and wants to distribute 27% of it to the shareholders. The company decides to buyback shares. The Finance Manager of the company estimates that its share price after re-purchase is likely to be 10% above the buyback price, if the buyback route is taken. The number of shares outstanding at present is 10 lakhs and the current EPS is ₹ 3.

You are required to determine:

(i) The price at which the shares can be re-purchased, if the market capitalization of the company should be ₹ 210 lakhs after buyback,

(ii) The number of shares that can be re-purchased, and

(iii) The impact of share re-purchase on the EPS, assuming that net income is the same.

Answer

(i) Let P be the buyback price decided by Rahul Ltd.

Market Capitalization after Buyback = 1.1P (Original Shares – Shares Bought Back)

210 lakhs = 1.1P [10 lakhs – (27% of 100 lakhs/P)]

210 lakhs = 11 lakhs x P – 27 lakhs x 1.1

210 lakhs = 11 lakhs P – 29.7 lakhs

11 lakhs P = 210 lakhs + 29.7 lakhs

$$P = \frac{239.7}{11} = ₹\ 21.79 \text{ per share}$$

(ii) Number of Shares to be Bought Back

$$= \frac{₹\ 27 \text{ lakhs}}{₹\ 21.79} = 1{,}23{,}910 \text{ shares}$$

(iii) New Equity Shares = 10,00,000 – 1,23,910 = 8,76,090 shares

$$\therefore \text{EPS} = \frac{3 \times 10 \text{ lakhs}}{8{,}76{,}090} = ₹\ 3.43$$

Thus, EPS of Rahul Ltd., increases to ₹ 3.43.

Section B – Theory Questions

Question 1

Explain synergy in the context of Mergers and Acquisitions.

Answer

Synergy may be defined as follows: **V(AB) > V(A) + V(B)**.

In other words the **combined value of two firms** or companies **shall be more than their individual value**. Synergy is the **increase in performance of the combined firm** over what the two firms are already expected or required to accomplish as independent firms. This may be **result of complimentary services, economics of scale** or both.

A good example of complimentary activities can a company may have a good networking of branches and other company may have efficient production system. Thus the merged companies will be more efficient than individual companies.

On similar lines, economies of large scale is also one of the reasons for synergy benefits. The main reason is that, the large scale production results in lower average cost of production e.g. reduction in overhead costs on account of sharing of central services such as accounting and finances, office executives, top level management, legal, sales promotion and advertisement etc.

These economies can be "real" arising out of reduction in factor input per unit of output, whereas pecuniary economics are realized from paying lower prices for factor inputs for bulk transactions.

Question 2

Write a short note on Horizontal Merger and Vertical Merger.

Answer

Horizontal Merger:

The **two companies which have merged are in the same industry**, normally the market share of the new consolidated company would be larger and it is possible that it may **move closer to** being a **monopoly** or a near monopoly to avoid competition.

Vertical Merger:

This **merger happens when two companies that have 'buyer-seller' relationship** (or potential buyer-seller relationship) come together.

Question 3

What is take over by reverse bid or Reverse Merger?

Answer

In ordinary cases, the company taken over is the smaller company; in a 'reverse takeover', a **smaller company gains control of a larger one**. The concept of takeover by reverse bid, or of reverse merger, is thus not usual case of amalgamation of sick unit which is non-viable with healthy or prosperous unit

but is a case whereby the entire undertaking of the healthy and prosperous company is to be merged and vested in the sick company which is non-viable. A company becomes a sick industrial company when there is erosion in its net worth. This alternative is also known as taking over by reverse bid.

The **three tests should be fulfilled before an arrangement can be termed as a reverse takeover** is specified as follows:

(i) the **assets of the transferor company are greater** than the transferee company,

(ii) **equity capital to be issued by the transferee** company pursuant to the acquisition **exceeds its original issued capital**, and

(iii) the **change of control in the transferee** company through the introduction of a minority holder or group of holders.

This type of merger is also known as 'back door listing'. This kind of merger has been started as an alternative to go for public issue without incurring huge expenses and passing through cumbersome process. Thus, it can be said that reverse merger **leads to following benefits for acquiring company**:

(i) **Easy access to capital market.**

(ii) Increase in visibility of the company in corporate world.

(iii) **Tax benefits on carry forward losses** acquired (public) company.

(iv) **Cheaper and easier route to become a public company.**

Question 4

What is an equity carve out? How does it differ from a spin off?

OR

Reconcile differences between Equity Carve out and Spin Off.

Answer

Spin-off

In this case, a **part of the business is separated and created as a separate firm**. The **existing shareholders of the firm get proportionate ownership**. So there is no change in ownership and the same shareholders continue to own the newly created entity in the same proportion as previously in the original firm. The management of spin-off division is however, parted with. **Spin-off does not bring fresh cash.**

Equity Carve outs

This is like spin off, however, **some shares of the new company are sold in the market by** making a **public offer, so this brings cash**. More and more companies are using equity carve-outs to boost shareholder value. A parent firm makes a subsidiary public through an initial public offering (IPO) of shares, amounting to a partial sell-off. A new publicly-listed company is created, but the **parent keeps a controlling stake in the newly traded subsidiary**.

A carve-out is a strategic avenue a parent firm may take when one of its subsidiaries is growing faster and carrying higher valuations than other businesses owned by the parent. A carve-out generates cash because shares in the subsidiary are sold to the public, but the issue also unlocks the value of the subsidiary unit and enhances the parent's shareholder value.

CHAPTER - 15
Startup Finance

Section B – Theory Questions

Question 1

Explain Startup India Initiative.

OR

What is a startup to avail the benefits of government scheme?

OR

As per GSR Notification dated 19th February 2019, what conditions an entity need to satisfy to be considered as a startup?

OR

Enlist the criteria for an entity to be classified as a Startup entity under the Startup India Scheme initiated by the Government of India.

Answer

As per GSR Notification 127 (E) dated 19th February 2019, an **entity shall be considered as a Startup:**

(i) **Upto a period of 10 years from the date of incorporation**/registration, if it is incorporated as a private limited company (as defined in the Companies Act, 2013) or registered as a partnership firm (registered under section 59 of the Partnership Act, 1932) or a limited liability partnership (under the Limited Liability Partnership Act, 2008) in India.

(ii) **Turnover** of the entity for any of the financial years since incorporation/registration has **not exceeded 100 crore rupees.**

(iii) Entity is **working towards innovation, development or improvement of products** or processes or services, or if it is a scalable business model with a high potential of employment generation or wealth creation.

Provided that an **entity formed by splitting up or reconstruction** of an existing business shall **not** be **considered a Startup.**

Question 2

Explain some of the innovative sources for funding a start-up.

OR

What are some of the innovative ways to finance a start up?

OR

Non-bank Financial Sources are becoming popular to finance Start-ups. Discuss.

OR

Personal Financing is one of the innovative ways to finance a startup. Discuss other methods.

OR

Mr. R has completed his studies and wants to start his new online business. For a successful online

business there are various expenditure costs with regards to advertisement & application development. To make the business successful he wants to raise funds. Explain some of the innovative sources for funding a start-up.

Answer

Some of the sources for funding a startup:

(i) **Personal financing:** It may not seem to be innovative but you may be surprised to note that most budding entrepreneurs never thought of saving any money to start a business. This is important because most of the investors will not put money into a deal if they see that you have not contributed any money from your personal sources.

(ii) **Personal credit lines:** One qualifies for personal credit line based on one's personal credit efforts. Credit cards are a good example of this. However, banks are very cautious while granting personal credit lines. They provide this facility only when the business has enough cash flow to repay the line of credit.

(iii) **Family and friends:** These are the people who generally believe in you, without even thinking that your idea works or not. However, the loan obligations to friends and relatives should always be in writing as a promissory note or otherwise.

(iv) **Peer-to-peer lending:** In this process group of people come together and lend money to each other. Peer to peer to lending has been there for many years. Many small and ethnic business groups having similar faith or interest generally support each other in their start up endeavors.

(v) **Crowdfunding:** Crowdfunding is the use of small amounts of capital from a large number of individuals to finance a new business initiative. Crowdfunding makes use of the easy accessibility of vast networks of people through social media and crowdfunding websites to bring investors and entrepreneurs together.

(vi) **Microloans:** Microloans are small loans that are given by individuals at a lower interest to a new business venture. These loans can be issued by a single individual or aggregated across a number of individuals who each contribute a portion of the total amount.

(vii) **Vendor financing:** Vendor financing is the form of financing in which a company lends money to one of its customers so that he can buy products from the company itself. Vendor financing also takes place when many manufacturers and distributors are convinced to defer payment until the goods are sold. This means extending the payment terms to a longer period for e.g. 30 days payment period can be extended to 45 days or 60 days. However, this depends on one's credit worthiness and payment of more money.

(viii) **Purchase order financing:** The most common scaling problem faced by startups is the inability to find a large new order. The reason is that they don't have the necessary cash to produce and deliver product. Purchase order financing companies often advance the required funds directly to the supplier. This allows the transaction to complete and profit to flow up to the new business.

(ix) **Factoring accounts receivables:** In this method, a facility is given to seller who has sold good on credit to fund his receivables till amount is fully received. So, when the goods are sold on credit, and the credit period (i.e. the date upto which payment shall be made) is for example 6 months, the factoring company will pay most of the outstanding amount upfront. The balance amount will be paid on due date once the factoring company has received the full amount from customer after deducting its interest charges. In this way, startup can raise funds to pay its day-to-day expenses.

Question 3

Peer-to-Peer Lending and Crowd funding are same and traditional methods of funding. Do you agree? Justify your stand.

OR

How Peer to Peer funding different from Crowd Funding?

Answer

No, I do not agree with the given statement because while **peer-to-peer lending is in existence for many years, the crowd funding is contemporary source of finance** for Startup finance.

Peer-to-peer lending: In this process **group of people come together and lend money to each other**. Many small and ethnic business groups having similar faith or interest generally support each other in their start up endeavors

Crowdfunding: Crowdfunding is the **use of small amounts of capital from a large number of individuals to finance a new business initiative**. Crowdfunding makes use of the easy accessibility of vast networks of people through social media and crowdfunding websites to bring investors and entrepreneurs together.

Question 4

What do you mean by Pitch Presentation in context of Start-up Business?

OR

Explain Pitch Presentation. List the methods for approaching a Pitch Presentation.

OR

During Pitch Presentation to convince the investors to put money into the proposed business, how promoters deal with following points:

(i) Problem (ii) Solution (iii) Marketing/Sales (iv) Business Model

Answer

Pitch presentation is a short and brief presentation (not more than 20 minutes) **to investors explaining about the prospects of the company and why they should invest into the startup business**. So, pitch deck presentation is a brief presentation using PowerPoint to provide a quick overview of business plan and convincing the investors to put some money into the business. A pitch presentation can be **made either** during **face-to-face** meetings **or online meetings** with potential investors, customers, partners, and co-founders.

Some of the methods as how to approach a pitch presentation are as follows:

(i) **Introduction:** Introduction of the startup and a brief account of yourself.

(ii) **Team:** The next step is to introduce the audience the people behind the scenes. The reason is that the investors will want to know the people who are going to make the product or service successful.

(iii) **Problem:** The promoter should be able to explain the problem he is going to solve and solutions emerging from it.

(iv) **Solution:** It is very important to describe in the pitch presentation as to how the company is planning to solve the problem.

(v) **Marketing/Sales:** This is a very important part where investors will be deeply interested. The market size of the product must be communicated to the investors. The promoter can brief the investors about the growth and forecast future revenue.

(vi) **Projections or Milestones:** Projected financial statements can be prepared which gives an organization a brief idea about where is the business heading. It tells us that whether the business will be making profit or loss. Some projected statements may be presented like, Income Statement, Cash Flow Statement, Balance Sheet etc.

(vii) **Competition:** Every business organization has competition even if the product or service offered is new and unique. It is necessary to highlight in the pitch presentation as to how the products or services are different from their competitors.

(viii) **Business Model:** The term business model is a wide term denoting core aspect of a business including purpose, business process, target customers, offerings, strategies, infrastructure, organizational structures, sourcing, trading practices, and operational processes and policies including culture.

(ix) **Financing:** If a startup business firm has raised money, it is preferable to talk about how much money has already been raised, who invested money into the business and what they did about it.

Question 5

Explain the concept of Bootstrapping and describe various methods of bootstrapping used by start-ups.

OR

An individual attempts to found and build a company from personal finances or from the operating revenues of the new company. What this method is called? Discuss any two methods.

OR

What is the mode of financing is called in Startups, when a person attempts to found & build a company from personal finances or from the operating revenues of a new company? Explain briefly the methods of this mode.

Answer

An individual is said to be **boot strapping when** he or she attempts to found and **build a company from personal finances or from the operating revenues of the new company.**

Here are some of the methods in which a startup firm can bootstrap:

(i) **Trade Credit:** When a person is starting his business, **suppliers are reluctant to give trade credit**. They will insist on payment of their goods supplied either by cash or by credit card. However, a way out in this situation is to **prepare a well-crafted financial plan.** The next step is to pay a visit to the supplier's office. If the business organization is small, the owner can be directly contacted. On the other hand, if it is a big firm, the Chief Financial Officer can be contacted and convinced about the financial plan.

(ii) **Factoring:** This is a financing method where **accounts receivable** of a business organization **is sold to a commercial finance company to raise capital**. The factor then got hold of the

accounts receivable of a business organization and assumes the task of collecting the receivables as well as doing what would've been the paperwork. Factoring can be performed on a non-notification basis. It means customers may not be told that their accounts have been sold.

(iii) **Leasing:** Another popular method of bootstrapping is to **take the equipment on lease rather than purchasing** it. It will reduce the capital cost and also help lessee (person who take the asset on lease) to claim tax exemption. So, it is better to take photocopy machine, automobile or van on lease to avoid paying out lump sum money which is not at all feasible for a startup organization.

Question 6

Explain Angel Investors.

OR

Briefly explain how Angel Investors finance the Startups.

OR

Who are Angel Investors and how they are different from Venture Capitalists?

OR

Define Angle Investors, are these only individuals? If not, list the entities.

OR

"Angel Investors provide more favourable terms than other lenders." Explain.

Answer

Angel investors **invest in small startups** or entrepreneurs. Often, **angel investors are entrepreneur's family and friends**. The capital angel investors **provide** may be a **one-time investment** to help the business propel or an ongoing injection of money to support and carry the company through its difficult early stages.

Angel investors **provide more favorable terms compared to other lenders**, since they usually invest in the entrepreneur starting the business rather than the viability of the business. Angel investors are focused on helping startups take their first steps, rather than the possible profit they may get from the business. Essentially, angel investors are the opposite of venture capitalists.

Angel investors are **also called informal investors, angel funders, private investors, seed investors or business angels**. These are affluent individuals who inject capital for startups in exchange for ownership equity or convertible debt. Some angel investors invest through crowdfunding platforms online or build angel investor networks to pool in capital.

Angel investors typically use their own money, unlike venture capitalists who take care of pooled money from many other investors and place them in a strategically managed fund.

Though angel investors usually represent individuals, the entity that actually provides the fund **may be a limited liability company, a business, a trust or an investment fund,** among many other kinds of vehicles.

Angel investors who seed startups that fail during their early stages lose their investments completely. This is why professional angel investors look for opportunities for a defined exit strategy, acquisitions or initial public offerings (IPOs).

Question 7

Write a short note on Venture Capital Fund.

Answer

Venture Capital Fund means **investment vehicle that manage funds of investors** seeking to **invest in startup firms** and small businesses **with exceptional growth potential**. Venture capital is money provided by professionals who alongside management invest in young, rapidly growing companies that have the potential to develop into significant economic contributors.

Venture Capitalists generally:

- Finance new and rapidly growing companies
- Purchase equity securities
- Assist in the development of new products or services
- Add value to the company through active participation.

Question 8

State briefly the basic characteristics of venture capital financing?

OR

'Venture Capital Financing is a unique way of financing Startup'. Discuss.

Answer

Basic characteristics of Venture Capital Financing:

(i) **Long time horizon**: The fund would invest with a long-time horizon in mind. Minimum period of investment would be 3 years and maximum period can be 10 years.

(ii) **Lack of liquidity**: When VC invests, it takes into account the liquidity factor. It assumes that there would be less liquidity on the equity it gets and accordingly it would be investing in that format. They adjust this liquidity premium against the price and required return.

(iii) **High Risk**: VC would not hesitate to take risk. It works on principle of high risk and high return. So, high risk would not eliminate the investment choice for a venture capital.

(iv) **Equity Participation**: Most of the time, VC would be investing in the form of equity of a company. This would help the VC participate in the management and help the company grow. Besides, a lot of board decisions can be supervised by the VC if they participate in the equity of a company.

Question 9

Explain advantages of bringing Venture Capital in the company.

Answer

Advantages of bringing VC in the company:

(i) It **injects long-term equity finance** which provides a solid capital base for future growth.

(ii) The **venture capitalist is a business partner, sharing both the risks and rewards**.

(iii) The venture capitalist is able to **provide practical advice and assistance to the company** based on past experience with other companies which were in similar situations.

(iv) The venture capitalist **also has a network of contacts** in many areas that can add value to the company.

(v) The venture capitalist may be **capable of providing additional rounds of funding** should it be required to finance growth.

(vi) Venture capitalists are **experienced in process of** preparing company for initial public offering (**IPO**) of its shares onto the stock exchanges or overseas stock exchange such as NASDAQ.

(vii) They can also **facilitate a trade sale**.

Question 10

Explain various stages of Venture Capital Funding.

OR

Venture Capital Funding passes through various stages. Discuss.

Answer

The various stages of Venture Capital Funding are as follows:

(i) Seed Money: Low level financing needed to prove a new idea.

(ii) Start-up: Early stage firms that need funding for expenses associated with marketing and product development.

(iii) First-Round: Early sales and manufacturing funds.

(iv) Second-Round: Working capital for early stage companies that are selling product, but not yet turning in a profit.

(v) Third-Round: Also called Mezzanine financing, this is expansion money for a newly profitable company.

(vi) Fourth-Round: Also called bridge financing, it is intended to finance the "going public" process.

Question 11

Explain Indicative Risk Matrix of each stages of funding for Venture Capital Financing.

OR

"For a Venture Capitalist while the risk is different in each stage of financing so the risk perception and activity to be financed". Explain this statement.

Answer

Yes, risk in each stage is different stage of Venture Capital financing and so risk perception and activity to be financed as per indicative Risk matrix is given below:

Financial Stage	Period (Funds locked in years)	Risk Perception	Activity to be financed

Seed Money	7-10	Extreme	For supporting a concept or idea for product development and involves low level of financing.
Start Up	5-9	Very High	Initializing prototypes operations or developing products and its marketing.
First Stage	3-7	High	Started commercials production and marketing.
Second Stage	3-5	Sufficiently high	Expanding market and growing working capital need though not earning profit.
Third Stage	1-3	Medium	Market expansion, acquisition & product development for profit making company. Also called Mezzanine Financing.
Fourth Stage	1-3	Low	Facilitating public issue i.e. going public. Also called Bridge Financing.

Question 12

"A Limited Partnership Entity, in India, is not recognized for the purpose of Venture Capital Fund." Do you agree? Briefly explain the structure of Venture Capital Fund in India.

OR

Explain alternatives available to offshore investors for investments in Venture Capital Funds in India.

Answer

Yes, agree with the statement.

Three main types of fund structure exist: one for domestic funds and two for offshore ones:

(a) Domestic Funds: Domestic Funds (one **which raises funds domestically**) are **structured as:**

(i) A **domestic vehicle for the pooling of funds from the investor**, and

(ii) A **separate investment adviser** that carries those duties of asset manager.

The **choice of entity for the pooling vehicle falls between a trust and a company**, (India, unlike most developed countries does not recognize a limited partnership), with the trust form prevailing due to its operational flexibility.

(b) Offshore Funds: Two common **alternatives available to offshore investors are**:

Offshore structure

Under this structure, an **investment vehicle** (an **LLC or** an **LP organized** in a jurisdiction **outside India) makes investments directly into Indian** portfolio **companies**. Typically, the **assets are managed by an offshore manager**, while the investment advisor in India carries out the due diligence and identifies deals.

Unified Structure

When domestic investors are expected to participate in the fund, a unified structure is used. Overseas investors pool their assets in an **offshore vehicle** that **invests in a locally managed trust, whereas domestic investors directly contribute to the trust**. This is later device used to make the local portfolio investments.