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Module-B ABFM

CAIIB PAPER-3

Advanced Concepts of Financial Management

CAIIB Paper 3 (ABFM) Module B: Advanced Concepts of Financial Management

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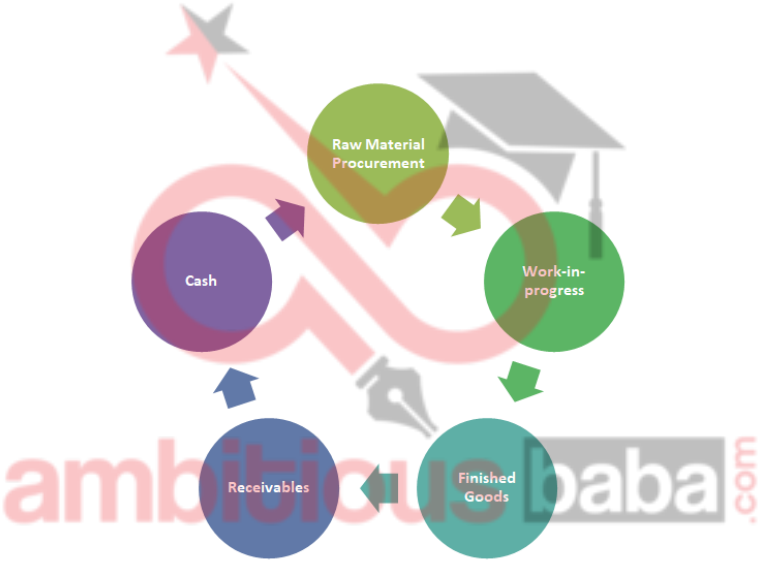
CAIIB Paper 3 (ABFM) Module B Unit 1: Sources Of Finance and Financial Strategies

Introduction

- **Owners or promoters**: finance to start the business is generally provided by the persons who moot the idea of business.
- Since the owners are going to stay with the project, their **finance is long term finance.**
- However, if the project is too big and the promoters do not have enough money, normally long-term borrowing is preferred.
- Since at times, processing of term loans takes time, promoters also go in for bridge finance which is a temporary funding to fill the time gap between the fund requirement and the actual release by the long-term lenders.
- Term finance is provided **by banks and financial institutions**.
- **Debt equity ratio:** Which means how much ideally promoters should contribute as equity and how much they should borrow for long term.
- **This depends on various factors but the general and safe norm is if equity is Rs. 100, one can safely borrow up to Rs. 200. [2:1]**
- **The entire requirement of long-term funds will depend on the size and capital requirement of the project.**
- **Working capital finance:** The finance required for running a business [Current assets - current liabilities]
- **Current assets:** Which are created and extinguished in an operational cycle.
- **An operational cycle**: Time or period in which cash, after going through various forms is converted back into cash.

- **For example, with cash you buy raw materials that are converted into finished goods through work in process and later when the finished goods are sold, they are converted into debtors or receivables and upon realisation or debt collection, the cash comes back into the business.**
- Clearly, you need funds for all these activities and functions before you realise profits.
- Like in any business, and depending on the creditworthiness of the business entity and the established norms, credit is generally available for procuring goods.
- Therefore, to that extent, fewer funds are required.
- The gap between these assets and the said liabilities is the working capital gap which can be financed by a bank.
- However, the bankers will always insist on the borrower to provide his contribution towards the gap.
- The quantum of working capital finance varies from time to time based on the level of business activities and the gap.



- It also depends on how you manage and minimise the gap.
- Financial strategies are those permutations and combinations which a business adopts or avails to satisfy its funds requirements, whether these are long-term or short-term.
- Strategies are so worked out as to maximise the advantages and minimise the cost of funds.
- A clean finance is the costliest, because the lender who has no assets to fall upon in case of a default and runs higher risks which he would cover by charging higher rate of interest.
- Equity is a clean finance and although it appears to be cheap, the cost of servicing is very high because the equity shareholders will expect good returns over the

years in the form of dividend, which is always distributed after the company pays its taxes.

Equity Capital

- Capital generally means the amount invested for establishing a business which is owned by the promoter.
- In accounting terms, it means the amount remaining after selling all the assets and paying off all the liabilities.
- It also represents the money the owner brought in at the time of setting up the business and the profits he earned but did not take away over a period of time.
- Over a period of time, as business developed, various forms of organisations or entities evolved with the arrival of corporates.
- A corporate has hordes of investors who come from various walks of life and who may neither know one another nor may be related to each other.
- It was at the time of arrival of corporates, that the term Equity got coined.
- Equity means a quality of being fair or impartial, something that is fair and just.

Equity capital has the following features as well as advantages;

- ✓ Each unit has the same value **called nominal value.**
- ✓ Equity holder has two types of financial rights; the right to income (dividend) and the right to retaining surplus assets in case of liquidation.
- ✓ Additionally, they also have voting rights (except in case of Differential Voting Right shares), whenever so required by the governing act viz. Companies Act, 2013
- ✓ Anyone can buy or subscribe to any number of Equity Shares subject the terms and conditions prescribed in the Articles of Association of the Company
- ✓ All subscribers to the Equity Shares are governed by a common document **called Memorandum and Articles of Association**
- ✓ All subsequent transferees of such shares also have to abide by the above document.
- ✓ The Equity Shareholder can exit at will by following the prescribed rules.
- ✓ If the company is listed on a stock exchange, the liquidity of the Equity Shares increases since the holder can sell it to anyone through the exchange.
- ✓ Equity Shares can be priced by the issuer at the nominal value or at a premium or discount subject to extant regulations and guidelines.
- ✓ Also, subject to extant regulations and guidelines, Equity Capital can be enhanced, reduced, subdivided, bought back or issued free of cost.

Some other terms related to the equity capital are:

Authorised Capital or Nominal Capital.

- ✓ This represents the maximum amount of capital that the company is authorised to issue which can be in any instalments as the Board decides.
- ✓ This is prescribed by the Memorandum and Articles of Association of the Company and in case of any change, the company has to go to the shareholders as prescribed in the Act.

Issued Share Capital

- ✓ The part of authorised capital which is issued to public for subscription.
- ✓ This includes shares issued for cash and for consideration other than cash to promoters of a company or other people.

Subscribed Share Capital;

- ✓ It is the portion of the issued share capital that is subscribed to by the public, i.e., applied for and allotted by the company.
- ✓ It also includes the face value of the company's shares issued for consideration other than cash.
- ✓ It is possible that all the shareholders, who have been called upon to subscribe to the capital, may not respond and therefore the actual subscribed capital may be less than the called up one.

Called-up Share Capital:

- ✓ This is that part of the Issued Capital that the company has called up from the shareholders. The call can be one or more subject to the extant regulations and need of funds by the company.

Paid up Share Capital:

- ✓ Paid up capital is the amount of money a company has received from shareholders in exchange of shares.
- ✓ However, even after subscription, some may skip or delay the actual payment and, in such case, the paid-up capital can still be lesser than the subscribed capital.
- ✓ Calls in Arrears are a part of the called up or subscribed capital which the company can follow up and rightfully collect when the shareholders fail to pay the full or part amount.
- ✓ Unpaid Share Capital is, as the name suggests, the amount finally determined as unpaid for which the management can take suitable decision.
- ✓ Forfeited Shares are that part of the subscribed capital which is not fully paid as required and as a final resort, the company forfeits the **amount so that it can be reissued as the Board decides, subject to the regulations.**

Why Equity Capital and not Long-Term Loans?

- **Except owners or promoters, no one would be able to take the inherent risk.**
- **The relations and friends also can be convinced to take or participate in the risk.**

- **Lenders can never assume the risk because they are interested in the immediate and guaranteed return or reward.**
- **Hence equity is a natural choice and the first option to raise funds.**

Depending of the size of the project, the equity portion is determined. Apart from the natural and the first choice, raising funds through equity have quite a few advantages which are enumerated below:

- ✓ Although there is expectation, the equity holders are not required to be paid compulsorily any reward or interest or compensation.
- ✓ Unlike loans, there is no repayment involved.
- ✓ It provides the risk capital which otherwise is difficult to source.
- ✓ It gives to the holder a sense of ownership
- ✓ Higher amount of equity provides higher level of safety and confidence to the lenders.

Internal Accruals

As a measure of financial prudence, no company can or would like to distribute the entire earnings after tax to the shareholders.

There are also dividend distribution rules which the regulators want the management to follow.

As a result, part of the Profit After Tax (PAT) is retained in the company, which is usually reflected in the general reserve.

These retained profits are internal accruals of the company.

These arise out of the cash profits i.e.

- ✓ PAT,
- ✓ Non-cash profits charged to the Profit & Loss account, in the form of provisions or reserves
- ✓ Depreciation charged to the Profit & Loss account.

Advantages:

- ✓ There is no restriction on the use of internal accruals, except as mentioned above.
- ✓ These can be used for long term as well as short term purposes.
- ✓ Internal accruals do not have any cost for use or servicing
- ✓ Internal accruals are readily available.
- ✓ Internal accruals are as liquid as the form in which these remain invested.
- ✓ The use or availing of internal accruals does not change the ownership structure or results in the dilution of control.
- ✓ There is no cost of raising these funds.

Disadvantages

- ✓ Just because internal accruals are readily and easily available, there is tendency of indiscriminate application of retained earnings.

- ✓ The cost of these funds in reality is higher because these represent undeclared dividend.
- ✓ These funds, therefore, belong to the equity shareholders and they expect reasonable return on these.
- ✓ Retained earnings are deprivation of dividend and over- use of such earnings may hurt the shareholders particularly the minority shareholders.
- ✓ The company cannot build a good dividend track record resulting into lesser interest by investing public.
- ✓ Safety cover provided by the retained earnings is reduced by the use of it.
- ✓ The ease of use and no cost element induces the management to lock up the funds in projects which may not be as well scrutinised as the ones undertaken with IPO proceeds or borrowed funds. This hurts the equity holders.

Preference Capital

This is that part of the capital which provides lesser risk to the investor compared to that which is taken by the equity investors. As the name suggests, the holder gets a preference with respect to dividend as well as payment is case of liquidation, which is one of the major monetary considerations for any investor. It is a quasi-risk capital because it is not as safe as secured debts which get payment priority over preference shares in case of liquidation of a company. Host of regulations with regard to the issue of preference shares exist. If equity is a common stock, preference share is preferred stock.

Let's now see what are the main features of the preference capital:

- ✓ It is a stock which is preferred over equity shares with regards to the payment of dividend and repayment in case of liquidation.
- ✓ Unlike equity capital, the dividend rate of preference share is fixed just like debentures.
- ✓ Generally speaking, the preference shares are entitled to dividend if distributable profits are available and hence dividend distribution is not obligatory like equity capital.
- ✓ Like equity capital, preference shares are paid dividend out of post-tax profits and hence the dividend on preference shares is not a tax-deductible expense.
- ✓ There are cumulative preference shares where the dividend is guaranteed. In other words, if in a year the company does not have enough profits to declare dividend, it is accumulated to the credit of the shareholders and paid when, in a subsequent year, the distributable surplus is available.
- ✓ Redeemable Preference Shares are those which get repaid as per the terms of issue. Under the current provisions of the **Companies Act, 2013, companies** limited by shares are prohibited from issuing Preference Shares which are not redeemable. All the preference shares are required to be redeemed within a **period not exceeding 20 years**. Redemption has to be made out of profits or out of the proceeds of fresh share issue for such redemption purpose. However, in case of banks, perpetual debt instruments can be issued.
- ✓ Preference shareholders have a limited right to participate in voting only on some of the resolutions as specified in the Companies Act, 2013. Where dividend

on preference shares **has not been paid for two years or more**, such shareholders get a right to vote on all company resolutions.

Why companies raise preference capital and the reasons are not far away to find:

- ✓ It is a good source of funds for very long period up to twenty years. In case of infrastructure companies, the period can even be more than twenty years.
- ✓ Mostly such securities are privately placed and hence the cost of raising such funds is not high.
- ✓ There is no compulsion to pay dividend unless cumulative preference shares are issued.
- ✓ The recurring cost in the form of dividend is fixed and known beforehand unlike dividend on equity shares.
- ✓ The current owners do not have to dilute their equity holding and hence they retain the present level of control over management.
- ✓ It is a part of the net worth of the company and hence it helps is improving the debt equity ratio.
- ✓ Absence of voting rights, unless the company skips dividend for two or more years, gives a comfort to the management who generally does not like interference.
- ✓ No security is provided to the preference shareholder unlike in case of debentures.

However, there are certain drawbacks, from the point of view of the management and the equity shareholders, which are enumerated below.

- ✓ Possibility of management interference in case of non-payment of dividends for more than two years.
- ✓ Dividend paid is a non-deductible expenditure which increases the real cost of funding.
- ✓ Redemption reserves are to be created leading to lower retained earnings which in turn may affect long term capital out lay plans to be funded out of internal accruals.
- ✓ Equity shareholders feel side-lined when the preference for dividend payout is given to preference shareholders.
- ✓ In case of liquidation, these shareholders get prior charge over the residual assets compared to the equity shareholders.
- ✓ Contingency of voting right devolution to these shareholders creates uncertainty and apprehension in the mind of the management.

Term Loans

- This is another major source of long-term finance by which a company can obtain term loans from banks or financial institutions.
- While banks also give working capital finance, the Financial Institutions are allowed to give only such loans which are repayable over the years as per the terms and conditions of the sanction.

- This source is different from equity and relatively, cheaper to service. The equity forms are either a permanent source where repayment is not there or a **very long period like 20 years** is available for repayment in the case of preference shares or capital. Term loans can be for long to medium terms stretching to about ten years.

The main features of Term Loans are described below:

- **Period:** All loans, except demand loans, are term loans and are generally granted for short terms to long terms. Short term loans are repaid within a year. **Long term is period from 5 to 10 years and medium term is a range from 1 to 5 years.** This is the period within which the loans are to be fully repaid. Loans granted for housing are generally for **long period ranging from 5 years to 30 years.**
- **Purpose:** Term loans are granted to acquire assets like land, buildings, plant and machinery to establish a factory or set up a project which are tangible and have a long useful life. For the reasons such as long gestation period, slow start to cash generation cycle and longer life, a longer period is granted for repayment. If the project is already running and loan is taken for capacity build up, a **shorter period up to 5 years** will suffice as cash flows are already there. Short to medium term loans are preferred for other tangible assets such computers, peripherals, furniture, renovations etc. Loans are also granted for housing and soft furnishing.
- **Interest**: Term loans carry a fixed and predetermined rate of interest. The rate to be charged is negotiated and depends upon factors such as period, risk, rating of the borrower or creditworthiness as well as the purpose. Interest is payable either monthly or quarterly and sometimes it is embedded into the equal monthly instalment (EMI) which combine both interest and principal.
- **Repayment:** Loans are generally repaid over the granted period and generally in instalments which are monthly, quarterly, half yearly or yearly. In some specific but time bound acquisition of assets, there is recovery by bullet payment in one shot. Moratorium is granted for principal repayments where projects are large and cash generations are likely to take time.
- **Currency:** In many large projects, the import component of assets is quite large where the loans are granted in foreign currency to facilitate proper requirement, since the quotations are foreign currency denominated and by the time the actual import takes place the INR element may be a different amount.
- **Security:** Uncertainty over a long period obviously enhances risk perception and so also insecurity in the mind of the lender. Even otherwise, no lender can or will lend without securing the term loan by creating charge over the primary assets.
- **Amount of loan**: In case of purchase of existing assets, the lender carries out an independent valuation and after providing a margin to cover value fluctuation and borrower's margin or contribution, the loan amount is determined. In cases where the term loan is for creation of fixed assets by the borrower, the loan amount is arrived at by the debt/equity ratio, as decided by the lender.

- **Appraisal:** The appraisal process of a term loan by the lender depends on the size and complexity of the project financed. However, no term loan is granted without examining the economic viability and technical feasibility.
- **WCTL:** This is not a type of normal term loan given by any bank or Financial Institution. It is a term loan against the current assets. It is used in the banking industry when a working capital loan, given by a bank, is not being properly serviced by the borrower due to temporary liquidity constraints.
- **Conversion:** Conversion of loan into equity is generally not a planned action except when the banks and the borrower agree upfront to convert loans into equity at a later stage. In such a case, at the expiry of the agreed term, the loan is converted into the equity of the borrower. The valuation mechanism is pre-agreed. Sometimes, it is optional for the lender to convert.
- **Moratorium:** It takes time for any project to start generating cash flows, positive cash flows and profits. Bigger the project, longer the time. Therefore, till such time the borrower starts generating required cash flows, the lenders give time to start the repayment.

A list of typical terms, conditions and requirements incorporated in the loan agreements.

- Reconstitution of the board.
- Induction of the independent directors.
- A seat on the board.
- Prior consent or approval of the lender required for following actions: Examples; Mergers, hiving off, restructuring, new projects, equity expansion or dilution, investments in or creation of subsidiaries, fresh or big funding exercise etc.
- Statutory registrations or approvals.
- Infusion of additional funds by the promoters.
- Prohibition on withdrawal of loans or funds already brought in by the promoters.
- Consent required of the lender if any other loans are being repaid.
- Restrictions on dividend pay-outs.
- Submission of quarterly data and annual audited financial statements.
- Requirements of rating by independent and reputed rating agency.
- Ceiling on further borrowings.
- Inspections and visits.
- Insisting on First charge failing which pari-passu charge.
- Prohibition on creating further charges.
- Pledge of promoters' shares or collaterals of personal assets of the promoters.
- Restrictions on promoters' right to dispose their shares.
- Appointment of compliance officers and proper Key Managerial Persons.
- Strong Corporate governance.
- Maintenance of prudent financial ratios including debt equity.

Debentures

- **Section 2(30) of the Companies Act, 2013 defines "debenture**" which includes debenture stock, bonds or any other instrument of a company evidencing a debt, whether constituting a charge on the assets of the company or not. In other words, it is a written instrument acknowledging debt by the company promising repayment at a certain future date.
- This is another form of long- term borrowing targeted at various individuals or institutions that subscribe to the issue and pay to the company. The terms of issue like tenure, rate of interest, denomination, minimum subscription, total issue size etc. all form part of the issue document.

The following are the main features of debentures:

Features:

- **An instrument**: Debenture is an instrument issued by the borrower company promising to pay, at fixed future date, a certain amount to the holder.
- Agreement or deed. If debentures are issued to more than 500 persons, Trustees are required to be appointed to look after interest of the debenture holders.
- **Regulations**: Section 71 of the companies Act, 2013 contains provisions relating to issue of debentures covering the points such as manner, procedures, convertibility, voting rights, redemption, creating reserves, prospectus or invitation, trust etc.
- **Fixed tenure:** Loans are repaid in instalments over a period of time. On the other hand, debentures are repaid on a fixed date on expiry of the term. Repayment on maturity is also called redemption. Perpetual bonds are also permitted to be issued.
- **Fixed rate of interest**: The rate of interest is also prefixed. In case of so called, Zero- Coupon bonds also, a fixed rate of interest, payable at the time of redemption, is involved as these are issued at a discount to their redemption value.
- **Options with the issuer**: The company issuing debentures can incorporate an option like call option where it can repay the principal before due date at a fixed price. This is called call option.
- **Option with the investor**: The mpany issuing debentures can incorporate an option like put option where the investor has the option to demand redemption before due date at a fixed price. This is called put option.
- **No voting rights**: Section 71(2) of the Companies Act,2013 prohibits giving any voting rights to a debenture holder.
- **Stake in the company**: In case of convertible (wholly or partly) debentures, which are permitted to be issued, the debenture holder gets an equity stake in the company after conversion in the equity followed by voting rights. The ratio of conversion as well as the price at which shares will be valued is indicated in the offer document.

Types of debentures:

- **Based on tenure**: There are debentures specifying redemption with call options, put options, or with fixed tenure under this kind. Perpetual bonds with call option, are also permitted to be issued.
- **Based on security**: Many a times, to offer lower rate of interest and a sense of security to the investors, secured debentures are issued providing first or second charge over the fixed assets of the company and appointing trustees if the number of holders exceeds 500.
- **Based on Convertibility**: To provide additional incentive to the investors, the companies issue partly or fully convertible debentures so that at a future date, upon conversion, the debentures holders can be growth participants and also have voting rights.
- **Based on negotiability**: The debenture is a debt instruments and mostly transferable by way of a registered transfer form. However, in case of bearer debentures the transfer takes place by mere delivery. Such debentures are rare due to concerns such as money laundering and benami transactions.

Advantages and disadvantages:

- Advantages emanate from the features of debentures such low cost of raising of funds, known and fixed future interest liability, known date of redemption liability facilitating planning of fund management, no dilution of owners' equity and management powers, flexibility to provide negotiated cost of servicing and redemption period beforehand, some of which are not available in Institutional Long Terms where the company does not have as much bargaining power.
- Disadvantages are that once issued, no negotiation of terms is possible, rating requirement may create some unanticipated problems, statutory requirement of creating reserve funds and investment there of and finally you deal with numerous investors as against one lender in case of Long-Term Loan.

CAIIB Paper 3 (ABFM) Module B Unit 2: Financial And Operating Leverages

Financial Leverage

- The owners of a business (equity shareholders), aim to enhance return on their investment.
- The measure of this return is Earning Per Share (EPS).
- When they conduct business without any debt, they achieve a certain EPS in the normal course of business.
- If they bring more equity, the profit in absolute terms will increase but the EPS will remain the same.
- Financial leverage means enhancing EPS without shareholders bringing money themselves but by borrowing.
- Through debt, an organisation will acquire assets which will add value to the business.

- The assumption here is that the cost of the borrowed funds will be less than the value added by these additional assets, purchased through the debt/borrowing

Calculating Financial Leverage

There is no one standard formula to calculate financial leverage. The important common methods to calculate it are as under:

- **Debt- to- Assets ratio**: This is calculated as Total Debt/ Total Assets
- **Debt- to- Equity ratio**: This is calculated as Total Debt/ Total Equity
- **Debt-to EBIDTA ratio**: This is calculated as Total Debt /EBIDTA
- Du-Pont analysis uses the "equity multiplier" as a measure of financial leverage. **This is calculated as**: Equity Multiplier = Total assets/ Total Equity
- **Interest Coverage ratio**: This is calculated as EBIT/ Interest expense

Degree Of Financial Leverage And Its Behaviour

- Financial leverage is a double edged sword.
- It may enhance the return on equity and, beyond a point, affect it adversely too.
- The fundamental rule of moderate, optimal or over use will apply here.
- In a smaller scenario, the business can afford to go for use above optimal level since the risk or the loss, if any, being small can be controlled easily.
- An optimal level is one which is just the right mix of equity and debt.
- How one arrives at the 'right' is a matter of fact and realistic estimate of cost verses benefit, after the exercise of fund infusion is efficiently completed.
- The businessman will estimate the value of business or assets once the borrowed funds are repaid and determine whether that level could have been achieved without the leverage.
- A scientific conversion of modest, optimal and over use into numbers will give you the degrees of leverage.
- In a large project, one has to adopt a cautious approach because risks too will be very high and above optimal leverage can prove to be disastrous.
- For calculating the degree of financial leverage, we seek to establish correlation between the operating profit (EBIT) and the interest expense, which is assumed to be a fixed expense.

Degree of financial leverage is defined as ratio of percentage change in EPS and percentage change in EBIT, and can be mentioned as under:

$$\text{Degree of Financial Leverage (DFL)} = \frac{\text{Percentage change in earnings per share (EPS)}}{\text{Percentage change in earnings before interest and tax (EBIT)}}$$

$$DFL = \frac{\Delta EPS / EPS}{\Delta EBIT / EBIT}$$

- **Δ**EPS means change in EPS and

- ΔEBIT means change in EBIT.

This formula can be further refined in view of the fact that ΔEPS/ EPS is equal to ΔEBT/ EBT (as tax rate and number of shares, which correlate EPS and EBT are constants), as under:

- DFL = ΔEBT/ EBT ΔEBIT/ EBIT
- Further, any marginal change in EBT will be equal to same change in EBIT as interest (I) is assumed to be a fixed amount.
- For example; if EBIT = Rs. 100 and I = Rs. 20, change in EBIT to Rs. 101 from 100 will result in change in EBT to Rs. 81 from Rs. 80. Therefore, ΔEBIT is equal to ΔEBT. So the above formula can be modified as;

DFL = ΔEBT/ EBT/ΔEBIT/ EBIT Or, DFL = EBIT /EBT

Degree of Financial Leverage (DFL) = Earnings before interest and tax(EBIT) / Earnings before tax(EBT)
Where, EBIT = Sales - (Variable cost + Fixed cost excluding interest)
EBT = EBIT – Interest

ILLUSTRATION

A firm's details are as under:

Sales (@100 per unit) Rs. 24,00,000

Variable Cost 50%

Fixed Cost Rs. 10,00,000

It has borrowed Rs. 10,00,000 @ 10% p.a. and its equity share capital is Rs. 10,00,000 (Rs. 100 each).

Consider tax @ 50%.

Calculate its Degree of Financial Leverage

	(Rs.)
Sales	24,00,000
Less: Variable cost	12,00,000
Contribution	12,00,000
Less: Fixed cost	10,00,000
EBIT	2,00,000
Less: Interest	1,00,000
EBT	1,00,000
Less: Tax (50%)	50,000
EAT	50,000
No. of equity shares	10,000
EPS	5

$$\text{Degree of Financial Leverage} = \frac{\text{EBIT}}{\text{EBT}} = \frac{2,00,000}{1,00,000} = 2 \text{ times}$$

Operating Leverage

As discussed above, in financial leverage, we establish a correlation between the fixed financial cost i.e. interest and the profit of the business.

In operating leverage, we consider other fixed expenses except interest and correlate these to the profit.

Consider the example of a wholesaler, who has got very low fixed costs but low contribution (difference between sales price and purchase price).

This business will be in profit even if the sales level comes down substantially as the fixed costs are quite low.

On the other hand, a business with high fixed cost like a hospital, will find any substantial drop in business to be disastrous even though the variable costs are low and consequently the contribution is high.

Degree Of Operating Leverage and Its Behaviour

The formula used is:

Degree of Operating Leverage (DOL) = % Change in EBIT/ % Change in Sales

Mathematically:

DOL = ΔEBIT/EBIT Δ Sales Quantity/Sales Quantity

- Δ Denotes change
- This formula can be further refined in the light of the fact
- EBIT = Sales quantity (Price per unit- variable cost per unit) – Fixed costs and, therefore,
- Δ EBIT = Δ Sales quantity (Price per unit- variable cost per unit) as the Fixed cost is a constant amount.

The rewritten formula will be:

DOL = Sales quantity (Price per unit-variable cost per unit) / EBIT

DOL = Contribution / Earnings Before Interest and Taxes (EBIT)

Illustration 1: Calculate Degree of Operating Leverage when, a company

- sells 1000 units of product X at Rs. 50
- variable cost of Rs. 30 per unit and
- fixed cost of Rs. 15,000.

Solution

Particulars	Product X
	(Rs.)
Sales (50 x 1000 units)	50,000
Variable Cost (30 x 1000 units)	30,000
Contribution	20,000
Fixed Cost	15,000
Profit (EBIT)	5,000

$$\text{Degree of Operating Leverage} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{20,000}{5,000} = 4 \text{ times}$$

Combined Or Total Leverage

This is a combination of financial and operative leverages. Here the fixed costsinclude both the operating fixed costs and financial fixed costs (interest). In such a situation, a marginal percentage change in revenue leads to disproportionate percentage change in EBT. For example, a 10% increase in revenue may increase EBT and consequently, the EPS by 15%. Similarly, a 10% fall in revenue may decrease EBT and consequently, the EPS by more than 10%. The following formula is used for calculating the degree of total leverage (DTL)

$$\text{Degree of Total leverage (DTL)} = \frac{\text{Percentage change in EBT}}{\text{Percentage change in Sales}}$$

It is a product of both financial and operating leverages and can be written as:

DTL = DFL × DOL

= EBIT/EBT × Contribution/ EBIT

= Contribution/EBT

ILLUSTRATION

A firm has sales of Rs. 10,00,000, variable cost of Rs. 7,00,000 and fixed costs of Rs. 2,00,000 and debt of Rs. 5,00,000 at 10% rate of interest. What are the operating, financial and combined leverages?

SOLUTION:

Statement of Profit	(Amt in Rs.)
Sales	10,00,000
Less: Variable Cost	7,00,000
Contribution	3,00,000
Less: Fixed Cost	2,00,000
EBIT	1,00,000
Less: Interest @ 10% on 5,00,000	50,000
Earnings before tax (EBT)	50,000

$$\text{Operating Leverage} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{3,00,000}{1,00,000} = 3$$

$$\text{Financial Leverage} = \frac{\text{EBIT}}{\text{EBT}} = \frac{1,00,000}{50,000} = 2$$

$$\text{Combined Leverage} = \frac{\text{Contribution}}{\text{EBT}} = \frac{3,00,000}{50,000} = 6$$

ILLUSTRATION

Z Ltd has estimated that for a new product, the break-even point is 2,000 units, if the items are sold for Rs14 per unit. The Cost Accounting department has currently identified variable cost of Rs. 9 per unit. Calculate the degree of operating leverage for sales volume of 2,500 units and 3,000 units. What do you infer from the degree of operating leverage at the sales volumes of 2,500 units and 3,000 units and their difference if any?

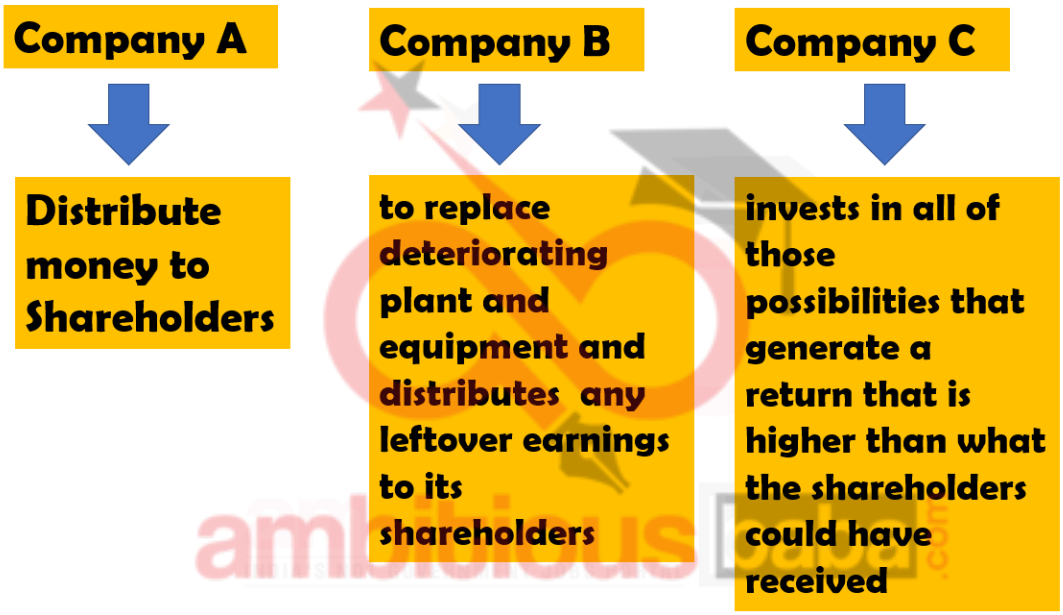
Statement of Operating Leverage

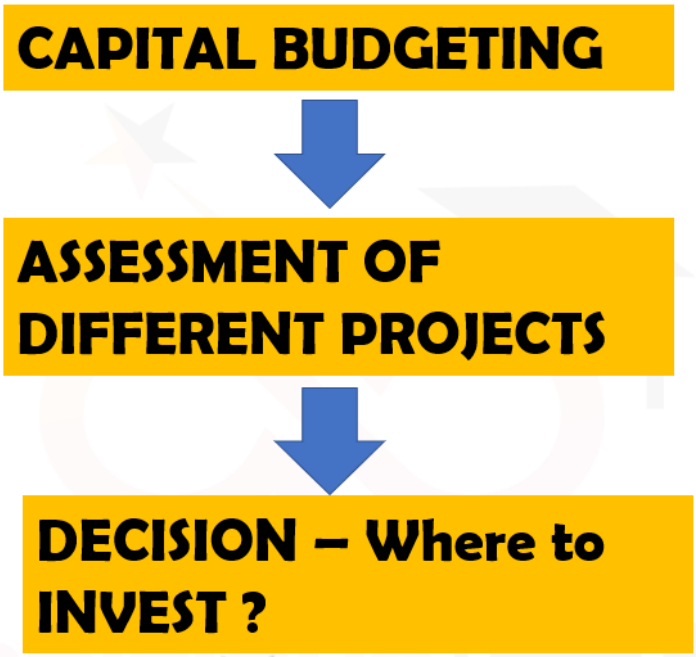
Particulars	2,500 Units	3,000 Units
Sales @ Rs. 14 per unit	35,000	42,000
Variable cost @ Rs. 9 per unit	22,500	27,000
Contribution	12,500	15,000
Fixed cost Rs. [2,000 × (14 - 9)]	10,000	10,000
EBIT	2,500	5,000
Degree of Operating Leverage = $\frac{\text{Contribution}}{\text{EBIT}}$	$\frac{12,000}{2,500}$	$\frac{15,000}{5,000}$
Degree of Operating Leverage	5	3

CAIIB Paper 3 (ABFM) Module B Unit 3: Capital Investment Decisions

Objective Of Capital Investment Decisions

- The goal of management is to increase the wealth of the shareholders as much as possible.
- In order to achieve this goal, the Finance Manager is responsible for analysing potential investment possibilities and identifying those that can boost the value of the company.
- Consider the following scenario: three companies, Company A, Company B, and Company C, all have the same assets and opportunities for investment.
- However, the management of Company A does not take advantage of its investment opportunities and instead distributes all of its earnings to its shareholders;
- the management of Company B only makes the investments necessary to replace deteriorating plant and equipment and distributes any





- leftover earnings to its shareholders; and
- the management of Company C invests in all of those possibilities that generate a return that is higher than what the shareholders could have received if they had invested the funds themselves.
- This allows them to earn a higher return.
- The objective of the capital investment decision is to first assess the requirement and then think about the sources, the cost, the form and the time

Estimation Of Project Cash Flows

- Cash requirement of any project can be safely analyzed in terms of long term, short term, owned, borrowed, fixed cost, working capital, inflows and outflows.
- All this can be appropriately included in a projected cash flow statement.

The process requires the following;

- ❑ Identify the elements of cash flow: A business typically will have three elements of cash flows:
- ❑ initial,
- ❑ operating and
- ❑ terminal.
- ❑ Initial Investment: Capital expenditure and the contribution for net working capital to start the project.

- The Operating one will comprise of the outflow and resulting inflow of the operations of the business.
- The Terminal is the one what remains that is net inflow after paying off all the realizations of the assets on liquidation of the business when the economic life comes to an end.
- All the flows are post tax for the reasons that that element does not belong to the business or the owners.

How to estimate and basis of each such element:

There are four principles to be kept in mind.

- **1st: Separation** Principle which means we have to separate the investment side from finance side which simply means separating assets for servicing cost of it. Cost flows in to investment side and the interest, if any, flows in to financing side.
- Then there is Incremental which means estimate separately the cost which will be incurred even if the project is not run from the cost which we incur while running it. We can also say it is fixed versus variable cost.
- While considering the cash flows, considering the Post -tax Cash Flow Always, is advisable since the tax payments cannot be ignored. This is the Third Principle.
- If you ignore, you will have to Discount Pretax Flows with a discount rate which may or may not be reliable. The last principle is consistency principle.

Collate all the components of cash flow:

- All the components of the cash flow namely fixed capital, working capital, own capital (Equity), long term borrowing, outflow for operations such as purchases, production expenses, operating and administration expenses, selling expenses, interest cost, and inflow on account of
- Sales and services are collated and net flow or the cash balance is found out to complete the cash flow statements.
- This is prepared for the period of the entire project period or for reasonably long enough period to reach a break even or achieve other objectives such as debt free status of closure or hive off etc.

Cash Forecasts

- Cash forecasts shall also include the inflow on account of sales and services.
- Forecasting sales will be an elaborate exercise and will take into account various factors such as estimated demand, production capacity planned, procurement or availability of raw materials, fixing price of the product, keeping in mind the competition and need to penetrate the market in the face of current market

conditions and market leaders, availability or required engagement of working capital funds, discounts, incentives to marketing team, cost of sales campaigns, exhibitions, touring, advertisements etc.

Statement showing the calculation of Cash Inflow After Tax

Particulars	(Rs.)	(Rs.)
Sales value		xxx
Less: Variable Cost		xxx
Contribution		xxx
Less: Fixed Cost		
(a) Fixed Cash Cost	xxx	
(b) Depreciation	xxx	xxx
Earning Before Tax (EBT)		xxx
Less: Tax		xxx
Earning After Tax (EAT)		xxx
Add: Depreciation		xxx
Cash Inflow After Tax (CFAT)		xxx

ILLUSTRATION

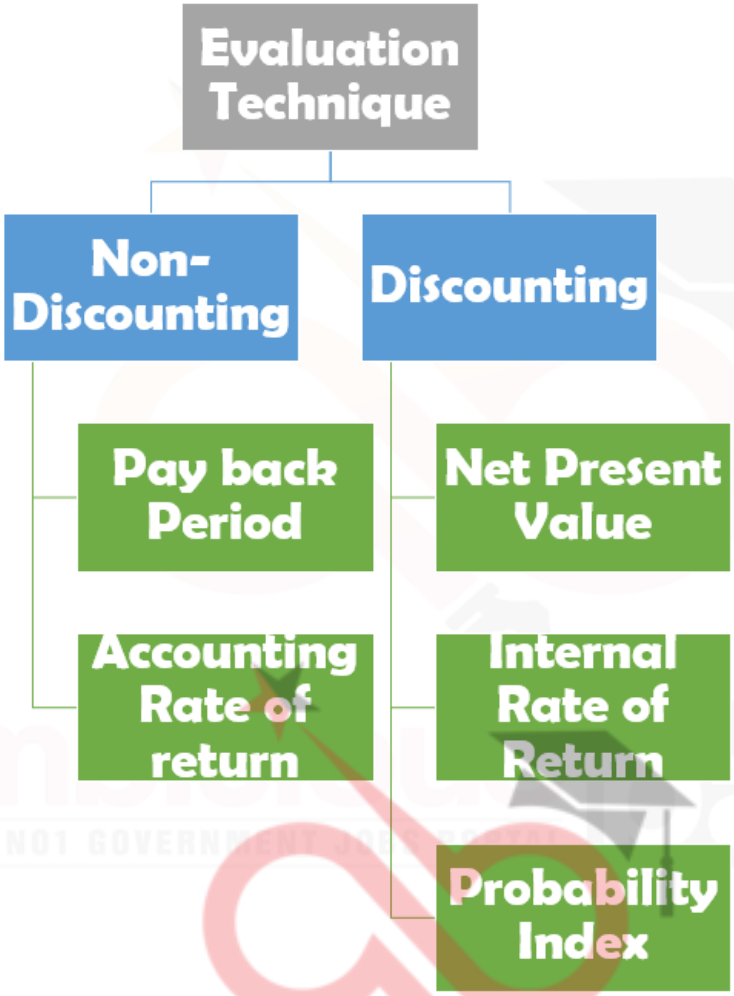
XYZ Ltd is evaluating the purchase of a new machinery with a depreciable base of Rs. 1,00,000; expected economic life of 4 years and change in earnings before taxes and depreciation of Rs. 45,000 in 2021, Rs. 30,000 in year 2022, Rs. 25,000 in year 2023 and Rs. 35,000 in year 2024. Assume straight-line depreciation and a 20% tax rate. You are required to compute relevant cash flows.

SOLUTION:

Depreciation = 1,00,000 divided by 4 = Rs. 25,000 per year

	Years			
	2021	2022	2023	2024
Earnings before tax and depreciation	45,000	30,000	25,000	35,000
Less: Depreciation	(25,000)	(25,000)	(25,000)	(25,000)
Earnings before tax	20,000	5,000	0	10,000
Less: Tax @20%	(4,000)	(1,000)	0	(2,000)
Earnings after tax	16,000	4,000	0	8,000
Add: Depreciation	25,000	25,000	25,000	25,000
Net Cash flow	41,000	29,000	25,000	33,000

Evaluation Techniques



Payback period, discounted payback period

- Payback period is the period at the end of which the initial investment is entirely returned to the investor.
- **Return of investment** = Net cash flow for each of the years of operation.
- When the cumulative cash flow is equal to the investment, the investment is considered to be returned and no further.
- It is to be remembered that both the positive or negative cash flows are to be added till the total net cash flow equals the amount of the initial investment.

When Cash Inflow is Same

Payback Period = Amount to be initially invested/ Estimated Annual Net Cash Inflow per year

Example: A firm requires an initial cash outflow of Rs. 24000 & cash inflows for 5 years are rs. 6000 every year. Calculate payback period.

When Cash Inflow is not same

Example: A firm requires an initial cash outflow of Rs. 20000 & cash inflows for 5 years are rs. 5000, 7000, 6000, 6000, 8000. Calculate payback period.

Part of 4th year = Balance Cash Outlay/ Cash Flow in 4th Year

Year	Cash Flow	Cumulative Cash Flow
1	5000	5000
2	7000	12000
3	6000	18000
4	6000	24000
5	8000	32000

The following points are worth noting:

- ❑ This method simply identifies the period in which the initial investment in the project is fully recovered.
- ❑ It does not take time value of money into account unless it is discounted payback period method.
- ❑ This is suitable for small businesses where it is not worth spending more time and money to make more detailed or scientific analysis.
- ❑ The shorter the period for recovery of initial investment, lesser is the risk and better or quicker is the probability to earn profits.
- ❑ Payback Period method ignores the cash flow beyond the payback period and hence ignores profit aspect.
- ❑ While payback period method is used across the line, the other more sophisticated methods are used in larger sized budgeting exercise.

ILLUSTRATION

Suppose a project costs Rs. 20,00,000 and yields annually a profit of Rs. 3,00,000 after depreciation @ 10% (straight line method) but before tax at 50%. The first step would be to calculate the cash inflow from this project. The cash inflow is calculated as follows:

Particulars	(Rs.)
Profit before tax	3,00,000
Less: Tax @ 50%	1,50,000
Profit after tax	1,50,000
Add: Depreciation written off	2,00,000
Total cash inflow	3,50,000

While calculating cash inflow, depreciation is added back to profit after tax since it does not result in cash outflow. The cash generated from a project therefore is equal to profit after tax plus depreciation. The payback period of the project shall be:

Payback period = Rs. 20,00,000 Rs. 3,50,000/Year = 5.71 Years

ILLUSTRATION

Rs. 30,000 cash outlay for a project with annual cash inflows of Rs. 6,000 would have a payback period of 5 years (Rs. 30,000/ Rs. 6,000). The problem with the Payback Period is that it ignores the time value of money. In order to correct this, we can use discounted cash flows in calculating the payback period. Referring back to our example, if we discount the cash inflows at 15% required rate of return, we have:

Year	Cash Flow (Rs.)	PVF@15%	PV (Rs.)	Cumulative PV (Rs.)
1	6,000	0.870	5,220	5,220
2	6,000	0.756	4,536	9,756
3	6,000	0.658	3,948	13,704
4	6,000	0.572	3,432	17,136
5	6,000	0.497	2,982	20,118
6	6,000	0.432	2,592	22,710
7	6,000	0.376	2,256	24,966
8	6,000	0.327	1,962	26,928
9	6,000	0.284	1,704	28,632
10	6,000	0.247	1,482	30,114

The cumulative total of discounted cash flows after ten years is Rs. 30,114. Therefore, our discounted payback is approximately 10 years as opposed to 5 years under simple payback. It should be noted that as the required rate of return increases, the distortion between simple payback and discounted payback grows.

Accounting Rate of Return (ARR)

- The foregoing method of appraisal does not help you to know the rate of return because we stop once the investment is recovered.
- The methods to determine the rate of return are many but the most common, easy, simple and practical is the accounting rate of return.
- This method involves estimating the revenue and expenses for say over three years and to find out the average rate of return which can be considered as the rate for appraising the investment.

ACCOUNTING RATE OF RETURN = Average annual net Income/ Investment

ILLUSTRATION

Suppose A Ltd. is going to invest in a project a sum of Rs. 3,00,000 having a life span of 3 years. Salvage value of machine is Rs. 90,000. The profit before depreciation for each

year is Rs. 1,50,000. The Profit after Tax and value of Investment in the Beginning and at the End of each year shall be as follows:

Year	Profit Before Depreciation (Rs.)	Depreciation (Rs.)	Profit after Depreciation (Rs.)	Value of Investment In (Rs.)	
				Beginning	End
1	1,50,000	70,000	80,000	3,00,000	2,30,000
2	1,50,000	70,000	80,000	2,30,000	1,60,000
3	1,50,000	70,000	80,000	1,60,000	90,000

The ARR can be computed by following methods as follows:

(a) **Version 1: Annual Basis**

$$ARR = \frac{\text{Profit After Depreciation}}{\text{Investment in the beginning of the year}}$$

Year	
1	$\frac{80,000}{3,00,000} = 26.67\%$
2	$\frac{80,000}{2,30,000} = 34.78\%$
3	$\frac{80,000}{1,60,000} = 50\%$

(b) **Version 2: Total Investment Basis**

$$ARR = \frac{\text{Average Annual Profit}}{\text{Investment in the beginning}} \times 100$$

$$= \frac{(80,000+80,000+80,000)/3}{3,00,000} \times 100 = 26.67\%$$

(c) **Version 3: Average Investment Basis**

$$ARR = \frac{\text{Average Annual Profit}}{\text{Average Investment}} \times 100$$

Average Investment = (Rs. 3,00,000 + Rs. 90,000)/2 = Rs. 1,95,000

Or, Average Investment = ½ (Initial Investment – Salvage Value) + Salvage Value

= ½ (Rs. 3,00,000 – Rs. 90,000) + Rs. 90,000 = Rs. 1,95,000

$$ARR = \frac{80,000}{1,95,000} \times 100 = 41.03\%$$

Net Present Value (NPV)

- **The meaning of NPV:** A bird in hand is better than two in the bush!
- A rupee now is more valuable than the same rupee a year later.
- This is what the present value means.
- Net present value used in terms of cash flow means the present value of all future cash flows.
- Cash flows mean net flow = The inflow - outflows

- Net flow after setting off the negative flows.
- If the NPV = 0, then the project will neither add value nor are you likely to lose.
- Positive NPV means project can be given go ahead the negative is red signal.

Strengths and limitations of NPV method:

The main strength of the NPV is that it takes into account the time element and brings the rate of return nearer to the reality.

- It helps you quickly evaluate the surplus you will end up with at the end of the project period and whether it matches your expectations all things considered.
- The biggest limitation is that it is all estimate and surreal.
- The discounting factor applied is very subjective.
- Moreover, this method does not provide the overall result of profit or loss over the period of the project.
- **Equivalent Annual Costs (EAC):** This cost of the asset is other than that for acquisition. In other words, it is an annual cost of owning, operating and maintaining an asset over its life time.
- **Net present value = Present value of net cash inflow - Total net initial investment**

If NPV >= 0	Accept the Proposal
If NPV < = 0	Reject the Proposal

- The NPV method can be used to select between mutually exclusive projects; the one with the higher NPV should be selected.

Illustration

Compute the net present value for a project with a net initial investment of Rs. 1,00,000. The net cash flow for year one is Rs. 55,000; for year two is Rs. 80,000 and for year three is Rs. 15,000. Further, the company's cost of capital is 10%. [PVIF @ 10% for three years are 0.909, 0.826 and 0.751]

Year	Cash Flow	PVIF @10%	Discounted Cash Flow
0	(100000)	1	(100000)
1	55000	0.909	49995
2	80000	0.826	66080
3	15000	0.751	11265
NPV			27340

Recommendation: Since the net present value of the project is positive, the company should accept the project

Internal Rate of return (IRR)

- An Internal Rate of Return means an annual rate of growth in investment a business is going to generate.
- The concept of calculating NPV and IRR is the same.
- However, while calculating IRR, the NPV is set to zero;

The formula and calculation used to determine this figure are as follows:

$$\frac{CF_1}{(1+IRR)} + \frac{CF_2}{(1+IRR)^2} + \frac{CF_3}{(1+IRR)^3} + \ldots + \frac{CF_n}{(1+IRR)^n} - CF_0$$

or

$$0 = NPV = \sum_{n=0}^{N} \frac{CF_n}{(1+IRR)^n}$$

where :

CF_0 = Initial investment/outlay

CF_1 CF_2 CF_3 ... CF_n = Cash Flows

n = Each Period

N = Holding Period

NPV = Net Present Value

- However, the formula is such that the resultant IRR will not be generated easily and therefore permutations and combinations through excel sheet on trial and error basis will give you the result which finally can be tested by simple calculations.
- If this rate of return is higher than basic or required RR(RRR), then only the investment is worth.
- RRR is equivalent to the cost of funds.

Limitations of the IRR method:

If the factors comprising the IRR calculations are difficult to predict, it may be misleading. In case cash flows intermittently turn positive as well as negative, there can be multiple rates. If the estimates in IRR and NPV differ drastically from actual results, the analysts will have to choose to combine IRR analysis with scenario analysis.

- Scenarios can show different possible NPVs based on varying assumptions.

- If studied in conjunction with weighted average cost of capital (WACC) and or Required Rate of Return (RRR), the results can be more authentic.
- **Multiple IRRs:** This situation arises when the project has non-conventional or casual or interruptive cash flows.

Definition and explanation of MIRR:

- A Modified IRR is the one calculated to correct aberrations arising out of disruptive or alternatively positive and negative cash flows as also to correct the unrealistic assumption of investing intermittent cash inflows at project IRR.
- Under this approach, any negative cash flow in any period, during the life of the project, is treated as the cost of the project and added to the initial cost of the project by discounting at the cost of the capital.
- This is called the Present Value of Costs (PVC).
- Also, the project inflows are compounded at the cost of capital to arrive at the total compounded terminal value (TV) of the inflows.
- Then an appropriate rate of discount for this compounded terminal value is found out so that this discounted terminal value is equal to the total present value of the cost of the project (PVC). This discount rate is called MIRR.

ILLUSTRATION

The calculation of MIRR can be illustrated through the following example. Square Limited is evaluating a project which has the following initial investment and cash inflows:

Year	0	1	2	3	4	5	6
Cash Flow	-240	-160	40	120	160	200	240

The cost of capital for Square Ltd is 15 percent.

Present value of cost = $240 + 160/(1.15) = 379.13$

Terminal value of cash inflows = $40(1.15)^4 + 120(1.15)^3 + 160(1.15)^2 + 200(1.15) + 240$

$= 69.96 + 182.51 + 211.60 + 230 + 240 = 934.07$

MIRR is computed as follows:

$379.13 = 934.07/(1 + MIRR)^6$

$(1 + MIRR)^6 = 934.07/379.13 = 2.463$

$1 + MIRR = 2.463^{1/6} = 1.162$

$MIRR = 1.162 - 1 = 0.162 = 16.2$ percent

Conclusion: As the MIRR is higher than the cost of capital, the project is acceptable.

Profitability Index

- This is an index that either explains or represents the relationship between the cost and the benefit of a project proposal.
- It is also called value investment ratio or profit investment ratio.

- PI is calculated by dividing the present value of future expected cash flows by the initial investment amount in the project.
- Higher the Index better is profitability of the project. Anything below 1 indicates that the project is unprofitable.

Mathematically: The Profitability Index (PI) is calculated as below:)

Profitability Index (PI) = Sum of discounted cash inflows/ Initial cash outlay or Total discounted cash outflow (as the case may be

Illustration

Suppose we have three projects involving discounted cash outflow of Rs. 5,50,000, Rs. 75,000 and Rs. 1,00,20,000 respectively. Suppose further that the sum of discounted cash inflows for these projects are Rs. 6,50,000, Rs. 95,000 and Rs. 1,00,30,000 respectively. Calculate the respective Profitability Index (PI) for the three projects.

SOLUTION:

The respective Profitability Index for the three projects would be as follows:

Profitability Index (PI) = Sum of discounted cash inflows/ Initial cash outlay or Total discounted cash outflow (as the case may be

PI = Rs. 6,50,000 / Rs. 5,50,000 = 1.18

PI = Rs. 95,000 /Rs. 75,000 = 1.27

PI = Rs. 1,00,30,000 /Rs. 1,00,20,000 = 1.001

- It can be seen that in absolute terms, project 3 gives the highest cash inflows yet its Profitability Index is low.
- This is because the outflow is also very high. The Profitability Index factor helps us in ranking various projects.

Social Cost Benefit Analysis

- Central and State Governments and local bodies or designated corporations take up many projects of infrastructure developments, airports, ports, bridges, dams etc.
- To support decision making process, SCBA is carried out. On one hand we have total cost of the project and on the other hand the social cost as well as benefits.
- One has to attach or allot value to each such impact or benefit. Adverse impact will have negative value and the benefits will have positive value.
- Adverse impact is the social cost. Loss of mangroves, generation of pollution, impact on plants, extinction of some birds and rare species, water level going down, health hazards are some of the social cost and environment impact.

- Benefits are ease of travel, fuel savings, time savings, employment generation, uplifting of living standards and bringing order in traffic management and safety, among others.
- If net result of positive and negative values is positive and equal or more than the cost of the project, the project is considered as beneficial.

CAIIB Paper 1 Module C Unit 4: Capital Budgeting For International Project Investment Decisions

Foreign Investment Analysis

- Special Considerations-Foreign & Home Currency Cash Flows
- Adoption of a currency conversion rate, particularly for cross currency transactions, will need care and efforts.
- If the project implementation time is long, the foreign currency valuation can pose problem because of the rate volatility.
- Your imports and exports, borrowings and repayments, dividends and repatriation; all will be at rates fluctuating from time to time.
- Elaborate workings and spread sheets, including for estimates, will be required.
- One may have to keep updating or revising in case of major exchange rate fluctuation.
- Moreover, the foreign investment cash flows, made in the relevant foreign currency, may need integration with Indian cash flows if the activities are integrated or the project cost benefits are shared both between the overseas outfit and local entity.
- One has to make a choice about the currency, on the basis of which one is dominant from the project point of view.

Foreign Currency Discount Rates Computation

- Converting local currency into a foreign currency is done at a prevailing rate which is called spot rate.
- Even spot rate varies from one form or mode of the currency to another such as currency notes, travellers' cheques, telegraphic transfer etc. However, if you want to contract for purchase at a future date, the rate called forward contract rate is to be adopted.
- If you want to sell your local currency to buy say USD at a future date, there will be discount to the value of your currency because you will have to pay future premium.
- Future contract rate needs to be adjusted by the interest rate and the time factor.
- To calculate the forward rate, we have to multiply the spot rate by the ratio of interest rates and adjust for the time until expiration.
- Thus, this aspect of currency rates is an important aspect while conducting the exercise of capital budgeting for foreign investments.

Capital Asset Pricing Model

- The abbreviated term CAPM describes the relationship between the risk and the returns or specifically, between the systemic risk and expected returns.
- The returns are always based on the risk and the time value of money.
- For pricing of a particular security or investment product, one has to undertake quite a few analyses.
- CAPM is one such method.
- This is generally done for risky assets, so that the price paid is appropriated to generate expected returns.
- Basically, one would like to find out risk free return over a time.
- A beta is generated, which is a measure of volatility or the systemic risk compared to the market as a whole.
- A security beta is calculated by dividing the product of the co-variance of the security's returns and the market returns by the variance of the of the market returns over a specified period.
- If it was possible to accurately forecast future cash flows, this type of derivative method would not be necessary. However, that not being the case, an investor would like to depend on such pricing method.

Calculation of CAPM

Cost of Equity (re) = Risk-Free Rate + Levered Beta x Market Risk Premium

Cost of Equity (re) = rf + βL x (rm – rf)

where: rf = risk-free rate

βL = levered beta

rm = expected return on the market

rm – rf = market risk premium

Risk-Free Rate (rf):

- ✓ The expected rate of return on an investment in a security considered to have no inherent risks is referred to as the risk-free rate.
- ✓ The actual risk-free rate that is used in CAPM shifts depending on the yields that are currently available for the selected security.

Market Risk Premium (rm – rf or mrp)

- ✓ The difference between the expected return on an investment and the risk-free rate is known as the market risk premium.

Beta (β)

- ✓ The S&P 500 index has traditionally been used as a stand-in for the market when calculating beta, which is a measure of the co-variance between the rate of return on a company's stock and the return on the overall market (systematic risk).

Example: rf = 7% , βL = 1.20 Rm – rf = 6%, Calculate Cost of equity using CAPM method

Cost of Equity (re) = rf + βL x (rm – rf)

= 7% + 1.2 (6%) = 7% + 7.2%

= 14.2%

Example: Calculate cost of equity where risk free rate of return is 10%, the firm's beta is equal to 1.75 & market return in 15%

Cost of Equity (re) = rf + βL x (rm – rf)

= 10% + 1.75 (15%-10%)

= 10% + 1.75*5

= 10% + 8.75% =18.75%

Arbitrage Pricing Theory

- This is an alternative method to CAPM.
- While CAPM takes into account security returns and market returns, this method or theory goes beyond it, thinking that market sometimes misprices securities.
- APT, therefore, tries to take advantages of any or many arbitrage opportunities or derivatives in the market or the economy.

- It uses the linear relationship between the asset's expected return and a number of macroeconomic factors or variables that affect or capture the systemic risk.
- GDP, Domestic Inflation Rate, Stock Indices, Gold Prices, risk free rate of interest are such factors.

$$E(ri) = rf + \beta i1 * RP1 + \beta i2 * RP2 + \ldots + \beta kn * RPn$$

ILLUSTRATION

For example, the following four factors have been identified as explaining a stock's return and its sensitivity to each factor and the risk premium associated with each factor have been calculated: (RP means Risk Premium)

- Gross domestic product (GDP) growth: ß = 0.6, RP = 4%
- Inflation rate: ß = 0.8, RP = 2%
- Gold prices: ß = -0.7, RP = 5%
- Sensex index return: ß = 1.3, RP = 9%
- The risk-free rate is 3%

Using the APT formula, the expected return is calculated as:

$$E(ri) = rf + \beta i1 * RP1 + \beta i2 * RP2 + \ldots + \beta kn * RPn$$

Expected return = 3% + (0.6 x 4%) + (0.8 x 2%) + (-0.7 x 5%) + (1.3 x 9%) = 15.2%

Example: Let us take a look at an arbitrage pricing theory example. For this example, let's consider our asset as a commodity stock called GOLD 123. The stock has two risk factors associated with it – inflation and the price of the U.S Dollar currency.

Rf (risk free rate) = 2%

Inflation – Risk premium = 2%, Beta = 0.2

U.S Dollar – Risk Premium =10%, Beta = 0.5

E(ri) = Rf + β1 *(factor 1) + β2 *(factor 2) + …+ βn *(factor n)

E(ri) = 0.02 + 0.2 * (0.02) + 0.5 * (0.10)

= 0.02 + 0.004 + 0.05

= 0.074, or 7.4%

In this arbitrage pricing theory example, the expected return of GOLD 123 is equivalent to 7.4%.

Issues Involved In Evaluation Of Overseas Projects

While the methods of evaluation of overseas projects are the same as for the domestic projects, the following issues are involved:

Calculation of Discount rate: Arriving at an appropriate discount rate is essential for applying the discounting methods of project evaluation. While the risk-free interest/discount rate is readily available in both India and the foreign country, we have to arrive at the relevant risk-adjusted discount rate.

The method applied for this will be clear from the following

(1 + ra) = (1 + rf) * (1 + rp)

Where,

ra = risk-adjusted discount rate,

rf = risk-free discount rate

rp = the risk premium

ILLUSTRATION: The following data is provided:

a. The risk-free discount rate in USA is 4%

b. The risk-free discount rate in India is 7%

c. The risk-adjusted discount rate, required by the company in India is 12% We have to calculate the risk-adjusted discount rate in USA, which will be acceptable to the company.

(1 + 0.12) = (1 + 0.07) * (1 + rp)

(1 + rp) = 1.12/ 1.07 = 1.0467

calculate the risk adjusted discount rate for US$, as under:

(1 + ra) = (1 + rf) * (1 + rp) or,

(1 + ra) = (1 + 0.04) * 1.0467 = 1.0888 = 8.88%

risk-adjusted discount rate, applicable for cash flows in US$

- Here we have assumed that the risk premium, required by the company for the US project is same as acceptable to it for a similar Indian project.
- However, in practice, it may require a higher risk premium in view of the additional risks involved like, trade barriers, currency fluctuations, stringent laws etc.

Approaches For Evaluation Of Overseas Project

There are, basically, two approaches for foreign project evaluation, viz. Home Currency Approach and Foreign Currency Approach.

Home Currency Approach

- Under this approach, all the cash flows of the project are converted in to home currency (rupee) by applying the actual/estimated spot rate at the time of the cash flow.
- These cash flows are then discounted using the domestic risk-adjusted discount rate.

This approach will be clear from the following

ILLUSTRATION: The following data is provided:

The cash flows of the project are as under (in US$, lakh):

- Initial investment 100
- First year net cash inflow 30
- Second year net cash inflow 40
- Third year net cash inflow 50
- Fourth year net cash inflow 50

The risk-adjusted rupee discount rate, required by the company, which is envisaging project in USA, is 12%

The notional risk-free interest rate in USA is 4%

The notional risk-free interest rate in India is 7%

Current Spot rate of 1 US$ is Rs. 80

We have to calculate the PV of the cash inflows of the project which has a useful life of 4 years, using the Home Currency approach.

Solution:

1st calculate the estimated spot rate for 1 US$, as under:

S1 = 80 * (1 + 0.07)/ (1 + 0.04) or,

S1 = 80 * (1.07)/ (1.04) = 80 * 1.0288

= Rs. 82.310

For 2nd Year,

S2 = 80 * $(1.0288)^2$ = 80 * 1.0585

= 84.6820

For Third Year

S3 = 80 * $(1.0288)^3$ = 80 * 1.0889

= 87.1130

For Fourth Year

S4 = 80 * (1.0288)4 = 80 * 1.1203

= 89.6250

Particulars	0	1	2	3	4
Cash Flow ($)	(100)	30	40	50	50
Spot rate	80	82.310	84.6820	87.1130	89.6250
Cash Flow (Rs.)	(8000)	2469	3387	4356	4481
PV@12%	1	0.893	0.797	0.7117	0.635
PV of Cash Flow	(8000)	2204	2700	3100	2848
Total					10852
NPV					2852

Foreign Currency Approach

- Under this approach, the cash flows of the project remain in the foreign currency only and are not converted in to home currency (rupee).
- These cash flows are then discounted, using the risk-adjusted discount rate of the foreign currency.
- The present value of the discounted cash flow, thus arrived, is converted in to home currency by applying the Present Spot Rate.

This approach will be clear from the following

ILLUSTRATION: The following data is provided:

a.The cash flows of the project are as under (in US$, lakh):

- Initial investment 100
- First year net cash inflow 30
- Second year net cash inflow 40
- Third year net cash inflow 50
- Fourth year net cash inflow 50

b. The risk-free discount rate in USA is 4%

c. The risk-free discount rate in India is 7%

d. The risk-adjusted discount rate, required by the company, in India, is 12%

e. Current Spot rate of 1 US$ is Rs. 80

We are required to calculate the PV of the cash inflows of the project, which has a useful life of 4 years, using the Foreign Currency approach.

(1 + ra) = (1 + rf) * (1 + rp)

- (1 + 0.12) = (1 + 0.07) * (1 + rp)
- (1 + rp) = 1.12/ 1.07 = 1.0467

calculate the risk adjusted discount rate for US$, as under:

- (1 + ra) = (1 + rf) * (1 + rp) or,
- (1 + ra) = (1 + 0.04) * 1.0467 = 1.0888 = 8.88%

Particulars	0	1	2	3	4
Cash Flow ($)	(100)	30	40	50	50
PV@8.89	1	0.918	0.843	0.774	0.711
PV of Cash Flow	(100)	27.55	33.73	38.72	35.55
Total					135.55 Rs. 135.55*80 = 10844
NPV					2844

Evaluation Methods

Evaluation methods using Home Currency Approach

Pay- back period method

Step 1.

Estimate the spot rate for each year of the project's life by using the formula, St = S0 * [(1 + rh)/ (1 + rf)]t

Step 2.

Convert foreign currency cash inflows in to home currency inflows, by using the spot rates arrived at in step 1

Step 3.

Convert initial investment in foreign currency in to home currency by using actual present spot rate

Step 4.

Find out the period during which the cash inflows in home currency are equal to the initial investment in home currency. This is the pay-back period.

Particulars	0	1	2	3	4
Cash Flow ($)	(100)	30	40	50	50
Spot rate	80	82.310	84.6820	87.1130	89.6250
Cash Flow (Rs.)	(8000)	2469	3387	4356	4481

Payback period = 2 + 2144/4356 = 2.49 years

NPV method

Step 1.

Estimate the spot rate for each year of the project's life by using the formula, St = S0 * [(1 + rh)/ (1 + rf)]t

Step 2.

Convert foreign currency cash inflows in to home currency inflows, by using the spot rates arrived at in step 1

Step 3.

Convert initial investment in foreign currency in to home currency by using actual present spot rate

Step 4.

Discount the cash inflows using the domestic risk-adjusted discount rate and find their PV.

Step 5. Calculate NPV by subtracting initial investment from the PV

Particulars	0	1	2	3	4
Cash Flow ($)	(100)	30	40	50	50
Spot rate	80	82.310	84.6820	87.1130	89.6250
Cash Flow (Rs.)	(8000)	2469	3387	4356	4481
PV@12%	1	0.893	0.797	0.7117	0.635
PV of Cash Flow	(8000)	2204	2700	3100	2848
Total					10852
NPV					2852

Internal Rate of Return Method

Step 1.

Estimate the spot rate for each year of the project's life by using the formula, St = S0 * [(1 + rh)/ (1 + rf)]t

Step 2.

Convert foreign currency cash inflows in to home currency inflows, by using the spot rates arrived at in step 1

Step 3.

Convert initial investment in foreign currency in to home currency by using actual present spot rate

Step 4.

By trial and error, find that discount rate which makes the PV of cash inflows equal to the initial investment

ILLUSTRATION:

Particulars	0	1	2	3	4
Cash Flow ($)	(100)	30	40	50	50
Spot rate	80	82.310	84.6820	87.1130	89.6250
Cash Flow (Rs.)	(8000)	2469	3387	4356	4481

IRR (r)of the project:

$8000 = 2469/(1 + r) + 3387/(1 + r)^2 + 4356/(1 + r)^3 + 4481/(1 + r)^4$

By trial and error, the rate is about 27%

Profitability Index Method

Step 1.

Estimate the spot rate for each year of the project's life by using the formula, St = S0 * [(1 + rh)/ (1 + rf)]

Step 2.

Convert foreign currency cash inflows in to home currency inflows, by using the spot rates arrived at in step 1

Step 3.

Convert initial investment in foreign currency in to home currency by using actual present spot rate

Step 4.

Discount the cash inflows using the domestic risk-adjusted discount rate and find their PV.

Step 5.

Calculate PI by dividing PV by the initial investment

ILLUSTRATION:

Particulars	0	1	2	3	4
Cash Flow ($)	(100)	30	40	50	50
Spot rate	80	82.310	84.6820	87.1130	89.6250
Cash Flow (Rs.)	(8000)	2469	3387	4356	4481
PV@12%	1	0.893	0.797	0.7117	0.635
PV of Cash Flow	(8000)	2204	2700	3100	2848
Total					10852
NPV					2852

So, PI = PV/ Initial investment = 10,852/ 8000 = 1.356

Particulars	0	1	2	3	4
Cash Flow ($)	(100)	30	40	50	50
PV@8.89	1	0.918	0.843	0.774	0.711
PV of Cash Flow	(100)	27.55	33.73	38.72	35.55

Evaluation methods using Foreign Currency Approach

Pay- back period method

Step 1.

Find out the period during which the cash inflows in foreign currency are equal to the initial investment in foreign currency. This is the pay-back period

Particulars	0	1	2	3	4
Cash Flow ($)	(100)	30	40	50	50

So, the pay-back period is 2 + (30/ 50) =2.6 years or 2 years and 7.2 months

NPV method

Step 1.

First calculate the risk-adjusted discount rate for foreign currency, which will be acceptable to the company, by using the formula; (1 + ra) = (1 + rf) * (1 + rp)

Step 2.

Discount the cash inflows in foreign currency, using this risk-adjusted discount rate for foreign currency, to arrive at the present value of the cash inflows in foreign currency.

Step 3.

Convert the figure, arrived at Step 2 to home currency by multiplying it by the present spot rate.

Step 4.

Convert the initial investment to home currency by multiplying it by the present spot rate.

Step 5.

Calculate NPV by subtracting initial investment from the PV

ILLUSTRATION:

Particulars	0	1	2	3	4
Cash Flow ($)	(100)	30	40	50	50
PV@8.89	1	0.918	0.843	0.774	0.711
PV of Cash Flow	(100)	27.55	33.73	38.72	35.55
Total					135.55 Rs. 135.55*80 = 10844 - 8000
NPV					2844 lakh

Internal Rate of Return Method

Step 1.

First calculate the risk-adjusted discount rate for foreign currency, which will be acceptable to the company, by using the formula; (1 + ra) = (1 + rf) * (1 + rp)

Step 2.

By trial and error, find out that rate of discount which makes PV of cash inflows in foreign currency, equal to initial investment in foreign currency. This is the IRR of the project.

Step 3.

If the rate calculated in step 2 is more than that in step 1, the proposal is acceptable.

Particulars	0	1	2	3	4
Cash Flow ($)	(100)	30	40	50	50

For finding IRR (r), use the formula;

$80 = 30/(1 + r) + 40/(1 + r)^2 + 50/(1 + r)^3 + 50/(1 + r)^4$

By trial and error, the value of r can be found, which will be about 35%

Profitability Index Method

Step 1.

First calculate the risk-adjusted discount rate for foreign currency, which will be acceptable to the company, by using the formula; (1 + ra) = (1 + rf) * (1 + rp)

Step 2.

Discount the cash inflows in foreign currency, using this risk-adjusted discount rate for foreign currency, to arrive at the present value of the cash inflows in foreign currency.

Step 3.

Convert the figure, arrived at Step 2 to home currency by multiplying it by the present spot rate.

Step 4.

Convert the initial investment to home currency by multiplying it by the present spot rate

Step 5.

Divide the figure of step 3 by the figure of step 4 to arrive at the PI

Particulars	0	1	2	3	4
Cash Flow ($)	(100)	30	40	50	50
PV@8.89	1	0.918	0.843	0.774	0.711
PV of Cash Flow	(100)	27.55	33.73	38.72	35.55
Total					135.55 Rs. 135.55*80 = 10844
NPV					2844

PI is 10,844/ 8000 = 1.356

CAIIB Paper 3 Module B Unit 5: Adjustment Of Risk And Uncertainty In Capital Budgeting Decision

Introduction

- Capital budgeting is required for project implementation which generally takes long time.
- Budgeting means estimating cost and revenue to be incurred and earned in the future period whether it is a project to be established or is a running enterprise.
- The word capital budgeting is for new projects generally.
- Cost = land, plant, labour, materials and engagement of working capital.
- Capital or cash has its own cost depending on time, volume, source including foreign sourcing.
- Revenue estimating exercise is also not simple where it is dependent on many factors including market behaviour and competition.
- Each element of cost and revenue, therefore, poses many questions and uncertainty.

Sensitivity Analysis

- The uncertainty of future movements of certain variables can move either way, that puts all our present estimates and the project or investments to jeopardy.
- We need to safeguard against this.
- The variables and important components of capital budget are cost, revenue and net profits.
- Taking all possible variables into account will be a difficult task, making calculations complex.

- Sensitivity analysis aims to assess the impact of changes in each of these important variables on our projections or estimates.

The steps that need to be taken in order to perform a sensitivity analysis are as follows:

✓ Identifying the factors that have an impact on the NPV (or IRR) of the project.
✓ Developing a mathematical understanding of the connections between the different variables.
✓ Conducting an analysis to determine how the changes in each of the variables will affect the net present value (or internal rate of return) of the project.

	Particulars	NPV
A	SP (I)	NPV (I)
B	VC (I)	NPV (D)
C	FC (I)	NPV (D)
D	Volume (I)	NPV (I)
E	Initial Investment (I)	NPV (D)
F	Life of Project (I)	NPV (I)
G	Cost of Capital (I)	NPV (D)

ILLUSTRATION 1

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

Particulars	Figure
Initial Capital Cost	400 cr
Annual Unit Sales	5 cr
SP per unit	100
VC per unit	50
FC per year	50 cr
Discount rat	6%

Required:

1. Calculate the Net Present Value (NPV) of the project. Assume that the tax rate is zero.

2. Compute the impact on the project's NPV considering a 2.5 per cent adverse variance in each variable. Which variable shall have the maximum effect? Consider Life of the project as 3 years.

Particulars	Amount
SP per unit	100
Less: VC	50
Contribution	50
Units sold	5 cr
Total contribution	250 cr
Less : FC	50 cr
Net cash flow per year	200 cr

Year	Cash flow (in cr)	PV Factor	PV
0	400	1	(400)
1	200	0.943	188.60
2	200	0.890	178
3	200	0.840	168
NPV			134.60

Sensitivity Analysis considering 2.5% Adverse Variance in each variable The table that follows demonstrates how to determine the impact on the NPV of the project in terms of percentages by adjusting one variable at a time by 2.5% (in a negative direction) while maintaining the other variables in their original states. As a result, it is clear that the change in selling price has the greatest impact on the NPV, accounting for 24.82 percent of the total change.

	Particulars	Base	Initial cost capital (I) to Rs.410 cr	SP p.u (D) to Rs. 97.5	VC p.u. (I) to 51.25	FC per year (I) to 51.25 cr	Units sold p.a. (D) to 4.875 cr
A	SP p.u	100	100	97.5	100	100	100
B	VC p.u	50	50	50	51.25	50	50
C	Contribution p.u	50	50	47.5	48.75	50	50
D	No. of units sold p.a. (in cr)	5	5	5	5	5	4.875
E	Total Contribution	250	250	237.5	243.75	250	243.75
F	FC p.a	50	50	50	50	51.25	50
G	Net Cash Inflow (E-F)	200	200	187.5	193.75	198.75	193.75
H	PV of Net Cash Inflow p.a (G * 2.673) $[1- 1/ (1+i)^n /i]$	534.60	534.60	501.19	517.89	531.26	517.89

	Particulars	Base	Initial cost capital (I) to Rs.410 cr	SP p.u (D) to Rs. 97.5	VC p.u. (I) to 51.25	FC per year (I) to 51.25 cr	Units sold p.a. (D) to 4.875 cr
I	Initial Capital cost	400	410	400	400	400	400
J	NPV (H-I)	134.60	124.60	101.19	117.89	131.26	117.89
K	% Change in NPV	-	-7.43%	-24.82%	-12.41%	-2.48%	12.41%

Scenario Analysis

- This method is an extension of or a step forward compared to the sensitivity analysis where only one variable was changed at a time.
- In this method, one plans for say, three scenarios namely, normal or the expected, optimistic and the pessimistic scenario.
- In the normal scenario, all the variables show expected values and the best values are taken for the optimistic scenario.
- It is in the pessimistic scenario the worst values are placed.
- Thus, all the variables move in the same directions at the same time.
- To explain the analysis in figures, the following table is presented.

Example:

Particulars	Figure
Cost of the Project	35,00,000
Annual Cash Inflows	12,00,000
Project Life (Years)	6
Discounting rate	10%

Determine NPV under the following scenario

Best Case Scenario 1: All variable remain unchanged

Scenario 2: Most likely case scenario:

Initial Project cost (I) by 20%, life remain same, decrease in annual cash inflow by 10% & increase in cost of capital to 12%

Scenario 3 : Worst case

Initial Project cost (I) by 20%, life of the project (d) to 5 years, decrease in annual cash inflow by 20% & increase in cost of capital to 12%

Scenario 1	Rs
Initial Project Cost	(35,00,000)
Life of the project	6 years
Annual Cash Inflow	12,00,000
PV @10%	4.355
PV of Cash inflows	52,26,000
NPV	17,26,000

Scenario 3	Rs
Initial Project Cost	(42,00,000)
Life of the project	6 years
Annual Cash Inflow	10.80,000
PV @12%	4.1114
PV of Cash inflows	44,40,312
NPV	2,40,312

Initial Project cost (I) by 20%

35,00,000 + 20% = 42,00,000

ACF (D) by 10% = 108000

Cost of Capital (I) to 12%

Scenario 3	Rs
Initial Project Cost	(42,00,000)
Life of the project	5 years
Annual Cash Inflow	9,60,000
PV @12%	3.604
PV of Cash inflows	34,59,840
NPV	(7,40,160)

Initial Project cost (I) by 20%

35,00,000 + 20% = 42,00,000

ACF (D) by 20% = 9,60,000

Cost of Capital (I) to 12%

	Pessimistic Scenario	Expected Scenario	Optimistic Scenario
Investment	48000	40000	36000
Sales	30000	36000	42000
Variable Cost	21000 (70%)	24000 (66.67%)	27300 (65%)
Fixed Costs	2600	2000	1600
Depreciation	4800	4000	3600
Pre- Tax Profit	1600	6000	9500
Tax	540	2000	3160
Profit after Tax	1060	4000	6340
Annual Cash flow from operation	5860	8000	9940
Net PV (Cash flow * PVIFA) 12%, 10 year	(14900)	5200	10080

ILLUSTRATION 3

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

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

Determine the net present value of each scenario based on the assumption that the cost of capital is 9%. If XYZ Ltd is sure about the most likely result in the first two years but uncertain about the cash flow in the third year, then analyse what the NPV will be assuming the worst case scenario in the third year.

		Worst Case		Most Likely		Best Case	
Year	PVF @9%	Cash Flow	PV	Cash Flow	PV	Cash Flow	PV
		'000	'000	'000	'000	'000	'000
0	1	(1400)	(1400)	(14000	(14000	(1400)	(1400)
1	0.917	450	412.65	550	504.35	650	596.05
2	0.842	400	336.80	450	378.90	500	421
3	0.772	700	540.40	800	617.60	900	694.80
NPV			-110.15		100.85		311.85

Most likely result in the first two years but uncertain about the cash flow in the third year, then analyse what the NPV will be assuming the worst case scenario in the third year.

= 550000 * 1/1.09 + 450000* $(1/1.09)^2$ + 700000 * $(1/1.09)^3$

= 504587 + 378756 + 540528 = 1423871

= (14,00,000) + 1423871 = 23871

Hillier Model

- An investor applies various techniques of analyzing the risk involved in any particular investment decision.
- Hillier's Model is one amongst many of these risk analysis techniques.
- This model is also based on NPV like earlier methods.
- Prof. Fredrick. S. Hillier of Stanford University suggested this model. Hillier's view was that the risk associated with the cash inflows is reflected in the standard deviation of the cash inflows.
- Lesser the deviation of cash flows from the mean value, the lesser would be the risk and vice versa.
- He argued that for risk analysis, value of standard deviation of net present value may be obtained through analytical deviation of the cash inflows.
- Two cases can be considered for such analysis viz. no correlation among cash flows and perfect correlation among cash flows.
- When cash flows for different years are perfectly correlated, the behaviour of cash flows in all years is alike.
- But, if they are not correlated, it implies that cash inflow in any particular year will be independent of the cash inflow in any other year during the life of the project.
- The formulae, though bit complicated, are presented below. Perfectly Correlated Cash

Uncorrelated Cash Flows

$$\overline{\text{NPV}} = \sum_{t=1}^{n} \frac{\overline{C_t}}{(1+i)^t} - I$$

$$\sigma(\text{NPV}) = \sum_{t=1}^{n} \left(\frac{\sigma_t^2}{(1+i)^{2t}} \right)^{1/2}$$

Perfectly Correlated Cash Flows

$$\overline{\text{NPV}} = \sum_{t=1}^{n} \frac{\overline{C_t}}{(1+i)^t} - I$$

$$\sigma(\text{NPV}) = \sum_{t=1}^{n} \frac{\sigma_t}{(1+i)^t}$$

Where Ct =expected cash flow for year t,

σt = standard deviation of cash flow for year t, i is the risk-free rate, and I is the initial investment.

Simulation Analysis

- Simulation means not real, imitation or deception.
- It is a process of creating a similar but artificial situation.
- What we do here is that firstly, we conduct analysis by finding out sensitivity of certain criteria of merit such as NPV, IRR, or any such criterion, to variation in basic factors.
- Then as a next step, we do simulations to find out likelihood under various scenarios to enable us to take the best suited decision.

The steps involved can be briefly stated as under:

- ✓ Prepare model project report on expected lines.
- ✓ Calculate NPV. (it can be IRR too)
- ✓ Find out how the NPV is influenced by or related to the parameters and the exogenous variables.
- ✓ Parameters are input variables specified by the decision maker who is in charge of the project.
- ✓ Exogenous variables are those whose value is determined outside the model and imposed on the model.
- ✓ These are not in control of the decision maker. This may probably depend on random event.
- ✓ For example, if we use seeds, fertilisers and water and then depend on rains to give us say 100 tons of a crop; the seeds, fertilisers, water and yield are endogenous and the rainfall is the exogenous factor which is not influenced by other variables.
- ✓ Fix the values of the parameters and also estimate the probability of distributions of exogenous variables.
- ✓ Select a value at random from the probability distributions of each of the exogenous variables.

- ✓ Determine the NPV with relation to the randomly generated values of exogenous variables and the predetermined or specified parameter values.
- ✓ Simulate the above exercise to any number of times to generate large number of simulated NPV.
- ✓ Plot the frequency distribution of the NPV and then consider which simulation is most probable or suitable.
- Most of the simulations are done using computers because of computational tedium and the multiplicity.
- Manual calculations become lengthy and bit difficult.
- This tool is versatile. Its capacity to handle multi factor project is a great scoring point.
- It can deal with complex inter relationships among parameters and exogenous variables, which are otherwise difficult to deal with manually.
- Despite heavily relying on computer computations, it does not replace skilled judgement which is required in selecting variables and combinations.
- Although this is a powerful tool, the treatment of correlations between variables remains a major problem. If correlations are not handled properly, it can give misleading conclusions.

Decision Tree Analysis

Like scenario analysis, another method to help in corporate decision making is Decision Tree method, which a graphical representation of possible outcomes(with their associated probability), attached to each decision.

So, there are two elements in a decision tree:

- Branch, which represents a decision (which is an alternative course of action) and
- Node, at the end of the branch, which represents the reward of the decision along with the probability attached to that reward.

Example: A finance manager has to select either project A or project B. The reward of project A (NPV) is Rs. 5 lakh and the probability attached to it is 40%. The reward of project B (NPV) is Rs. 4 lakh and the probability attached to it is 40%.

- It is graphically represented by a simple decision tree which has only two branches.
- First branch represents the decision to go for project A and the second branch represents the decision to go for project B.
- The nodes at the end of each branch represent the outcome (NPV) and the probability.
- This decision tree will further grow, i.e. there will be more branches emanating from node of first and/or second branch, if there are further uncertainties associated with each decision (represented by branch).

- For example, project A can be executed either by the company itself or it may be executed by a contractor on turnkey basis.
- The cost associated with each decision, and the probability of its completion in time, are different in both the cases.
- So, graphic representation will be through two more branches out of the node of first branch, one representing decision of internal execution and the other turnkey contract.
- The nodes at the end of each of these additional branches will show the probability and cost of each decision.
- As further uncertainties are taken into account, the decision tree will grow bigger and bigger.
- The management has to decide the factors to be taken into account depending upon the size and importance of the project.
- The above process of preparing the tree is called "Drawing (or delineating) the decision tree".
- This is first of the two steps involved in the whole process of "Decision Tree Analysis".
- The other step is "Evaluating the outcome".
- This process of evaluation starts from the last branch of the tree till we come to the starting point of the tree.
- We have already learnt in Scenario Analysis, the way to evaluate a situation.
- For example, if the probability associated with NPV of Rs. 5 lakh is 40% and that associated with NPV of Rs. 4 lakh is 60%,
- the estimated NPV is: (5 * 0.4) + (4 * 0. 6) = Rs. 4.4 lakh.
- We can continue to move backward in the decision tree, calculating the estimated NPV at each node, selecting the decision of higher value and discarding the other, till we come to the starting point.

Corporate Risk Analysis

- Every existing business firm has its own unique risk profile for its cash flows.
- When a new project/ investment is envisaged, which has its own risk profile, the combined risk profile of the firm is likely to undergo a change.
- Corporate Risk Analysis is the evaluation of this impact of the new project/investment on the combined risk profile of the firm.
- A corporate faces variety of risks like economic, competition, financial, reputation, operational, compliance, security etc.
- It is to be evaluated what type of corporate risk analysis one has to do while embarking up on a project and preparing capital budget.

- The project may have impact, good or bad, on the corporate.
- For example, in a portfolio of securities, when a new security is to be added, it may impact the overall profile of the portfolio due to a different standard deviation of its returns and the correlation of its returns with the returns on the other securities in the portfolio.
- Similarly, we may analyse what the risk connected with a project will mean in terms of corporate risk?
- A project is like a product in a bouquet of other projects carried out by the corporate.
- A project on a standalone basis or by itself may look risky or not so profitable.
- However, if you look in conjunction with the overall product or project profile of the corporate, it may be a complimentary one.
- Diversification, backward integration or a captive power plant cannot be viewed or reviewed independently.

Managing Risk

- The cost
- Financial Leverage
- Pricing
- Sequential Investment
- Information Intelligence
- Strategic Alliance
- Insurance
- Supply chain management
- Shorter time to market
- Derivatives
- Contingency planning

Project Selection Under Risk

- Evaluation using our judgemental capabilities
- How quickly we become risk free
- Risk adjusted discount rate
- Certainty Expectations

Risk Analysis In Practice

We have several methods of risk analysis. These contain various ways and complicated mathematical formulae, some of which are quite complex. However, while applying any such method, what we keep common in our mind is certain features of compilation. We will now cover some of these in the paragraphs to follow.

- Revenue Estimation
- Cost Estimates
- Flexibility in investing
- Sensitivity Analysis

- Scenario Analysis
- Decision Making:

(i) Decision Making using Cost-Volume-Profit (CVP) Analysis

(ii) Decision Making using Relevant Cost Concepts

(iii) Decision Making using Activity Based Costing

(iv) Ethical and Non-Financial Considerations Relevant to Decision Making

CAIIB Paper 3 Module B Unit 6: Decision Making

Decision Making Using Cost-Volume-Profit (CVP) Analysis

- In practical terms, the cost, volume and the price are the important ingredients of any profit analysis.
- Cost has two main components namely, fixed and variable.
- The fixed cost per unit will go down if volume of production or sales increases.
- Variable cost generally varies with volume but here too the variance will depend on the product mix and the processes adopted.
- Higher volume of productions will generally reduce the cost of production due to economy of scale, but incremental cost due to upscaling the facilities may again change the cost structure.
- Higher volume in sales may accompany with disproportionate increase in marketing cost, some of which will be for brand building and the rest may commensurate with the sales volumes.
- While pricing will have direct impact on profitability, it in fact determines the breakeven point.
- Higher the sales realisation, earlier the breakeven point.
- Volume will also have direct impact on absolute profits, which too will be a determining factor in calculating the breakeven point.
- An investor will have many constraints and criteria while taking a decision to invest.

Some important points affecting investment decisions due to cost, volume and price, which ultimately determine profits and the breakeven point, are noted below.

- When we introduce a new product in the market, we cannot expect high volumes and therefore the costing will be higher.
- In the aforesaid scenario, we will have to keep the price affordable or practically low to attract new set of buyers, which will delay the breakeven point.
- In case of a consumer products having large market, we will have to plan for big volumes which will require large capital investment.
- In the aforesaid scenario, to carve out a reasonable market share, huge advertisement and brand building expenses will have to be incurred affecting the cost and profitability.

- Moreover, building large capacity will need huge investment delaying the payback period.
- A speciality product, on the other hand, can be launched with high price and good margins but may need brand building and huge R&D expenditure.

Decision Making Using Relevant Cost Concepts

- In decision making, one of the other ways is to classify the costs according to whether they are relevant or not to a particular decision.
- This concept is called Relevant Cost Concept and is valid and applicable for not only while planning an investment, but also while running a business, on the premises that decision making is a constant process and cost is an integral part of it.
- Why we call it a Relevant Cost is because the cost is not a fixed or onetime concept but a concept relevant at a given time for a given situation.
- It varies in total from one alternative to another.
- In fact, every business decision has its cost whether known, unknown, direct or indirect.
- Let's now discuss in more detail various cost elements.
- Relevant costs are those future costs which will be affected by a decision whereas, irrelevant costs are those which are not affected by the decision.
- To give a simple example, if one owns both, a diesel and a petrol car, and he has to undertake a long journey, the decision about using diesel or petrol car will take into account the costs of petrol and diesel but not the cost of road tax and insurance, as these costs are already incurred and will remain the same, irrespective of the decision.
- So, the costs of petrol and diesel are relevant costs, while the costs of road tax and insurance are irrelevant cost.
- In this example, the costs of road tax and insurance are **called "Sunk Costs**" as these are made even before the decision making process starts.
- Sunk cost does not mean that it is a wrongly incurred expenditure or has no benefit. In our above example, road tax and insurance costs have to be incurred and have their benefits. The only point is that these are irrelevant to the decision of making a choice of using which of the cars.
- Relevant costs are also categorised as Avoidable costs, while the irrelevant costs are categorised under Unavoidable costs.
- This is because avoidable costs are incurred only if a specific business decision is made while the unavoidable costs will have to be incurred irrespective of the outcome of the decision.
- In our above example, the road tax and insurance costs are unavoidable costs while the cost of petrol and diesel are the avoidable costs.
- The relevant cost concept helps the decision making process by discarding the irrelevant cost data and thus, make the decision making **process less complicated.**
- While using the concept of Relevant costs, it is worthwhile to examine the so called **"Opportunity Costs".**

- When you conceive a project, you had an alternative use available or was in mind which could have given you some X return.
- When you use the resources for another project, you will lose that opportunity and potential income. That lost income is the opportunity cost.
- It may be noted that opportunity cost, as a part of decision making, will arise only when use of Scares Resources is Involved.

Some of the important areas of decision making, which involve the Relevant Cost Concept, are as under:

- Add or drop a product line or segment:
- Make or buy decision
- Setting price of a product:
- Accepting or rejecting special orders
- Heavy discount offers from suppliers
- Import Substitutes
- Raw material mix
- Sale and Deals
- Outsourcing an activity or service

Relevant cost analysis plays a significant role in decision-making. Let us check out some relevant cost examples:

Example 1:

- The ABC Company plans to launch a self-care portal, which will result in a reduction of five positions within the company's customer support department.
- In this case, the cost that is significant and relevant is the payment for the five personnel positions.

Example 2:

A business has received orders from buyer X for 3 materials A, B and C. It already has some old inventory of products B and C, as specified in the following table.

We have to arrive at the relevant cost of each material for making the decision of whether to sell or not.

Material	Inventory	Units required	Sales price per unit
A	Nil	50	Rs. 10 p.u.
B	150 @ Rs.15 p.u	200	Rs. 17 p.u Inventory units can be sold at Rs.13
C	90 @ Rs.30 p.u.	100	Rs.23

Material A: With zero inventories, they will buy all 50 units at Rs. 10.

Hence, relevant costs = 50 units × Rs. 10 = Rs. 500

Material B: we will have to purchase 50 units @ 17/unit from the market to fulfil the order.

Hence, relevant cost of material B = Rs. 13 × 150 + Rs. 17 × 50 = Rs. 1,950 + Rs. 850 = Rs. 2800

Material C: Relevant cost of Material C = 100 units × Rs. 23 = Rs. 2,300

Example of Make or Buy Decision using Relevant Cost Concept

- A company that specialises in the production of completed items needs to have certain components.
- It must choose between manufacturing the components in-house or obtaining them from a third party.
- Naturally, the one with the lowest cost is the one to choose.
- In the case of a make or buy decision, some examples of associated costs are direct materials, direct labour, and other overhead expenses.
- Let's say a business needs a component for a machine.
- They have the option of procuring the part from a third party or producing it in-house at the factory.
- In the event that the business chooses to outsource certain functions, it will need to free up some space that can be rented out.
- If the management decides to outsource work it can generate **additional cash from rented premises.**
- Thus, the company is able to reach the conclusion with the help of relevant cost analysis that purchasing the part is a more financially sound choice.

For example; The ABC Company is in the business of producing auto parts, some of which require very precise pieces of machinery.

- When purchasing from a supplier, the unit price is Rs. 5 (five rupees).
- However, the identical component can also be manufactured by the company itself.
- The company needs a total of 50,000 individual units of spare parts each year.

The following costs are incurred by the company when the goods are produced internally:

- Direct materials = Rs. 2/unit
- Direct labour = Rs. 2/unit
- Overhead costs = Rs. 1/unit
- Special tools = Rs. 40,000 Item

Items	Cost per units (Rs)	Total Cost for 50000 units
Direct Material	2	1,00,000
Direct Labour	4	1,00,000
Overhead cost	1	50,000
Special Toots		40,000
Total		2,90,000

According to the above illustration, it will cost ABC Rs. 2,50,000 to buy from a supplier. And it will cost Rs. 2,90,000 to make the same internally. Therefore, ABC should continue outsourcing.

Example of Continue Production or Close Business Unit decision, using Relevant Cost Concept

- The question of whether or not to continue operations or to shut down individual business units, inevitably arises at some point in the life of every company.
- In this case, the management needs to assess whether or not the units produced are generating the desired income and whether or not the maintenance cost of the plant and machinery is high.
- When it comes to making that decision, having the appropriate cost analysis form is of the utmost importance.

For Example The company Amol makes cheese worth Rs. 10,000 per month.

- Maintenance cost for machinery is Rs. 3,000,
- Rs. 2,000 for material,
- Rs. 2,500 for labour, and
- Rs. 2,500 for miscellaneous costs.
- Overall expenses amount to Rs. 10,000 for an income of the same amount at Rs. 10,000.
- So, the company might think of discontinuing the cheese unit.
- Amol might continue with cheese production if the expenses are lower, like Rs. 7,500/-.

Decision Making Using Activity Based Costing (ABC)

- Prior to the emergence of ABC, companies typically calculated profitability using the allocation method.
- This allocation method involved allocating costs to a product or customer using metrics such as the total number of units produced, accounts, customers, or transactions.
- Activity Based Costing (ABC) is used for estimating the cost which in turn is used for decision making.

- It has been widely used to help the management in taking important decisions like pricing, outsourcing etc.
- The method is used for costing of products, service or even a customer who is being serviced, all termed as objects under this method.
- The method is named after activity, which is the focus of the process.
- ABC method of costing is based on the fact that the products and services, provided by a company to its customers, involves various such activities which are not exclusively related to one product or service.

For example: The quality control department ensures that all the products and services provided by the company are of desired quality.

- But the service provided by this department is not equally spread over all such products and services.
- Activity-Based Costing (ABC) is technique of appropriately assigning the costs of such activities to various products and services of the company.
- ABC involves identification of each cost driving activity and apportioning its cost to different products or jobs.
- The basis for this allocation is the quantity of each such cost driving activity required for their completion.

- **Under this technique, the overhead costs of the company are identified with each cost driving activity.**

Example: Company SW Ltd purchases CKD (Completely Knocked Down) packs of 2 wheelers and 3 wheelers and assembles them to sell in the market.

- The material and labour cost of each pack, till it reaches the assembly line, is Rs. 50,000 and Rs. 80,000 respectively.
- Total cost incurred by assembly line, during the year, is Rs. 20,00,000, utilising 20,000 labour hours.
- Assembly of a 2 wheeler takes, on an average, 20 labour hours while the assembly of a 3 wheeler takes 30 labour hours. We have to find the cost of each 2-wheeler and 3wheeler using the ABC costing method.

Solution:

- Direct cost of material and labour for each pack is known, viz. Rs. 50,000 and Rs. 80,000 respectively.
- In the activity of assembly, the main cost constituent (cost driver) is the labour, which is paid on hourly basis.
- Rate of the cost driver is total assembly cost/labour hours used = 20,00,000/ 20,000 = Rs. 100 per labour hour.
- So, the assembly cost allocated to each 2-wheeler is Rs. 20*100 and for 3-wheeler, it is Rs. 30*100.

- So, the total cost of each 2-wheeler is Rs. 52,000 and that of each 3 wheeler, Rs. 83,000.

Methodology of Activity Based Costing Method

- The basis of attribution of cost can be the benefit received from the indirect activates.
- The cost attribution can also be based on the activities undertaken to produce each product or service.

The following terms are used while operating ABC System:

- **Cost Object**. This is an item for which the cost measurement is required and it can be a product, service or a customer.
- **Cost Pool**: This term is used for grouping of the costs incurred on a particular activity which drives them
- **Cost Driver**. This is any factor that causes a change in the cost of activity. These are further classified into Resource Cost Driver and Activity Cost Driver.
- ABC method can give us product profitability as well as customer profitability.
- It can also throw light of process efficiency. In short, activity-based cost information is both intuitive and logical.
- To conclude, it makes sense to those charged with the task of improving performance and the method provides them with transparent information on the cost ramifications of their decisions.

Activity cost driver rate = Total cost of activity / Activity driver

ILLUSTRATION

Let's say that the management of a company that manufactures certain electronic devices has taken a decision to install an ABC system. The management comes to the conclusion that there should only be three cost drivers for all overhead expenses, and those are direct labour hours, machine hours, and the quantity of purchase orders. The following are the company's overhead costs, as shown in the general ledger: –

General Ledger	Amount (Rs.)
Payroll taxes	1,000
Machine maintenance	500
Purchasing Dept. labour	4,000
Fringe benefits	2,000
Purchasing Dept. Supplies	250
Equipment depreciation	750
Electricity	1,250
Unemployment insurance	1,500
Total	11,250

Differentiate which overheads are driven by direct labour hours?

Payroll taxes	Rs. 1,000
Fringe benefits	Rs. 2,000
Unemployment insurance	Rs. 1,500
Total	Rs. 4,500

Similarly, overheads driven by machine hours include Machine maintenance, depreciation and Electricity totalling Rs. 2,500 and finally overheads driven by number of purchase orders include purchasing department labour and purchasing department supplies totalling Rs. 4,250. Now, overhead rate is calculated by the formula Total cost in the activity pool ÷ Base, base being the total number of labour hours, machine hours and total number of purchase orders in the given case. Assume that the total number of labour hours be 1,000 hours, machine hours be 250 hours and total purchase orders be 100 orders. So, Cost driver rate would be

Cost Driver Rate	(Rs.)
Rs. 4,500/ 1,000	Rs. 4.50 per labour hour
Rs. 2,500/ 250	Rs. 10 per machine hour
Rs. 4,250/ 100	Rs. 42.50 per purchase order

Character-Based Decision-Making Model

- There are many models which suggest framework for deciding the ethical soundness of a decision.
- Prominent among them is the Character-Based Decision-Making Model, developed by Josephson Institute of Ethics.
- It provides a framework that can be used to decide whether a decision is morally and ethically sound.

The pillars of this model are:

- Trustworthiness,
- Respect,
- Responsibility,
- Fairness, and
- Citizenship.

The model suggests a seven-step path to better decisions.

These steps are:

- Stop and Think
- Clarify Goals
- Determine Facts
- Develop Options
- Consider Consequences
- Choose
- Monitor and Modify

The model suggests the rationalization of obstacles to ethical decision making, as under: rationalizations

- If It's Necessary, It's Ethical
- The False Necessity Trap
- If It's Legal and Permissible, It's Proper
- **It's Just Part of the Job**
- It's All for a Good Cause
- I Was Just Doing It for You
- I'm Just Fighting Fire with Fire
- It Doesn't Hurt Anyone
- Everyone's Doing It
- It's Ok if I Don't Gain Personally
- I've Got It Coming
- I Can Still Be Objective

The model involves the Golden Rule – **"Help when you can and avoid harm when you can."**

It also involves the principle that, in general, the company should make decisions that promote the greatest amount of moral justness.

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