

CAPITAL BUDGETING DECISIONS

Concept:

Where should you put your money? “put it where your mouth is”, said the wag. In business you should put your money in those assets and those projects that maximise wealth. Capital budgeting function involves organisation's decision to invest its resources in long term assets like land, building, equipments, vehicles etc. So capital budgeting is budgeting for capital expenditure. Forgetting taxation for a moment, capital expenditure means “making a large outlay of money today in anticipation of benefits (cash inflows) which would flow across the life of the investment”

The basic feature of capital budgeting decision is:

- 1) Current funds are exchanged for future benefits (Large outlay)
- 2) There is an investment in long term activities; and (Irreversible)
- 3) The future benefits will occur to the firm over series of years. (future impact)

Need for CAPITAL INVESTMENT

- 1) Wear and tear of old equipments.
- 2) Obsolescence
- 3) Variation in product demand necessitating change in volume of production.
- 4) Product improvement requiring capital addition.
- 5) Learning curve effect.
- 6) Expansion.
- 7) Change of plant site.
- 8) Diversification
- 9) Productivity improvement

IMPORTANCE OF CAPITAL BUDGETING

- 1) Long-term implication.
- 2) Involvement of large amount of funds
- 3) Irreversible decisions
- 4) Risk and uncertainty
- 5) Difficult to make

Factors influencing investment decision

- 1) Management outlook.
- 2) Competitor's strategy.
- 3) Opportunities
- 4) Market forecast
- 5) Fiscal incentives
- 6) Cash flow budget
- 7) Non economic factors

TYPES OF CAPITAL INVESTMENT DECISIONS

(A) On the basis of firm's existence: The capital budgeting decisions are taken by both newly incorporated firms as well as by existing firms. The new firms may be required to take decision in respect of selection of a plant to be installed. The existing firm may be required to take decisions to meet the requirement of new environment or to face the challenges of competition. These decisions may be classified as follows:

(i) **Replacement and Modernisation decisions:** The replacement and modernisation decisions aim at to improve operating efficiency and to reduce cost. Generally all types of plant and machinery require replacement either because of the economic life of the plant or machinery is over or because it has become technologically outdated. The former decision is known as replacement decisions and later one is known as modernisation decisions. Both replacement and modernisation decisions are called cost reduction decisions.

(ii) **Expansion decisions:** Existing successful firms may experience growth in demand of their product line. If such firms experience shortage or delay in the delivery of their products due to inadequate production facilities, they may consider proposal to add capacity to existing product line.

(iii) **Diversification decisions:** These decisions require evaluation of proposals to diversify into new product lines, new markets etc. for reducing the risk of failure by dealing in different products or by operating in several markets.

(B) On the basis of decision situation:

(i) **Mutually exclusive decisions:** The decisions are said to be mutually exclusive if two or more alternative proposals are such that the acceptance of one proposal will exclude the acceptance of the other alternative proposals. For instance, a firm may be considering proposal to install a semi-automatic or highly automatic machine. If the firm install a semi-automatic machine it exclude the acceptance of proposal to install highly automatic machine.

(ii) **Accept-reject decisions:** The accept-reject decisions occur when proposals are independent and do not compete with each other. The firm may accept or reject a proposal on the basis of a minimum return on the required investment. All those proposals which give a higher return than certain desired rate of return are accepted and the rest are rejected.

(iii) **Contingent decisions:** The contingent decisions are dependable proposals. The investment in one proposal requires investment in one or more other proposals. For example if a company accepts a proposal to set up a factory in remote area it may have to invest in infrastructure also e.g. building of roads, houses for employees etc.

Procedure of Capital Budgeting

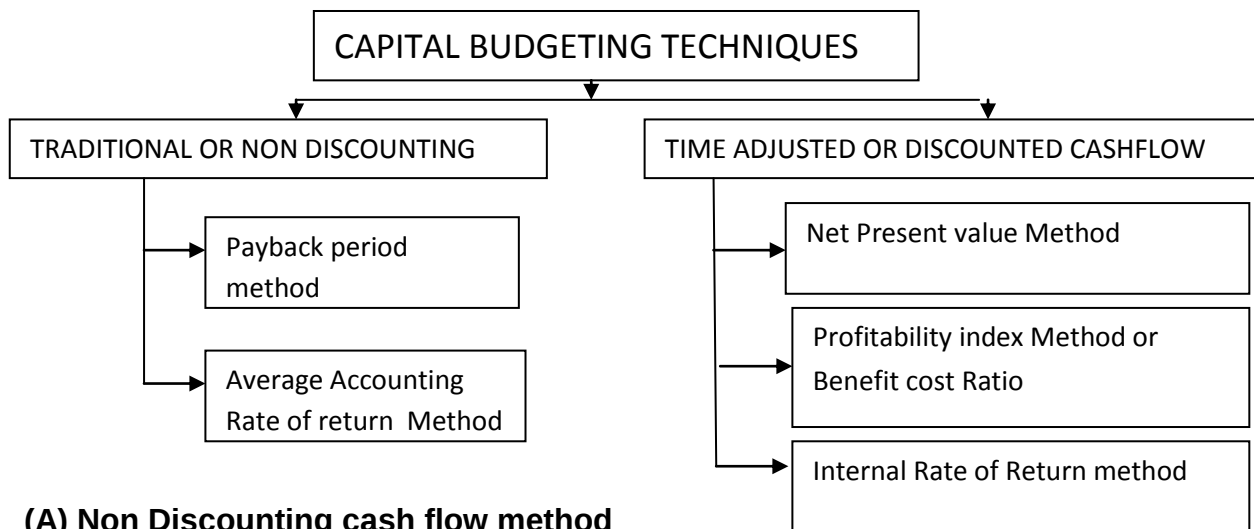
- 1) Identification of potential opportunities
- 2) Establishing the criteria
- 3) Screening and co-ordination
- 4) Evaluating investment proposals
- 5) Budgeting capital expenditure
- 6) Controlling project in process
- 7) Follow up and performance report

The principle of time value of money

A rupee received today is greater than a rupee received tomorrow because money has time value of money. I.e. *Earlier is better. Because of....*

- 1) Opportunity Cost: money received today can be reinvested to earn additional Interest and return.
- 2) Inflation: Inflation decrease purchasing power of money, as price of goods and Services ↑, purchasing power ↓.
- 3) Risk: future is always uncertain and unpredictable; therefore money received now is certain whereas money received in future is less certain.

PROJECT EVALUATION TECHNIQUES



(A) Non Discounting cash flow method

1) The payback period method:

This technique estimates the time required by the project to recover the firms initial outlay, through cash inflows.

- The payback period for each investment proposal is compared with the maximum period acceptable to management and
- Proposals are then selected in order of those having minimum payout period.

Payback period:
$$\frac{\text{cost of project or initial investment}}{\text{Annual cash inflow}}$$

Imp points: Cash inflow for project should be estimated on an after tax basis. (i.e annual profit after tax but before depreciation).

Illustration 1

Suppose a project costs Rs. 20,00,000 and yields annually a profit of Rs. 3,00,000 after depreciation @ 12½% (straight line method) but before tax 50%. The first step would be to calculate the cash inflow from this project. The cash inflow is Rs. 4,00,000 calculated as follows :

Rs.	
Profit before tax	3,00,000
Less : Tax @ 50%	<u>1,50,000</u>

Profit after tax	1,50,000
Add : Depreciation written off	<u>2,50,000</u>
Total cash inflow	4,00,000

While calculating cash inflow, depreciation is added back to profit after tax since it does not cash outflow. The cash generated from a project therefore is equal to profit after tax plus depreciation.

Payback period = $\frac{\text{Rs. 2000000}}{\text{Rs. 400000}}$ = 5 Years

Some Accountants calculate payback period after discounting the cash flows by a predetermined rate and the payback period so calculated is called, 'Discounted payback period'

Sometimes there are projects where the cash inflows are not uniform. In such a situation cumulative cash inflows will be calculated.

Illustration 2

If the project needs an initial investment of rs.25 L and the annual cash inflow for five years are Rs. 6 L, Rs 9 L, Rs 7 L, Rs 6 L, and Rs 4 L respectively. The payback period will be calculated as follows:

Year	Cash Inflow	Cummulative cash inflow
1	6 L	6 L
2	9 L	15 L
3	7 L	22 L
4	6 L	28 L
5	4 L	32 L

It is evident from the above table that in 3 years Rs. 22 L has been recovered and Rs. 3 L is left of initial investment of Rs. 25 L. It indicates that payback period is between 3 to 4 years calculated as follows:

Payback period: 3 years + $\frac{3 \text{ L}}{6 \text{ L}}$ = 3.5 years

Decision rule: Accept the project if payback period calculated for it is less than the maximum set by the management, reject the project if it is otherwise.

Payback period shows breakeven point where cash inflow are equal to cash outflows.

Advantages:

A major advantage of the payback period technique is that it is easy to compute and to understand as it provides a quick estimate of the time needed for the organization to recoup the cash invested. The length of the payback period can also serve as an estimate of a project's risk; the longer the payback period, the riskier the project as long-term predictions are less reliable. The payback period technique focuses on quick payoffs. In some industries with high obsolescence risk or in situations where an organization is short on cash, short payback periods often become the determining factor for investments.

Limitations:

The major limitation of the payback period technique is that it ignores the time value of money. As long as the payback periods for two projects are the same, the payback period technique considers them equal as investments, even if one project generates most of its net cash inflows in the early years of the project while the other project generates most of its net cash inflows in the latter years of the payback period. A second limitation of this technique is its failure to consider an

investment's total profitability; it only considers cash flows from the initiation of the project until its payback period and ignores cash flows after the payback period. Lastly, use of the payback period technique may cause organizations to place too much emphasis on short payback periods thereby ignoring the need to invest in long-term projects that would enhance its competitive position.

It may be said that payback period is defined as the measure of project liquidity and capital recovery rather than its profitability

2) Average Accounting (Book) Rate of Return (ARR): The accounting rate of return of an investment measures the average annual net income of the project (incremental income) as a percentage of the investment.

ARR in original investment:

$$= \frac{\text{Average Net earnings after depreciation and taxes}}{\text{Original investment (average investment)}}$$

The numerator is the average annual net income generated by the project over its useful life. The denominator can be either the initial investment or the average investment over the useful life of the project. Some organizations prefer the initial investment because it is objectively determined and is not influenced by either the choice of the depreciation method or the estimation of the salvage value. Either of these amounts is used in practice but it is important that the same method be used for all investments under consideration.

Decision Rule: Accept the proposal if $ARR > \text{minimum rate of return (cut off rate)}$

Reject the proposal if $ARR < \text{Minimum rate of return (cut off rate)}$

Advantages:

The accounting rate of return technique uses readily available data that is routinely generated for financial reports and does not require any special procedures to generate data. This method may also mirror the method used to evaluate performance on the operating results of an investment and management performance. Using the same procedure in both decision-making and performance evaluation ensures consistency. Lastly, the calculation of the accounting rate of return method considers all net incomes over the entire life of the project and provides a measure of the investment's profitability.

Limitations:

The accounting rate of return technique, like the payback period technique, ignores the time value of money and considers the value of all cash flows to be equal. Additionally, the technique uses accounting numbers that are dependent on the organization's choice of accounting procedures, and different accounting procedures, e.g., depreciation methods, can lead to substantially different amounts for an investment's net income and book values. The method uses net income rather than cash flows; while net income is a useful measure of profitability, the net cash flow is a better measure of an investment's performance. Furthermore, inclusion of only the book value of the invested asset ignores the fact that a project can require commitments of working capital and other outlays that are not included in the book value of the project.

Illustration 3

Suppose a project requiring an investment of Rs. 10,00,000 yields profit after tax and depreciation as follows:

Years	Profit after tax and depreciation Rs.
1.	50,000
2.	75,000
3.	1,25,000
4.	1,30,000
5.	<u>80,000</u>
Total	<u>4,60,000</u>

Suppose further that at the end of 5 years, the plant and machinery of the project can be sold for Rs. 80,000. In this case the rate of return can be calculated as follows.

$$\frac{\text{Total profit} \times 100}{\text{Net investment in project} \times \text{no of years of profit}}$$

$$\frac{460000 \times 100}{920000 \times 5 \text{ years}} = 10\%$$

This rate is compared with the rate expected on other projects, had the same funds been invested alternatively in those projects. Sometimes, the management compares this rate with the minimum rate (called-cut off rate) they may have in mind. For example, management may decide that they will not undertake any project which has an average annual yield after tax less than 15%. Any capital expenditure proposal which has an average annual yield of less than 15% will be automatically rejected.

(B) Discounted Cash Flow Methods**(1) Net Present Value Method:**

The net present value technique is a discounted cash flow method that considers the time value of money in evaluating capital investments. An investment has cash flows throughout its life, and it is assumed that a rupee of cash flow in the early years of an investment is worth more than a rupee of cash flow in a later year. The net present value method uses a specified discount rate to bring all subsequent net cash inflows after the initial investment to their present values (the time of the initial investment or year 0).

The discount rate or desired rate of return on an investment is the rate of return the firm would have earned by investing the same funds in the best available alternative investment that has the same risk.

Net present value = Present value of net cash Inflow - Total net initial investment

The steps to calculating net present value are (1) Determine the net cash inflow in each year of the investment, (2) select the desired rate of return, (3) Find the discount factor for each year based on the desired rate of return selected, (4) Determine the present values of the net cash flows by multiplying the cash flows by the discount factors, (5) Total the amounts for all years in the life of the project, and (6) Subtract the total net initial investment.

Illustration 4

Compute the net present value for a project with a net investment of Rs. 1, 00,000 and the following cash flows if the company's cost of capital is 10%? Net cash flows for year one is Rs. 55,000; for year two is Rs. 80,000 and for year three is Rs. 15,000.

[PVIF @ 10% for three years are 0.909, 0.826 and 0.751]

Solution Year	Net Cash Flows	PVIF @ 10%	Discounted Cash Flows
1	55,000	0.909	49,995
2	80,000	0.826	66,080
3	15,000	0.751	11,265
			1,27,340

Total Discounted Cash Flows 1,27,340

Less: Net Investment 1,00,000

Net Present Value 27,340

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

Decision Rule: If NPV > Zero : Accept the project

NPV < Zero: Reject the project

NPV = Zero: Firm is indifferent to accept or reject the project.

Advantages

(i) NPV method takes into account the time value of money.

(ii) The whole stream of cash flows is considered.

(iii) The net present value can be seen as the addition to the wealth of share holders. The criterion of NPV is thus in conformity with basic financial objectives.

(iv) The NPV uses the discounted cash flows i.e., expresses cash flows in terms of current rupees. The NPVs of different projects therefore can be compared. It implies that each project can be evaluated independent of others on its own merit.

Limitations

(i) It involves difficult calculations.

(ii) The application of this method necessitates forecasting cash flows and the discount rate. Thus accuracy of NPV depends on accurate estimation of these two factors which may be quite difficult in practice.

(iii) The ranking of projects depends on the discount rate. Let us consider two projects involving an initial outlay of Rs. 25 lakhs each with following inflow :

	(Rs in lakhs) 1st year	2nd year
Project A	50.0	12.5
Project B	12.5	50.0

At discounted rate of 5% and 10% the NPV of Projects and their rankings at 5% and 10% are as follows:

	NPV@5%	Rank	NPV@10%	Rank
Project A	33.94	I	30.78	I
Project B	32.25	II	27.66	II

The project ranking is same when the discount rate is changed from 5% to 10%. However, the impact of the discounting becomes more severe for the later cash flows. Naturally, higher the discount rate, higher would be the impact. In the case of project B the larger cash flows come later in the project life, thus decreasing the present value to a larger extent.

(iv) The decision under NPV method is based on absolute measure. It ignores the difference in initial outflows, size of different proposals etc. while evaluating mutually exclusive projects.

(2) Profitability index (PI) or desirability Factor

PI is defined as the rate of present value of the future cash benefits at the required rate of return to the initial cash outflow of the investment.

$$\text{PI:} \quad \frac{\text{Sum of discounted cash inflows}}{\text{Initial cash outlay/Total discounted cash outflow (as the case may be)}}$$

Illustration 5

we have three projects involving discounted cash outflow of Rs.5,50,000, Rs75,000 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 desirability factors for the three projects.

Solution

The desirability factors for the three projects would be as follows:

$$\begin{array}{lll} 1. \frac{\text{Rs.650000}}{\text{Rs.550000}} = 1.18 & 2. \frac{\text{Rs.95000}}{\text{Rs. 75000}} = 1.27 & 3. \frac{\text{Rs.10,030,000}}{\text{Rs.10,020,000}} = 1.001 \end{array}$$

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

Advantages

The method also uses the concept of time value of money and is a better project evaluation technique than NPV.

Limitations

Profitability index fails as a guide in resolving *capital rationing* where projects are indivisible. Once a single large project with high NPV is selected, possibility of accepting several small projects which together may have higher NPV than the single project is excluded. Also situations may arise where a project with a lower profitability index selected may generate cash flows in such a way that another project can be taken up one or two years later, the total NPV in such case being more than the one with a project with highest Profitability Index.

The Profitability Index approach thus cannot be used indiscriminately but all other type of alternatives of projects will have to be worked out.

CAPITAL RATIONING

(2010-Jun, 2007-Jun, 2000-Dec)

Generally, firms fix up maximum amount that can be invested in capital projects, during a given period of time, say a year. The firm then attempts to select a combination of investment proposals that will be within the specific limits providing maximum profitability and rank them in descending order according to their rate of return; such a situation is of capital rationing.

A firm should accept all investment projects with positive NPV, with an objective to maximise the wealth of shareholders. However, there may be resource constraints due to which a firm may have to select from among various projects. Thus there may arise a situation of capital rationing where there may be internal or external constraints on procurement of necessary funds to invest in all investment proposals with positive NPVs.

Capital rationing may also be introduced by following the concept of 'Responsibility Accounting', whereby management may introduce capital rationing by authorising a particular department to make investment only up to a specified limit, beyond which the investment decisions are to be taken by higher-ups.

The selection of project under capital rationing involves two steps:

- (i) To identify the projects which can be accepted by using the technique of evaluation.
- (ii) To select the combination of projects.

In capital rationing it may also be more desirable to accept several small investment proposals than a few large investment proposals so that there may be full utilisation of budgeted amount.

Illustration 6

Alpha Limited is considering five capital projects for the years 2010,2011,2012 and 2013. The company is financed by equity entirely and its cost of capital is 12%. The expected cash flows of the projects are as follows :

Year and Cashflow (Rs. '000) Project	2010	2011	2012	2013
A	(70)	35	35	20
B	(40)	(30)	45	55
C	(50)	(60)	70	80
D	—	(90)	55	65
E	(60)	20	40	50

Note : Figures in brackets represent cash outflows

All projects are divisible i.e. size of investment can be reduced, if necessary in relation to availability of funds. None of the projects can be delayed or undertaken more than once.

Calculate which project Alpha Limited should undertake if the capital available for investment is limited to Rs. 1,10,000 in year 2010 and with no limitation in subsequent years. For your analysis, use the following present value factors:

Year	2000	2001	2002	2003
Discounting factor	1.00	0.89	0.80	0.71

Solution: project E B C A For project D no limitation
Rank 1 2 3 4

3) INTERNAL RATE OF RETURN (IRR)

The IRR refers to the rate which equates the present value of cash inflows and present value of cash outflows. In other words, it is the rate at which NPV of investment is Zero. If NPV is positive, a higher discount rate may be used to bring it down to equalise the discount cash inflows and vice versa. That is why IRR is defined as the break even financing rate for the project.

$$\text{IRR} = \text{lower rate} + \left[\frac{\text{PVCIF at lower rate} - \text{PVCOF}}{\text{PVCIF at lower rate} - \text{PVCIF at higher Rate}} \right] \times \text{Difference in Rate}$$

Decision Rule: if $\text{IRR} > \text{Cost of capital (cut off rate)} = \text{Accept}$
 $\text{IRR} \leq \text{Cost of capital (cut off rate)} = \text{Reject}$

Illustration 7

Calculate the internal rate of return of an investment of Rs. 1, 36,000 which yields the following cash inflows:

Year	Cash Inflows (in Rs.)
1	30,000
2	40,000
3	60,000
4	30,000
5	20,000

Answer: IRR : 10.7%

Advantages:

- (i) This method makes use of the concept of time value of money.
- (ii) All the cash flows in the project are considered.
- (iii) IRR is easier to use as instantaneous understanding of desirability can be determined by comparing it with the cost of capital
- (iv) IRR technique helps in achieving the objective of maximisation of shareholders wealth.

Limitations

- (i) The calculation process is tedious if there are more than one cash outflows interspersed between the cash inflows, there can be multiple IRRs, the interpretation of which is difficult.
- (ii) The IRR approach creates a peculiar situation if we compare two projects with different inflow/outflow patterns.
- (iii) It is assumed that under this method all the future cash inflows of a proposal are reinvested at a rate equal to the IRR. It is ridiculous to imagine that the same firm has a ability to reinvest the cash flows at a rate equal to IRR.
- (iv) If mutually exclusive projects are considered as investment options which have considerably different cash outlays. A project with a larger fund commitment but lower IRR contributes more in terms of absolute NPV and increases the shareholders' wealth. In such situation decisions based only on IRR criterion may not be correct.

*****Modified Internal Rate of Return (MIRR)**

there are several limitations attached with the concept of the conventional Internal Rate of Return. The MIRR addresses some of these deficiencies e.g, it eliminates multiple IRR rates; it addresses the reinvestment rate issue and produces results which are consistent with the Net Present Value method.

Under this method , all cash flows , apart from the initial investment , are brought to the terminal value using an appropriate discount rate(usually the Cost of Capital). This results in a single

stream of cash inflow in the terminal year. The MIRR is obtained by assuming a single outflow in the zeroth year and the terminal cash in flow as mentioned above. The discount rate which equates the present value of the terminal cash in flow to the zeroth year outflow is called the MIRR.

Illustration 8

Using details given in illustration 7, calculate MIRR considering a 8% Cost of Capital .

Ans: MIRR of the investment based on a single cash inflow of Rs 2,13,587 and a zeroth year cash out flow of Rs 1,36,000 is 9.4% (approximately)

Illustration 9

CXC Company is preparing the capital budget for the next fiscal year and has identified the following capital investment projects:

Project A: Redesign and modification of an existing product that is current scheduled to be terminated. The enhanced model would be sold for six more years.

Project B: Expansion of a product that has been produced on an experimental basis for the past year. The expected life of the product line is eight years.

Project C: Reorganization of the plant's distribution centre, including the installation of computerized equipment for tracking inventory.

Project D: Addition of a new product. In addition to new manufacturing equipment, a significant amount of introductory advertising would be required. If this project is implemented, Project A would not be feasible due to limited capacity.

Project E: Automation of the Packaging Department that would result in cost savings over the next six years.

Project F: Construction of a building wing to accommodate offices presently located in an area that could be used for manufacturing. This change would not add capacity for new lines but would alleviate crowded conditions that currently exist, making it possible to improve the productivity of two existing product lines that have been unable to meet market demand.

The cost of capital for CXC Company is 12%, and it is assumed that any funds not invested in capital projects and any funds released at the end of a project can be invested at this rate. As a benchmark for the accounting (book) rate of return, CXC has traditionally used 10%. Further information about the projects is shown below.

	<i>Project A</i>	<i>Project B</i>	<i>Project C</i>	<i>Project D</i>	<i>Project E</i>	<i>Project F</i>
Capital Investment	106,000	200,000	140,000	160,000	144,000	130,000
NPV@12%	69,683	23,773	(10,228)	74,374	6,027	69,513
IRR	35%	15%	9%	27%	14%	26%
Payback Period	2.2 years	4.5 years	3.9 years	4.3 years	2.9 years	3.3 years
ARR	18%	9%	6%	21%	12%	18%

If CXC Company has no budget restrictions for capital expenditures and wishes to maximize stakeholder value, the company would choose, based on the given information, to proceed with Projects A or D (mutually exclusive projects), B, E, and F. All of these projects have a positive net present value and an internal rate of return that is greater than the hurdle rate or cost of capital. Consequently, any one of these projects will enhance stakeholder value. Project C is omitted because it has a negative net present value and the internal rate of return is below the 12% cost of capital.

With regard to the mutually exclusive projects, the selection of Project A or Project D is dependent on the valuation technique used for selection. If net present value is the only technique used, CXC Company would select Projects B, D, E, and F with a combined net present value of 173,687, the maximum total available. If either the payback method or the internal rate of return is used for selection, Projects A, B, E, and F would be chosen as Project A has a considerably shorter payback period than Project D, and Project A also has a higher internal rate of return than Project D. The accounting rate of return for these two projects is quite similar and does not provide much additional information to inform the company's decision. The deciding factor for CXC Company between Projects A and D could very well be the payback period and the size of the initial investment; with Project A, the company would be putting fewer funds at risk for a shorter period of time.

If CXC Company were to use the accounting rate of return as the sole measurement criteria for selecting projects, Project B would not be selected. It is clear from the other measures that Project B will increase stakeholder value and should be implemented if CXC has no budget restrictions; this clearly illustrates the necessity that multiple measures be used when selecting capital investment projects.

Rather than an unrestricted budget, let us assume that the CXC capital budget is limited to 4,50,000. In cases where there are budget limitations (referred to as capital rationing), the use of the net present value technique is generally recommended as the highest total net present value of the group of projects that fits within the budget limitation will provide the greatest increase in stakeholder value. The combination of Projects A, B, and F will yield the highest net present value to CXC Company for an investment of 436,000.

RISK ANALYSIS IN CAPITAL BUDGETING DECISION:

"In a world of certainty, the risk element is zero. In a real world, certainty element is zero!!"

Risk: An expression of the possibility that the actual outcome will differ from expected outcome.

Risk Analysis: Risk analysis gives management better information about the possible outcomes that may occur so that management can use their judgement and experience to accept an investment or reject it.

Since risk analysis is costly, it should be used relatively in costly and important projects.

Risk and uncertainty are quite inherent in capital budgeting decision. This is so because investment decision and capital budgeting's are action of today which bear fruits in future which is unforeseen. It is necessary to allow discounting factor to cover risk. One way to compare risk in alternative proposal is the use of standard deviation. Lower SD indicates lower risk. However wherever returns are expressed in revenue terms the co-efficient of variation gives better measurement for risk evaluation.

Probability: it is chance of occurrence or non occurrence of an outcome. Probability is an expression of individual assessment of an outcome of a given course of action.

Probability Distribution: it indicates a range of possible outcomes, the chance of occurrence of each of which is assigned a numerical value.

Expected Value: is the simple average of all possible value after taking into the account the probability of occurrence.

Standard deviation= SD is a standardised unit of deviation from mean.

Higher the SD... Higher the Risk

How to compute: 1) Compute EV

2) Compute Deviation (d) from expected value. (EV- original value)

3) compute- deviation square d_i^2

- Probability = $\pi_i \times d_i^2$

- Summation: $\sum \pi_i d_i^2$

- Determine square root of summation.

Decision: SD= Risk, Ev= Return.

Same return (Ev) - Choose lower risk project.

Same Risk (SD) - Choose higher return.

Different return, Different risk – depend upon risk preference of investors.

Risk Adjusted Discount rate: (RADR)

The discounts rate in capital budgeting represents the expected rate of return. Project with higher risk are generally accepted to provide higher return. All projects should not be discounted at the same rate, namely the co's cost of capital.

Hence, the cut-off discount rate should be adjusted upward or downward to take care of the additional risk element. This is referred to as risk adjusted discount rate. A project will be accepted if it yields a positive NPV using RADR.

Higher the risk in a project, higher would have to be the adjustment in cut off rate and vice versa.

RADR: Cost of capital + premium for risk.

RADR are used in investment and budgeting decisions to cover time value of money and the risk.

Illustration:10

Solution Ltd have been in IT business for six years and enjoy a favourable market reputation. Corporate tax is 30%. They anticipate that the demand for its solutions would increase sizably since many foreign firms are setting up their BPO shops in India. For an expansion project, they propose to invest Rs.22 crores to be funded by new debt and equity on 50:50 basis. Enquiries with merchant bankers reveal that funds can be raised as under.

Debt	Rate
First rs. 5 crores	10%
Next rs. 5 crores	12%
All additional funds	15.72%
Equity	12%
Risk gradation by company	2% over WMCC

- 1) compute the appropriate risk adjusted discount rate.
- 2) what should be target breakeven level of net annual cash flow after tax for the company, If the life of the project is four years.

ANS: 1)RADR: 12% 2) break even level of annual CFAT is Rs.724.40 lacs.

CE approach:**Certainty Equivaleant Factor(CEF):**

CEF is the ratio of assured cashflow to uncertain cashflow.

Under this approach, the cashflow expected in a project are converted into risk less equivalent amount. The adjustment factor used is called CEF. This varies between 0 to 1. Here decision maker specifies the sum he must be assured of receiving to make him indifferent between a 'certain sum' and the expected value of 'risky sum'.

"Under CE approach, the assured (certain) cashflow are discounted at risk free rate to arrive at NPV."

$$\text{CEF} = \frac{\text{CEF}}{\text{UCF}} \quad \text{Certain cash flow} \quad \text{CCF} = \text{UCF} \times \text{CEF}$$

Method of computation under CE approach;

- 1) Convert uncertain cash flow to certain cash flow by multiplying with CEF.
- 2) Discount CCF at risk free rate to arrive NPV, if NPV positive project can be expected.

Illustration:11

Blue prints Ltd whose cost of capital is 10% is considering project with the following expected cash flows. The risk free rate is 8%. The NPV at 10% is found to be positive.

Year	0	1	2	3
Cash flow Rs.	(22500)	17500	12500	12500

Due to uncertainties about future cash receipts, the management decides to adjust these cash flows to certainty equivalents, by taking 60%, 55%, and 50% of the cash flows of year 1 to 3 respectively. Assess the viability of the project.

Ans: Decision- since NPV is negative the project should be rejected.

Limitation of CEF approach:

Determining the CE factor is subjective. The role of judgement is predominant. Risk averse decision maker may prefer to use the risk adjusted discount rate method that involves adjusting the discount rate rather than adopt CEF method.

RADR & CEF:

Under RADR approach, we adjust the discount rate to take care of projects with higher risk. That is, we use a higher discount rate. Under CEF method, we make downward adjustment of project cashflow and use the risk free rate to arrive at NPV.

Decision Tree:

In a capital budgeting exercise, the decision maker has to identify and evaluate the various alternative course of action leading to the investment decision. A decision tree captures these alternatives in the form of a diagram and useful for clarifying the range of alternative course of action, assessing possible outcomes. i.e multiplicity of choices and outcomes.

"A decision tree is a graphical device that shows a sequence of strategic decisions and expected consequences under each possible set of circumstances."

There are two stages in preparing a decision tree. The first step is drawing the decision tree itself, in a manner that reflects all the choices and outcomes. The second step is to incorporate probabilities, relevant values and derive expected monetary value.

Remember: 1) Draw from left to right: but evaluate from right to left.

2) Sum up probable values at chance node: pick the best in decision node.

Illustration:12

June'2006

A firm has an investment proposal requiring an outlay of 40000 Rs. The investment proposal is expected to have 2 year economic life with no salvage value. In year-1, there is a 0.4 probability that CFAT(cashflow after tax) will be rs.25000 and 0.6 probability that CFAT will be rs.30000. the probabilities assigned to CFAT for the year 2 are as follows.

IF CFAT= Rs.25000		If CFAT = Rs.30000	
Amount	Probability	Amount	probability
12000	0.2	20000	0.4
16000	0.3	25000	0.5
22000	0.5	30000	0.1

The firm uses a 10% discount rate for this type of investment. You are required to—

- 1) Present the above information in the form of a decision tree. (6 marks)
- 2) Find out the NPV under a) the worst outcomes and b) under the best outcomes. (7 marks)
- 3) Find out the probability or otherwise of the above investment proposal (7 marks)

Simulation:

Meaning: simulation is quantitative procedure. It is a mathematical model that represents actual decision making under condition of uncertainty for evaluating alternative course of action based up on facts and assumption. Such model involves conducting a series of organized experiments to predict the probable outcome of that process in a given period of time. Simulation means construction of a model to represent a real life situation and provides a trial and error movement toward an optimum solution.

One of the most widely used models is montecarlo simulation. The model has gained its name, from the 'gambling' element of its random selection of numbers within a set of individual probability distribution.

Illustration: 13

You are the CFO of Dynamite Ltd. Your company propose to buy equipment costing Rs. 1,00,000/-. The equipment will last 5 years. Your company's cost of capital is 10%. Your analysts have suggested that the expected revenues per annum can be Rs.100,000 or Rs. 125,000 or Rs.137,500 or Rs. 150,000/-. Similarly, the cost could be Rs. 62,500 or Rs.75,000 or Rs. 87,500 or Rs.100,000/- The probability for these variables is:

Revenues	0.15	0.40	0.30	0.15
Costs	0.10	0.25	0.35	0.30

You wish to run a simulation model and have picked the random number 81, 02, 60, 04, 46, 31, 67, 25, in that order, alternatively for revenue and costs. Decide whether the project can be undertaken.

Ans: positive NPV Rs. 148784. Project is seen to be viable.

Self Examination Questions**Objective Type Questions**

- A capital budgeting technique which does not require the computation of cost of capital for decision making purposes is,
(a) Net Present Value method (b) Internal Rate of Return method
(c) Modified Internal Rate of Return method (d) Pay back
- If two alternative proposals are such that the acceptance of one shall exclude the possibility of the acceptance of another then such decision making will lead to,
(a) Mutually exclusive decisions (b) Accept reject decisions (c) Contingent decisions (d) None of the above
- In case a company considers a discounting factor higher than the cost of capital for arriving at present values, the present values of cash inflows will be
(a) Less than those computed on the basis of cost of capital (b) More than those computed on the basis of cost of capital
(c) Equal to those computed on the basis of the cost of capital (d) None of the above
- The pay back technique is specially useful during times
(a) When the value of money is turbulent (b) When there is no inflation
(c) When the economy is growing at a steady rate coupled with minimal inflation. (d) None of the above
- While evaluating capital investment proposals, time value of money is used in which of the following techniques,
(a) Payback method (b) Accounting rate of return (c) Net present value (d) None of the above
- IRR would favour project proposals which have,
(a) Heavy cash inflows in the early stages of the project. (b) Evenly distributed cash inflows throughout the project.
(c) Heavy cash inflows at the later stages of the project (d) None of the above.
- The re investment assumption in the case of the IRR technique assumes that,
(a) Cash flows can be re invested at the projects IRR (b) Cash flows can be re invested at the weighted cost of capital
(c) Cash flows can be re invested at the marginal cost of capital (d) None of the above
- Multiple IRRs are obtained when,
(a) Cash flows in the early stages of the project exceed cash flows during the later stages.
(b) Cash flows reverse their signs during the project (c) Cash flows are un even (d) None of the above.
- Depreciation is included as a cost in which of the following techniques,
(a) Accounting rate of return (b) Net present value
(c) Internal rate of return (d) None of the above
- Management is considering a Rs 1,00,000 investment in a project with a 5 year life and no residual value . If the total income from the project is expected to be Rs 60,000 and recognition is given to the effect of straight line depreciation on the investment, the average rate of return is :
(a) 12% (b) 24% (c) 60% (d) 75%
- Assume cash outflow equals Rs 1,20,000 followed by cash inflows of Rs 25,000 per year for 8 years and a cost of capital of 11%. What is the Net present value?
(a) (Rs 38,214) (b) Rs 9,653 (c) Rs 8,653 (d) Rs 38,214
- What is the Internal rate of return for a project having cash flows of Rs 40,000 per year for 10 years and a cost of Rs 2,26,009?
(a) 8% (b) 9% (c) 10% (c) 12%
- While evaluating investments, the release of working capital at the end of the projects life should be considered as,
(a) Cash in flow (b) Cash out flow (c) Having no effect upon the capital budgeting decision (d) None of the above.
- Capital rationing refers to a situation where,
(a) Funds are restricted and the management has to choose from amongst available alternative investments.
(b) Funds are unlimited and the management has to decide how to allocate them to suitable projects.
(c) Very few feasible investment proposals are available with the management.
(d) None of the above
- Capital budgeting is done for
(a) Evaluating short term investment decisions. (b) Evaluating medium term investment decisions.
(c) Evaluating long term investment decisions. (d) None of the above

Answers to Objective Type Questions

- | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|----|----|----|
| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. |
| 10. | 11. | 12. | 13. | 14. | 15. | | | |

THOUGHT:

'No one discover their destiny, your destiny will discover you.... it will find you, provided you have done the preparation and inner work required to seize the opportunity when it presents itself. All of us, whether or not we are warriors, have a cubic centimetre of chance that pops out in front of our eyes from time to time. The difference between the average person and a warrior is that warrior is aware of this and stays alert, deliberately waiting, so that when this cubic centimetre of chance pops out, it is picked up'

Here's the key. Stop worrying about finding your destiny. Spend your time getting to know yourself. Focus on rebuilding your self- relationship. Get to know your deepest and truest values. As you get to know who you are and what you are really all about, you will be able to seize that 'cubic centimetre of chance' when it pops out in front of you. And trust me, it will'

CAPITAL BUDGETING DECISION

Ex: 1 ABC Ltd is a small company that is currently analyzing capital expenditure proposals for the purchase of equipment; the company uses the net present value technique to evaluate projects. The capital budget is limited to 500,000 which ABC Ltd believes is the maximum capital it can raise. The initial investment and projected net cash flows for each project are shown below. The cost of capital of ABC Ltd is 12%. You are required to compute the NPV of the different projects.

	Project A	Project B	Project C	Project D
Initial Investment	200,000	190,000	250,000	210,000
Project Cash Inflows				
Year 1	50,000	40,000	75,000	75,000
2	50,000	50,000	75,000	75,000
3	50,000	70,000	60,000	60,000
4	50,000	75,000	80,000	40,000
5	50,000	75,000	100,000	20,000

Answer:

Net present value	(19,750)	25,635	27,050	(3,750)
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Ex:2. EEC Ltd is considering the purchase of a machine. Two machines LM and PM are available. Each costing Rs.100000. both machines will last for five years with no residual value. In comparing the profitability of machines, a discount rate of 10% is to be used. Earning after taxation @40% and charging depreciation on Straight line are expected to be as follow.

Year	1	2	3	4	5
LM Rs.	10000	20000	30000	10000	nil
PM Rs.		(10000)	10000	20000	40000

Indicates which machine would be more profitable investment under various methods of ranking investment proposals viz. ARR, payback, NPV and PI.

ANS: ARR: LM: 14% PM 16% , Payback: LM=2.6 years, PM=3.3 years, NPV: LM=30770 Rs. PM=29730rs. PI: LM=1.308, PM=1.2973

EX:3. The FFM Ltd is in the tax bracket of 35% and discounts its cash flows at 16%. In the acquisition of an asset worth Rs.1000000. it is given two offers either to acquire the assets by taking a bank loan @15% p.a repayable in five yearly instalments of rs.200000 each plus interest or to lease in the assets at yearly rentals of 324000 Rs. For five years. In both cases, the instalment is payable at the end of one month year. Applicable rate of depreciation is 15% using WDV method. You are required to suggest the better alternatives.

Ans: cash outflow in lease option: Rs.689504.4 and in buying option Rs. 731540.4.. lease is better.

EX:4 Project x involves an initial out lay of Rs. 16.2 million. Its life span is expected to be 3 years. The cash streams generated by it are expected to be as follows.

Year:	1	2	3	ANS: IRR= 15%
Cash inflow Rs in million	8	7	6	

You are required to calculate the internal rate of return.

EX:5 Software enterprise is considering the purchase of a new computer system for R & D division which would cost Rs.3500000. the operation and maintenance cost (excluding depreciation) are expected to be rs. 7 lak p.a. it is estimated that the useful life of the system would be 6 years, at the end of which the disposal value is expected to be rs. 1 lak. The tangible benefits expected from the system in the form of reduction in design and draftsmanship cost would be rs. 12 lak p.a. the disposal of used drawing, office equipment and furniture initially is anticipated to net rs. 9 lak.

As a capital expenditure in R&D. The proposal would attract 100% write off for tax purpose. The gains arising from disposal of used assets may be considered tax free. The corporate tax rate is 35%. The required rate of return of the company is 12%. After appropriate analysis of cash flows, advise the company of the financial viability of the proposal. Ignore tax on salvage value.

Ans: NPV is RS.(119250) hence not viable

Ex:6

Ankit Ltd is considering to take up project – X or Y. both the projects have same life, require equal investment of Rs.80 lakh and have almost same yield. An attempt is made to use probability theory to analyse the pattern of cash flow from either project during first year of operation. This pattern is likely to continue during life of these projects. The results of analysis are as follows:

Project –X		Project –Y	
Cash flow	Probability	Cash flow	Probability
1200000	0.10	800000	0.10
1400000	0.20	1200000	0.25
1600000	0.40	1600000	0.30
1800000	0.20	2000000	0.25
2000000	0.10	2400000	0.10
8000000	1.00	8000000	1.00

You are required to decide as to which project is riskier to be dropped by the company.

Ans: Project X: S.D: 219099 C.O.V : 0.1369

Project Y: S.D : 456070 C.O.V: 0.285. Y is more risky.

Ex:7

Evaluate the feasibility or otherwise of a project keeping in view the following data:

- 1) the nominal rate of return is 14%
- 2) the expected rate of inflation over life is 7%
- 3) Cash flow of the project are as under:

Year:	0	1	2	3	4
Cash flow	(10000)	3000	3000	3000	3000

Also find out the real rate of return.

Ans: Real rate of return: 6.54%.IF cashflow nominal: NPV is -1261 Rs. and if cashflow real NPV is 269 Rs.

Ex:8

Alfa Ltd is in the business of manufacturing bearings. Some more product are being planned to be added to the existing system. To manufacture the planned product lines the firm needs a machine which if purchased outright will cost Rs. 10, 00,000. Modern hire purchase and leasing co has offered two proposal as below:

Proposal:1 (Hire purchase)

Rs.250000 will be payable on signing of the agreement. Three annual instalments of Rs. 400000 will be payable at the end of each year starting from year first. The ownership of the machine will be transferred automatically at the end of third year. The company will be able to claim depreciation on straight line basis with zero salvage value.

Proposal: 2 (lease)

Rs. 20000 will be payable towards initial service fee upon signing of the agreement which is tax deductible expense. Annual leasing rental of Rs. 432000 is payable at the end of each year starting from the first year for a period of three years.

Evaluate the above two proposal and advise the company as to which proposal implies lesser cost given that tax rate is 35% and discount rate is 20%. (Calculation may be rounded off to Rupee).

Ans: the present value of cash outflows in case of hire purchase is Rs. 729543 and in case of lease Rs 604478. So the lease option implies lesser cost and firm should procure the machine on lease basis.

2010, June professional programme – 20 marks

EX 9: A Surya manufacturer is planning to start a new manufacturing process. Following are the estimated net cash flows and probabilities of the new manufacturing process:

Year	Net cash flows(Rs)		
	P=0.2	P=0.6	P=0.2
0	(-)200000	(-)200000	(-)200000
1	40000	60000	80000
2	40000	60000	80000
3	40000	60000	80000
4	40000	60000	80000
5	40000	60000	80000
5(salvage)	0	40000	60000

Surya manufacturers cost of capital for an average risk project is 10%

(a) The project has average risk find the project's NPV

(b) Find the best case and worst case NPVs what's the probability of occurrence of the worst case if the cash flows are perfectly dependent (perfectly positively correlated) over time and independent over time?

(c) Assume that all the cash flows are perfectly positively correlated, that is, there are only three possible cash flow streams over time:

(1) The worst case.

(2) The most likely or base case; and

(3) The best case with probabilities 0.2 0.6 and 0.2 respectively

These cases are represented by each of the columns in the given table. Find the expected NPV? The standard deviation and co-efficient of variation.

Ans: NPV=49794 Rs. Worst case= -48365 Rs, Base case=52284 Rs, Best case= 140518

2009, December professional programme – 20marks

EX 10: Alfa Ltd. Is in the business of manufacturing bearings. Some more product lines are being planned to be added to the existing system. To manufacture the planned products fines, the firm needs a machine which if purchased outright will cost RS 10, 00,000. Modern hire-purchase and leasing co. has offered two proposals as below

Proposal -1(hire purchase)

RS 2, 50,000 will be payable on signing of the agreement. Three annual instalments of RS. 4, 00,000 will be payable at the end of each year starting from year first. The ownership of the machine will be transferred automatically at the end of third year. The company will be able to claim depreciation on straight line basis with zero salvage value.

Proposal-2(lease)

RS 20000 will be payable towards initial service fee upon signing of the agreement which is tax-deductible expense. Annual lease rental of RS 432000 is payable at the end of each year for a period of three years. Evaluate the above two proposals and advise the company as to which proposal implies lesser cost given that tax –rate is 35% and discount rate is 20% (calculation may be rounded off to rupee.)

Ans: Proposal 1 outflow Rs.7,29,543 and proposal 2 outflow 604478. Second is better

2009, December professional programme – 4marks

EX 11: Monark Ltd. Is considering two alternative financial plans to start a new project. In plan-1, it is likely to issue equity shares of RS. 16 lakh and 13% preference capital of RS 4 lakh. In plan-2, the company will issue equity shares of RS. 8 lakh, 13% preference capital of RS 4 lakh, and 15% debentures of RS. 8 lakh. The face value of equity shares in both plans is RS. 10 tax rate is 30%.

You are required

to determine level of EBIT at which the EPS would be same under both the plans.

Ans: at the Rs.3,14,286 of EBIT the EPS of both companies will same at Rs. 1.05

2009 ,December cs final – 20marks

EX 12: Asin Ltd. Manufactures a special chemicals. It is thinking of replacing its existing machine by a new machine, which would coast RS25 lakh. The company's current production is 80,000 units, and if the new machine bought, it is expected to increase to 1,00,000 units. The selling price of the product would remain unchanged at RS. 80 per unit. The following is the cost of producing one unit of the product using both existing and new machines:

Coast per unit RS

	Existing machine (80.000 units)	New machine (1,00,000 units)	Difference
Material	30.0	25.5	(4.5)
Wages and salaries	20.5	15.0	(5.5)
Supervision	8.0	10.0	2.0
Repairs	4.5	3.0	(1.5)
Power and fuel	6.2	5.7	(0.5)
Depreciation	0.1	2	1.9
Allocated corporate overheads	4.0	5.0	1.0
	73.3	66.2	(7.1)

The existing machine has an accounting book value of RS. 40,000, and it is fully depreciated for tax purposes. It has a remaining economic life of 5 years. The supplier of the new machine has offered to accept old machine in exchange for RS. 1,00,000. However, the market prise of the old machine today is RS. 60,000 and RS. 15,000 after 5 years. New machine has a life of 5 year and salvage value of RS. 1,00,000 at the end of economic life. Tax rate is 30% and WDV depreciation rate is 25%. The after tax required rate of return is 20%. Decide whether new machine should be purchased.

Ans- NPV 12,75,000 lakh, it should be accepted.

2009,December cs final – 10 marks

EX 13: A company is considering two mutually exclusive projects. The company used certainty equivalent approach. Estimated cash flows and certainty equivalents for each project are as follows:

Year	Cash flow	Project-1 certainty equivalent	Cash flow	Project-2 certainty equivalent
0	-30,000	1.00	-40,000	1.00
1	15,000	0.95	25,000	0.90
2	15,000	0.85	20,000	0.80
3	10,000	0.70	15,000	0.70
4	10,000	0.65	10,000	0.60

Which project should be accepted, if risk free discount rate is 15% ?

Ans NPV of 1 = Rs.351 and NPV of 2 = Rs 1998.

2009, December cs final – 10 marks

Ex 14: priyanka Ltd. Intends to establish a warehouse so as to exploit the present market situation. The initial cost of project is expected to be RS. 30 lakh and the life of such warehouse will be 5 year. The funds will be provided by the business house. Required to be repaired over period of 5 year at an interest rate of 15% per annum. The operating cost is estimated at RS 6 lakh in the first year and is expected to increase at the rate of RS.50,000 every year.

It is proposed to fix storage charges rate in such a way that income over period of five year covers the initial investment of RS. 30 lakh as well as the operating cost.

The occupancy of the warehouse is expected to be 9,000 MT in the initial year and will increase by 250 MT in each of the following year.

You are required

To find out storage rate to be charged per MT/month so as to break-even in this project ignore income-tax. Residual value of the project is estimated to be RS. 3,60,000.

Ans- Storage Rate/ton/M 13.50

2009, june cs Final – 10 marks

Ex 15: Glow Ltd. Is considering to acquire an additional computer to supplement its time-share computer services to its clients. It has two options-

(1) To purchase the computer for RS. 22,00,000

(2) To lease the computer for 3 year from a leasing company for RS. 5,00,000 as annual lease rent plus 10% of gross time-share service revenue. The agreement also requires an additional payment of RS. 6,00,000 at the end of third year end, and the computer reverts to the lessor after the contract period.

The company estimated that the computer under review now will be worth RS. 10,00,000 at the end of third year. Forecast revenues are-

Year	RS.
1	22,50,000
2	25,00,000
3	27,50,000

Annual operating cost (excluding depreciation/lease rent of computer) are estimated at RS. 9,00,000 with an additional RS. 1,00,000 for start-up and training at the beginning of the first year. These costs are to be borne by the lessee. Glow Ltd. Will borrow at 16% interest to finance acquisition of computer, repayment are to be made according to following schedule:

Year-end	Principal (RS)	Interest (RS)	Total(RS)
1	5,00,000	3,52,000	8,52,000
2	8,50,000	2,72,000	11,22,000
3	8,50,000	1,36,000	9,86,000

The company uses straight line method to depreciate and pays 50% tax on its income

The management of Glow Ltd. Approaches you as, the company secretary, For advice. Which alternative would you recommend and why?