

CHAPTER 2

CAPITAL BUDGETING PRACTICES - A THEORETICAL FRAMEWORK

This chapter presents a theoretical framework of the capital budgeting decision. This chapter has been divided into four sections. Section I discusses the different types of investment projects and different stages of capital budgeting process. Section II discusses the capital budgeting techniques available for investment evaluation and other issues like discount rate used, cash flow estimation, NPV-IRR conflict etc. Section III presents a discussion on the aspect of risk, various risk factors and capital budgeting techniques for incorporating risk. The last section i.e. Section IV deals with the methods used to calculate cost of capital and cost of equity capital.

Section I

Types of Investment and Stages of Capital Budgeting

2.1 Classification of Investment Projects

The decision making process of capital budgeting varies depending on whether the project is independent, mutually exclusive or is a contingent project. *Independent projects* are those where the acceptance or rejection of one does not directly eliminate other projects from consideration or affect the likelihood of their selection. *Mutually Exclusive projects* can be defined as two or more projects that cannot be pursued simultaneously– the acceptance of one prevents the acceptance of the alternative proposal. On the other hand, *Contingent project* is the one in which the acceptance or rejection of which is dependent on the decision to accept or reject one or more other projects.

Capital Budgeting Decision making process may also vary depending on the nature of the investment project, i.e. whether it is an expansion or a diversification or a replacement and modernisation project. *Expansion projects* are those which invest in additional assets to expand existing product or service line or increase the capacity to cater to growing demand. *Diversification projects* on the other hand are those in which investment is aimed at producing new products or services or entering into new production activity or new business. It can also be defined as expansion of new business. *Replacement and Modernisation Investment* is meant to replace outdated and obsolete equipment or assets with new efficient and economical assets so as to reduce operating costs, increase the yield and improve the operating efficiency.

2.2 Stages of Capital Budgeting Process

Capital budgeting process can be divided into four major phases: identification, development, selection and post-audit. In the first phase, ideas and suggestions for possible investment opportunities of enterprise resources are identified. In the second phase, ideas and suggestions with greatest income potential are developed into complete and detailed investment plans. In the third phase, investment plans are compared, and those that appear to be in the best interest of the enterprise are selected. In the final phase, investment performance is monitored for any significant variations from expectations to determine if goals are being met (Mukherjee, 1987, p. 37). Several tasks are required to be performed at different phases which are briefly explained below.

1) Strategic planning

Strategic planning can be defined as an organization's process of defining its strategy by setting its policies, directions, priorities and specifying the structural, strategic and tactical areas of business development that would facilitate achievement of the corporate goal.

2) Identification of investment opportunities

This means developing a mechanism wherein the investment suggestions coming from inside the firm, such as from its employees, or from outside the firm, such as from a firm's advisors are 'listened and paid attention to' by the management.

3) Preliminary screening of projects

This step is undertaken to avoid unnecessary wastage of resources like time, money and effort, these identified investment opportunities are subjected to a preliminary screening process by management i.e. to isolate the marginal and unsound proposals.

4) Financial appraisal of projects

Financial appraisal of projects involves the application of cash flow forecasting techniques, project evaluation or capital budgeting techniques, risk analysis techniques and even mathematical programming techniques so as to determine whether the proposed investment project would add value to the firm or not.

5) Qualitative factors in project evaluation

Along with quantitative analysis, qualitative factors are also considered which include many like societal impact on employment, environmental impact of the project and safety issues involved, government's political attitude towards the project,

strategic consequences of consumption of scarce resources or raw material, labour management relationships in the project, legal hassles and difficulties with respect to the use of patents, copyrights and trade or brand names and impact on the firm's image, if the project is socially questionable.

6) The accept/reject decision

To decide whether to accept/reject a project, all information, coming from the financial appraisal and qualitative results, is collected for making decisions. Managers with experience and knowledge also consider other relevant information using their routine information sources, expertise, 'gut feeling' and, of course, judgements.

7) Project implementation and monitoring

Once an investment project is accepted, the implementation phase for an industrial project, involves the setting up of manufacturing facilities, project and engineering designs, negotiations and contracting, construction, and training and plant commissioning. Also effective methods are required to monitor and control the capital budgeting process as the project may face some practical problems, such as human relationship, political maneuvering and so on.

8) Post-implementation audit/Project review

This is the last phase which involves the examination of the project's progress in its implementation phase, an in-depth analysis of the actual costs and benefits to date, the likely future prospects of the project and a comparison of these prospects to the initial expectations. Post-implementation audit can provide useful feedback to project appraisal or strategy formulation by analyzing the past 'rights' and 'wrongs'.

Section II

Capital Budgeting Techniques and its Considerations

2.3 Capital Budgeting Techniques

Companies use capital budgeting techniques to decide whether or not a particular project is economically viable and adds to the value or wealth of the firm. In case of more than one project, these aid the management in identifying the projects that maximise the firm's objective function of shareholders' wealth maximization. While some companies prefer traditional non-discounted less sophisticated techniques like Pay Back Period Method, Accounting Rate of Return etc., others have moved towards more sophisticated Discounted Cash Flow (DCF) techniques like Net Present Value

(NPV) and Internal Rate of Return (IRR). The two broadly categorised techniques of capital budgeting are discussed below.

2.3.1 Traditional Capital Budgeting Techniques

The traditional techniques of capital budgeting, also known as Non-Discounted Cash Flow Techniques (NDCF), do not consider the time value of money and give equal weight to money earned in different time periods.

1) Payback Period Method (PBP)

The Payback period for a project that generates constant cash flows is calculated by dividing the initial outlay of the project with the annual cash inflow and in case annual cash inflows are unequal, the payback period can be found by adding up the cash inflows until the total is equal to the original cost of asset. If there are a number of investment proposals, than the one with a shorter payback period is preferred. In case of a single project, if the payback period calculated for a project is less than the maximum payback period set up by the management, it would be accepted otherwise it would be rejected. Besides being simple to understand and easy to calculate, the Payback period method has the advantage that it requires less time and effort. Further, it focuses on reduction of the loss through obsolescence and also considers the risk element present in the future investments by emphasizing on early recovery of cash. Due to its short-term approach and emphasis on liquidity, this method is particularly suited to a firm, which is starving of cash.

But its greatest demerit is that it is not consistent with the objective of shareholders wealth maximization. Further, it doesn't take into account the cash inflow earned after the payback period and hence the profitability cannot be assessed correctly. It also ignores the time value of money and doesn't consider timing and magnitude of cash inflows. However, in spite of these weaknesses, payback period is still very popular for its emphasis on practical considerations of liquidity and risk element of a business.

2) Accounting Rate of Return Method (ARR)

ARR is calculated by dividing the average annual net profits after taxes by the average investment i.e. average return on average investment = (average annual profit / average investment) x 100.

If the ARR of the project is more than the cut off rate decided by the management, then the investment project is accepted else it is rejected. ARR has certain advantages like it is simple and easy to understand as it directly uses the accounting profits

without the complexity of estimating the cash flows of a project. Secondly, it incorporates the entire stream of income of an investment proposal. However its certain serious flaws are that it considers accounting profits and not cash flows, ignores the time value of money and is not applicable where investment is done in parts.

In the present researches these traditional techniques have been found to be applied as a supplementary method in combination with the primarily used Discounted Cash Flow techniques.

2.3.2 Discounted Cash Flow (DCF) Capital Budgeting Techniques

These techniques give due weightage to the time value of money by using an appropriate discount rate to calculate the present value of cash flows.

1) Net Present Value (NPV) Method

Net Present Value here refers to present value of net cash inflows generated by a project less the initial investment on the project. Before calculating NPV, a target rate of return is set (generally the firm's appropriate cost of capital) which is used to discount the net cash inflows from a project. According to Porterfield (1966), the NPV of a project is the present value of cash inflows minus the present value of the cash outflows. In mathematical form the net present value is explained as:

$$\text{NPV} = - \text{Initial Investment} + \left[\frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \dots \right]$$

Or

$$\text{NPV} = - \text{Initial Investment} + \sum_{t=1}^n \frac{C_t}{(1+r)^t}$$

Where,

C_t is the net cash inflow at the end of year t where t varies from 1 to n .

n is life of project, and r is the discount rate/ cost of capital.

If NPV is positive ($\text{NPV} > 0$), i.e. the present value of cash inflow exceeds the present value of cash outflows, then the investment proposal is accepted, but if NPV is negative ($\text{NPV} < 0$) then the investment proposal is rejected. This method has the merit that it is consistent with the objective of shareholders' wealth maximization as it considers the entire stream of earnings of a project. Also it explicitly recognizes the time value of money and gives due emphasis on timing and magnitude of cash inflow.

However, this method has certain computational problems like difficulty in cash flow estimation, difficulty in measuring discount rate and ambiguous results in case of mutually exclusive projects with unequal life or unconventional cash flow patterns.

2) Internal Rate of Return (IRR) Method

This method is also known as time-adjusted rate of return; yield method, trial and error yield method etc. The Internal Rate of Return can be defined as that rate of discount, which equates the present value of cash inflows with the cash outlay. Mathematically it can be defined as the value of r in the following equation:

$$\text{Initial Investment} = \sum_{t=1}^n \frac{C_t}{(1+r)^t}$$

where C_t is net cash inflow at end of time t where t varies from 1 to n , **r is the Internal Rate of Return (IRR)**, and n is the life of the project.

If the Internal Rate of Return(r) is higher or equal to the minimum required rate of return i.e. cost of capital or cut off rate then the investment project is accepted and it is rejected if the Internal rate of return is less than the cost of capital or cut off rate. In the case of a number of proposals, highest rank is given to the proposal, which has the highest Rate of Return. However, these rates must be higher than the cost of capital or cut off rate.

IRR has the same merits as of NPV method like consistency with the objective of shareholders' wealth maximization, considering the entire stream of earnings of a project and giving due emphasis on timing and magnitude of cash inflow. However, its serious drawbacks include multiple rate of returns rather than one unique rate and ambiguous results in case of mutually exclusive projects with unequal life, unequal scale of investment or unconventional cash flow patterns.

3) Modified Internal Rate of Return (MIRR)

MIRR is a modification and an improvement over the traditional Internal Rate of Return (IRR). The MIRR can be calculated by the following steps:

- Calculate the present value of the cash outflow (PVC) associated with the project using cost of capital (r) as the discount rate.

$$\text{PVC} = \sum_{t=0}^n \frac{\text{Cash Outflow}}{(1+r)^t}$$

- Calculate the terminal value (TV) of the cash inflows expected from the project.

$$TV = \sum_{t=0}^n \text{Cash Inflow} (1+r)^{n-t}$$

- MIRR is obtained by solving the following equation $PVC = \frac{TV}{(1+\text{MIRR})^n}$

MIRR is superior to IRR in two ways.

- Firstly, it assumes that project's cash flow are reinvested at the cost of capital which is more realistic than at the same rate of return as that generated by the project itself in case of IRR.
- Secondly, it generally gives only one rate, hence avoids the problem of multiple rate of returns.

However, MIRR does suffer from some of the other drawbacks of IRR, like it can lead to an incorrect choice between mutually exclusive investments. In case of mutually exclusive projects of same size NPV and MIRR lead to same decision but if mutually exclusive projects differ in size, then there is a possibility of conflict.

4) Discounted Pay Back Period

A major shortcoming of the conventional payback period is that it does not take into account the time value of money. To overcome this limitation, the discounted payback period has been suggested. In this method cash flows are firstly converted into their present values by applying a suitable discount rate and then these are added to find the time period to recover the initial outlay of the project. The time period at which the cumulated present value of cash inflows becomes equal to present value of cash outflows is known as discounted payback period. As per this method a project with a shorter payback period is preferred to the one which has a longer payback period.

5) Profitability Index (PI)/Benefit Cost Ratio

The profitability index compares the present value of future cash inflows with the initial investment on a relative basis. Therefore, the Profitability Index (PI) is the ratio of the present value of cash flows (PVCF) to the initial investment of the project.

$$PI = \frac{\sum_{t=1}^n \frac{C_t}{(1+r)^t}}{I_0}$$

where C_t is the cash flow at the end of year t where t varies from 1 to n ,

n is life of project

r is the discount rate/ cost of capital

I_0 is initial investment

The acceptance rule under this method is that, a project with a PI greater than one is accepted, but a project with PI less than one is rejected and the project may or may not be accepted if the PI is equal to one. The PI method is closely related and very similar to the NPV approach. It has the same merits as NPV like it considers time value of money and maximises shareholders wealth. Similarly the drawbacks like difficulty in calculating cash flows and measuring discount rate are also common.

6) Adjusted Present Value (APV)

All discounted-cash-flow (DCF) methodologies bundle all financing side effects into a single discount rate. On the contrary, APV approach first proposed by Stewart C. Myers unbundles components of value and analyses each component like interest tax shield, issue costs, subsidies separately by using extra discounting. In this approach, the projects' cash flows are broken down into two components i.e. operating cash flows and certain cash flows associated with financing the project. These components are then valued such that

$$APV = \text{Unlevered Project Value} + \text{Value of Project Financing}$$

The decomposition of cash flows is undertaken so that different discount rates may be used on the components. As operating cash flows are more risky than finance related cash flows, they are discounted at a higher rate.

$$APV = \left[\sum_{t=1}^n \frac{CF_t}{(1+k_{eu})^t} - ICO \right] + \left[\sum_{t=1}^n \frac{I_t(T_c) - F}{(1+k_d)^t} \right]$$

where CF_t is the after tax operating cash flow at time t , ICO is Initial Cash Outlay, k_{eu} is required rate of return if the firm all equity financed or unlevered. I_t is interest payment of debt at time t . T_c is the Corporate Tax rate, k_d is the before tax cost of debt financing and F is the after tax floatation cost associated with financing.

The power of APV lies in the added managerially relevant information it can provide. APV method is pleasing to many academics but it is not widely used in

business. This is because it is relatively difficult and assumes that there is no other market imperfection other than corporate taxes and floatation costs. This method is particularly suitable if a company departs radically from its previous financing patterns or invests in an entirely new line of business resulting in major alteration in financial or business risk.

7) NPV Adjusted with Real Options

This can be defined as an approach to capital budgeting that relies on option pricing theory to evaluate projects. Real options approach is intended to supplement, not replace, capital budgeting analysis based on standard DCF methodologies. Standard capital budgeting techniques are flawed as they consider only current information and assumes all managerial actions are absent once the cash flows estimates are prepared. In practice capital budgeting decisions are not passive and static. Instead they are subject to managerial actions with several options as time progresses. For example, after having implemented a project, managers have the option of reducing capacity utilization, or undertaking advertising campaign if volumes are not picking up. Similarly, options of increasing production, raising prices, develop more product variants are also available if product is accepted more than expected. Thus, an endless number of future courses of action are available while standard capital budgeting exercise ignores the strategic value of a decision.

In capital budgeting flexibility of management and the ability to change the cash flows of the project subsequently is referred to as an option on real assets. Options on real assets are normally of three types: Option to Delay, that is decision regarding timing of project implementation; Option to Expand, that is an option or flexibility to increase the production, increase price or add product lines to enhance the cash flow of a project later depending on the experiences gained in the initial phases of the project; and Option to Abandon, that is the flexibility of the management to exit the project having implemented it realizing its salvage value. There are three different methods of valuing real options namely DCF Approach, Binomial Model and Black Scholes Formula.

DCF Approach is popularly known as NPV with Real Options. The presence of managerial or real options enhances the worth of an investment project. The worth of a project can be viewed as its NPV calculated in traditional way together with the value of any option. Thus, **Projects Worth** = NPV + Option(s) Value

In an Option to Expand using DCF approach we view project in two phases. In Phase I we do not consider option to expand or do DCF Valuation without Call Option. However in Phase II we consider option to expand and do DCF Valuation with Call Option. In this case

Project worth=NPV without expansion option + Value of Expansion Option

The Option to abandon which is similar to put option, we carry similar DCF valuation without Put option and DCF valuation with Put Options. In this case

Project worth=NPV without Abandonment Option + Value of Abandonment Option.

However, in an Option to Delay we find the NPV of different timing options and choose the one with maximum NPV.

8) The Hurdle Rate

The hurdle rate is the minimum acceptable rate of return on a capital investment project. It is equal to the company's cost of capital plus the project's risk premium, i.e.

$$\text{Hurdle Rate} = \text{Cost of Capital} + \text{Risk Premium}$$

By using the hurdle rate (i.e., cost of capital + risk premium) as the project's minimum acceptable rate of return, the likelihood that any projects that is accepted will indeed be profitable is increased. So, the hurdle rate is set high enough and the project is profitable enough to clear it, then one can be wrong on some of the estimates and still be fine. In* other words, hurdle rate is simply the required rate of return in a discounted cash flow analysis, above which an investment makes sense and below which it does not. Often, this is based on the firm's cost of capital or weighted average cost of capital, plus or minus a risk premium to reflect the project's specific risk characteristics, also called the required rate of return. In case of NPV method, hurdle rate may be used as discount rate and in IRR method the projects with a rate of return above the hurdle rate may be accepted.

9) Earnings Multiple Approach or Price/Earnings (P/E) method

This is a variation of the payback method since it calculates how many years it will take until the initial investment (the share price) will be paid back by earnings. It considers earnings instead of cash-flows and only considers one earning figure (instead of many), and again does not take the time value of money into consideration. On the other hand, this relative valuation method has the advantage of letting the more or less efficient capital market guide the decision.

10) Economic Value Added (EVA)

This is an estimate of a firm's economic profit being the value created in excess of the required return of the company's investors (being shareholders and debt holders). It is a specific approach of calculating economic profit developed by consulting firm Stern Stewart and Co. In other words, EVA is the profit earned by the firm less the cost of financing the firm's capital. The idea is that value is created when the return on the firm's economic capital employed is greater than the cost of the capital. It is the net operating profit after taxes (or NOPAT) less a capital charge, the latter being the product of the cost of capital and the economic capital. The basic formula is:

$$\text{EVA} = \text{Net operating profit after taxes} - \text{a capital charge [the residual income method]}$$

$$\text{i.e. EVA} = \text{NOPAT} - (c \times I)$$

where NOPAT is profits derived from a company's operations after cash taxes but before financing costs and non-cash bookkeeping entries, c is the Cost of Capital is the minimum rate of return on capital required to compensate investors (debt and equity) for bearing risk, their opportunity cost. I is the investment or capital i.e. the amount of cash invested in the business, net of depreciation. It can be calculated as the sum of interest-bearing debt and equity or as the sum of net assets less non-interest-bearing current liabilities (NIBCLs). The capital charge calculated by multiplying c with capital is the cash flow required to compensate investors for the riskiness of the business given the amount of economic capital invested. It can also be defined as $\text{EVA} = [\text{Return on Net Assets (RONA)} - \text{required minimum return}] \times \text{net investments}$.

2.4 NPV and IRR Contradiction

A number of surveys have shown that, in practice, the IRR method is more popular than the NPV approach. Despite NPV's conceptual superiority, managers seem to prefer IRR over NPV because IRR is intuitively more appealing as it is a percentage measure. However, IRR has never had a good academic press. Compared with NPV, IRR has many drawbacks: it is only a relative measure of value creation, it can have multiple answers, it is difficult to calculate, and it appears to make a reinvestment that is unrealistic. But financial managers still prefer it. IRR expresses itself as a percentage measure of project performance and provides a useful tool to measure 'headroom' when negotiating with suppliers of funds.

It fills the need that NPV does not. Managers as well as financial analysts usually think in terms of rate of returns rather than absolute rupee values. IRR results can be readily interpreted by all parties. It can be compared to the expected inflation, current borrowing rates, cost of capital, and so on. It also offers a practical advantage over NPV. NPV cannot be estimated unless the discount rate is known but IRR can still be calculated.

However there are some problems with the IRR method. Firstly, in case of non-conventional projects, it often gives unrealistic multiple rates of return. In this case, there may be two discount rates i.e. Multiple Internal Rate of Return that makes the present value equal to the initial investment. In this case, there is confusion as to which rate should be used for comparison with the cut off rate. Secondly, in case of mutually exclusive projects (where out of two or more projects one that is best is to be found), the IRR is misleading. Thirdly, in case of projects with different pattern of cash flows, substantial difference in initial investment or time horizons, IRR is again unreliable. Thus, the IRR method, despite its popularity in the business world, entails more problems than a practitioner may think.

Similarly, many surveys support NPV over IRR as criteria to evaluate investment. **Lorrie and Savage (1955)** mentioned the difficulties associated with the use of IRR. The ranking of projects given by IRR is different from that of NPV in case of mutually exclusive and non-conventional projects. However, still many prefer NPV to IRR, as it is very consistent with the objective of shareholders' wealth maximization.

When comparing two projects, the use of the NPV and the IRR methods may give different results. A project selected according to the NPV may be rejected if the IRR method is used. The use of the IRR always leads to the selection of the same project, whereas project selection using the NPV method depends on the discount rate chosen. They generally give conflicting results in the following situations: in case of non conventional investment projects with cash outflows throughout project life and in case of mutually exclusive projects with either unequal project life, difference in scale of investment or pattern/timing of cash flows.

Generally speaking, one can use and rely on both the NPV and the IRR if the following two conditions are met.

- First, if projects are compared using the NPV, a discount rate that fairly reflects the risk of each project should be chosen. There is no problem if two projects are discounted at two different rates because one project is more risky than the other.

The result of the NPV is as reliable as the discount rate that is chosen. If the discount rate is unrealistic, the decision to accept or reject the project is baseless and unreliable.

- Second, if the IRR method is used, the project must not be accepted only because its IRR is very high. Management must ask whether such an impressive IRR is possible to maintain. In other words, management should look into past records and existing and future business, to see whether an opportunity to reinvest cash flows at such a high IRR really exists. If the firm is convinced that such an IRR is realistic, the project is acceptable. Otherwise, the project must be re evaluated by the NPV method, using a more realistic discount rate.

The two methods give identical results provided two conditions are met:

- i) Conventional Cash Flows must be there in the project with negative initial cash flows and positive subsequent cash flows.
- ii) Project should be independent i.e. can be accepted or rejected without reference to any other project.

2.5 Discount Rate /Cut off Rate in Investment Evaluation

The discount rate/cut off rate used in DCF techniques is matched with the cash flows of the project. The cost of capital that is used as discount rate will depend upon whose perspective capital investment proposal is being examined. The cash flows that are discounted will have to be consistent with the stakeholders that are being considered. In case all cash flows are considered then relevant discount rate will be Weighted Average Cost of Capital. However, if analysis is done from the perspective of equity shareholders times then relevant cash flows will be those belonging to equity shareholders and relevant discount rate will be cost of equity. In case of companies heavily dependent on debt or loans even cost of debt or bank rate or term lending rate of financial institutions only may be considered as the relevant discount rate. WACC is widely used discount rate, because by accepting projects yielding more than weighted average required return the firm is able to increase the market price of its stock. However, in actual practice it is suitable for one product firm with all investment proposals having similar risk characteristics.

In case of multi product firm with investment proposals of varying risk, WACC is inappropriate. Thus, the discount rates have to be modified if the risk profile of cash flows of the new project is substantially different from that of the existing company operations. Further risk profile of different divisions of an

organization or for its overseas projects may vary. Thus discount rate may have to be adjusted in such cases.

2.6 Cash Flow Forecasting Methods

Irrespective of which method of evaluation is adopted for capital budgeting, the projection of cash flow is a prerequisite. The projection of cash flows is a more cumbersome and challenging exercise than the selection of capital budgeting technique. The projection of cash flows by managers is influenced by an individual's frame of mind of being pessimistic or optimistic, risk perception of future, manager's tendency to find short cut to a problem. Apart from these behavioral problems that distort the projection, another reason to have incorrect cash flows is the inability of managers to discern what needs to be included and what to be excluded in the cash flows. Projection of Cash Flows of a project is done under three broad heads of initial cash outlay, regular cash flows and terminal year cash flows (Project at the end of Project's useful Life). While estimating the cash flows care has to be taken to include only relevant and incremental cash flows, include the opportunity costs, account for any side effects, ignore the sunk costs, incorporate working capital and exclude depreciation being a non cash expense.

Cash Flow estimation though calculated quantitatively is mainly based on manager's subjective estimates. These estimates may carry manager's bias. There may be an overstatement or understatement of cash flows depending on what is the manager's desire. Thus, Cash Flow Estimation needs to be done with full care and vigilance to avoid selection of unprofitable projects which otherwise might appear lucrative due to overstatement of cash flows.

Section III

Measures of Risk, Risk Factors and Capital Budgeting Techniques Incorporating Risk

2.7 Risk and its Measures

Experienced operators in an industry develop a keen intuition for the risks in a venture and are able to discount the bullish forecasts in investment proposals. The experienced ones look for one or two key indicators in the investment proposal and decide very quickly about the degree of risk in the venture. This intuitive approach of investment based on hard won experience is very important. The proposal of the investment is thought out from all angles, which help to define how the project is to

be managed, as it will highlight, particularly, the critical areas that will need close control. Risks can be segregated into two broad categories namely business risk and financial risk. The business risk belongs to the line manager whereas the corporate finance department is supposed to possess the expertise to handle the financial risk.

Business risks include competitor, technological and customer factors. Competitor risk is particularly important where a new product or sales outlet or pricing strategy is introduced. If the project is going to have a significant impact on the market, it should be assumed that competitor would react, if possible. How quickly they react, may be difficult to estimate and quantify. This factor must be considered and documented in the investment proposal, and if the possible reaction is going to be significant then contingency plans need to be built into the proposal. For ventures into the unknown, the risk can be contained by the use of pilot projects. The cost justification for pilot projects gives a good indication of the likely success of the full project. The cost justification for a pilot project lies in its ability to minimize the risk of larger losses. Deciding what is or is not worthwhile is a subjective decision based on the extent of the possible risks and the ability to test the risks. Thus risk refers to variability. It is a complex and multifaceted phenomena. Diverse measures have been used to capture different facets of risk. The most important ones include:

- **Range-** It is the simplest measure of risk denoted by the difference between highest and lowest values of a distribution.
- **Standard Deviation/Variance-** is the most widely used absolute measure of risk which provides a better insight into risk analysis by finding out the dispersion of cash flows. It measures the difference between possible cash flows that can occur and their expected value. If two projects have the same cost and their net present values are also the same, standard deviations of the expected cash inflows of the two projects may be calculated to judge the comparative risk of the projects. Standard deviation is measured by multiplying the probability, with the squared difference of outcome, and the expected value and then finally calculating the square root of the summation of all possible outcomes. Square of the standard deviation is called the variance. The project having a higher standard deviation is said to be more risky as compared to the other.

- **Coefficient of Variation-** It is a relative measure of risk defined by the Standard Deviation of the probability distribution divided by its expected value i.e.

$$CV = \text{Standard Deviation} / \text{Expected Value}$$

Coefficient of variation is a relative measure of dispersion. If the projects have the same cost but different net present values, relative measure i.e. coefficient of variation should be computed to judge the relative positions of risk involved. It is calculated by dividing the standard deviation by expected value of the possible outcomes.

- **Semi Variance-** It is the measure of risk that considers only negative deviations unlike standard deviation or variance that considers both deviations negative as well as positive.
- **Expected Net Present Value Based on Subjective Probabilities-**The classical concept of objective probability is of little use in analysing investment decisions because these decisions are non-repetitive and hardly made under independent identical conditions over time. In such cases knowledgeable persons may pool their experience and judgement to define the probability distribution. Thus these are referred to as subjective probability distributions. The expected Net Present values can be found by multiplying the monetary value of the possible events (cash flows) by their probabilities.

$$\text{Expected Net Present Value} = \sum_{t=0}^n \frac{ENCF_t}{(1+k)^t}$$

where $ENCF_t$ is the Expected Net Cash Flows (Inflows and Outflows) in period t and k is the discount rate. Here $ENCF_t = \sum_j NCF_{jt} * P_{jt}$ where NCF_{jt} is the net cash flow for the j^{th} event in period t and P_{jt} is the probability of net cash flow for j^{th} event in period t .

2.8 Risk Factors

The different sources of risk explain in general, from where the risk arises. Further, the specific important factors of risk prevalent in the market or the macroeconomic risk forces which are beyond the control of the business enterprise are summarised below.

1. Inflation Risk

A factor affecting all investments is purchasing power risk, or the chance that the purchasing power of invested dollars will decline. With uncertain inflation, the real (inflation-adjusted) return involves risk even if the nominal return is safe (e.g., a Treasury bond). This risk is related to interest rate risk, since interest rates generally rise as inflation increases, because lenders demand additional inflation premiums to compensate for the loss of purchasing power.

2. Interest Rate Risk

The variability in an investment's return resulting from changes in the level of interest rates is referred to as interest rate risk. It is risk to the earnings or market value of a portfolio due to uncertain future interest rates. In this deregulated era, interest rate fluctuation is a common phenomenon with its consequent impact on investment values and yields. Interest rate risk affects fixed income securities and refers to the risk of a change in the value of your investment as a result of movement in interest rates. There are two perspectives on risk, one is book value perspective, which perceives risk in terms of its effect on accounting earnings, and the other market value perspective—sometimes called an economic perspective—which perceives risk in terms of its effect on the market value of a portfolio.

3. Term Structure Risk (also called yield curve risk or re-pricing risk)

This risk is due to changes in the fixed income term structure. It arises if interest rates are fixed on liabilities for periods that differ from those on offsetting assets. One reason may be maturity mismatches. Term structure risk also occurs with floating rate assets or liabilities. If fixed rate assets are financed with floating rate liabilities, the rate payable on the liabilities may rise while the rate earned on the assets remains constant. In general, any occasion on which interest rates are to be reset—either due to maturities or floating rate resets—is called a repricing. The date on which it occurs is called the repricing date. It is this terminology that motivates the alternative name "repricing risk" for term structure risk.

4. Business Cycle/GDP Risk

The risk of business cycles or other economic cycles, adversely affects the returns of an investment, an asset class or an individual company's profits. Cyclical risks exist because the broad economy has been shown to move in cycles – periods of peak performance followed by a downturn, then a trough of low activity. Between the peak and trough of a business or other economic cycle, investments may fall in value to

reflect the uncertainty surrounding future returns as compared with the recent past. Cyclical risk can also be tied to inflationary risks, as some investors consider inflation to be cyclical in nature. Cyclical risk does not typically have a tangible measure, but instead is reflected in the prices or valuations of assets that are deemed to have higher or lower cyclical risks than the market.

5. Commodity Price Risk

Commodity markets have, at various times, exhibited significant price volatility. These high and volatile commodity prices may result in a fall in value of investments. The combination of inelastic demand and supply in many commodities means that, at least in the short term, unanticipated changes in demand or supply can generate large price swings.

6. Exchange Rate Risk

Foreign exchange risk (also known as Exchange rate risk or Currency risk) is a financial risk posed by an exposure to unanticipated changes in the exchange rate between two currencies. Investors and multinational businesses exporting or importing goods and services or making foreign investments throughout the global economy are faced with an exchange rate risk which can have severe financial consequences if not managed appropriately. If foreign exchange markets are efficient such that purchasing power parity, interest rate parity, and the international Fisher effect hold true, a firm or investor needn't protect against foreign exchange risk due to an indifference toward international investment decisions. A deviation from one or more of the three international parity conditions generally needs to occur for an exposure to foreign exchange risk. All investors who invest internationally in today's increasingly global investment arena face the prospect of uncertainty in the returns after they-convert the foreign gains back to their own currency. Unlike the past when most U.S. investors ignored international investing alternatives, investors today must recognize and understand exchange rate risk, which can be defined as the variability in returns on securities caused by currency fluctuations. Thus, exchange rate risk also called currency risk relates to the potential for change in the value of one currency in relation to another.

7. Distress Risk/Probability of Bankruptcy

A company is said to be in Distress risk or bankruptcy if it faces one of the two possible conflicts. These can be defined either as a cash shortage on the assets side of the balance sheet, or a debt overhang in liabilities. Both sets of circumstances

however, draw similar results, namely that cash flow is insufficient to cover current obligations. This forces company into negotiations with their creditors, about the conditions of deferment on their debt repayment during the ensuing period of distressed restructuring. When entering financial distress, companies are quickly confronted with the dilemma of raising capital to fund their restructuring.

8. Company size Risk/Small firms being more risky.

The small firm has limited or no access to most of the traditional debt and equity markets that supply long term financing to the corporate world, and therefore operates in segmented and imperfect financial markets. These small firms face unique financing problems at virtually every stage of their development. Many of the traditional sources for financing corporate business development are not available to small firms. Therefore, small business is financed by only a segment of debt and equity markets that are imperfect markets. Large firms' demand functions for debt and equity are downward sloping and they substitute among alternative debt and equity instruments that offer the most favourable terms. Small firms usually pursue the maximum quantities of debt and capital they can obtain at the existing market price. Since small businesses rarely obtain long term debt or equity in traditional financial markets, they must rely on trade credit and bank credit as major sources of debt and they obtain much of their external capital from entrepreneurs' own funds and informal investors who are family members or acquaintances of the entrepreneur. Informal investment is the direct contribution of capital to return.

9. Market to Book Ratio

Market/book ratio, sometimes called price-to-book ratio, is a way of measuring the relative value of a company compared to its stock price or market value. Market/book ratio is a useful way of measuring your company's performance and making quick comparisons with competitors. It is an essential figure to potential investors and analysts because it provides a simple way of judging whether a company is under or overvalued. If your business has a low market/book ratio, it is considered a good investment opportunity. At its most simple, market/book ratio measures the market capitalization (expressed as price per stock) of a business divided by its book value (the value of assets minus liabilities). The book value of a company refers to what would be left if the business paid its liabilities and shut its doors, although, of course, a growing business will always be worth more than its book value

because it has the ability to generate new sales. To calculate market/book ratio, take the current price per stock and divide by the book value per stock:

Market/book ratio = Market price per stock ÷ Book value per stock

10. Momentum Price risk

This study shows that past trading volume provides an important link between ‘momentum’ and ‘value’ strategies. Specifically, we find that firms with high (low) past turnover ratios exhibit many glamour (value) characteristics, earn lower (higher) future returns, and have consistently high negative (positive) earnings surprises over the next eight quarters. Past trading volume also predicts both the magnitude and persistence of price momentum. Specifically, price momentum effects in reverse over the next five years, and high (low) volume winners (losers) experience faster reversals. Collectively, our findings show that past volume helps to reconcile intermediate-horizon ‘under reaction’ and long-horizon ‘overreaction’ effects. The fact is that you cannot get rich without taking risks. Risks and rewards go hand in hand; and, typically, higher the risk you take, higher the returns you can expect. In fact, the first major Zurich Axiom on risk says: "Worry is not a sickness but a sign of health. If you are not worried, you are not risking enough". Then the minor axiom says: "Always play for meaningful stakes". The secret, in other words, is to take calculated risks, not reckless risks. In financial terms, among other things, it implies the possibility of receiving lower than expected return, or not receiving any return at all, or even not getting your principal amount back. Every investment opportunity carries some risks or the other. In some investments, a certain type of risk may be predominant, and others not so significant. A full understanding of the various important risks is essential for taking calculated risks and making sensible investment decisions.

2.9 Capital Budgeting Techniques Incorporating Risk

As mentioned in the previous sections, in today’s turbulent business environment companies are increasingly exposed to a multitude of risks. These risk factors affect all companies in some or other manner. Risk Analysis in capital budgeting is used as a measure for reducing the risk, which helps us in finding out the range of variation of possible results of proposed projects. A wide variety of tools are available for handling risk; from simple Break even Analysis to Simulation and other complicated statistics based methods. Depending upon the amount of initial outlay, the criticality of the cash flows to the overall cash flows and other factors, the analysis

of risk and tools of handling the same may be decided. However, still there are a few companies who follow no formalised method for adjustment of these risks but may make these adjustments informally in the cash flows or discount rates. Similarly, many adjust them on the basis of Judgement Evaluation of the Corporate Finance Managers. Several measures like conservative estimation of revenues, safety margin in cost figures, flexible investment yardsticks according to project riskiness are based on managers' subjective Judgement rather than explicitly defined probability distributions. Thus, Judgement evaluation in project appraisal is in practice very popular to incorporate risk factor in capital budgeting. Other formal risk adjustment techniques used by the companies may be categorised as below:

2.9.1 Conventional Risk Handling Techniques

There are a fewer simpler techniques of assessing risk associated with capital budgeting proposals that are considered equally effective and easy to comprehend. These techniques are based on existing or project cash flows or they incorporate risk in the capital budgeting process itself rather than addressing the issue separately.

These conventional techniques of handling risk in capital investment proposals are:

1) Risk-Adjusted Discount Rate

For a long time, the economists have assumed that to allow for risk, the businessman requires a premium over and above the risk free alternative. Accordingly the more uncertain the return in the future, the greater is the risk and the greater premium required. Based on this reasoning, it is proposed that the risk premium can be incorporated in the capital budgeting analysis through the discount rate. That is, if the time preference for money is recognized by discounting estimated future cash flows, at some risk free rate, to their present values, then to allow for the riskiness, of those future cash flows, a risk premium rate may be added to risk free discount rate. Such a discount rate will allow for both times preference and risk preference and will be a scam of risk free rate and risk premium rate. The Risk adjusted discount rate accounts for risk by varying the discount rate depending on the degree risk in an investment proposal. While, WACC is already a risk adjusted discount rate for projects in the same line of business as existing, it cannot be used as universal discount rate for all projects of the firm. Risk-adjusted discount rate method uses a higher discount rate for more risky cash flows and lesser discount rate for less risky cash flows. The discount rate method can be expressed as follows:

Where k is risk-adjusted rate and is given by

Risk adjusted discount rate = Risk-free rate + Risk premium

$$k = k_f + k_r$$

and

$$NPV = \sum_{t=0}^n \frac{NCF_t}{(1+k)^t}$$

2) Shorter Payback Period

Payback is one of the oldest and commonly used methods for recognizing risk associated with an investment proposal or project. This method as applied in practice is more of an attempt to allow for risk in capital budgeting decision rather than a method to measure profitability. Business firms using this method usually prefer shorter payback periods to longer ones and often establish guidelines that firms accept. The Maximum cut-off Payback period, decided by the management is set as a bench mark for acceptance or rejection of the project. However this cut off period may be lengthened or shortened for specific projects. This is a useful procedure only if the forecast of cash flows associated with the project are likely to be unimpaired for a certain period. It mainly accounts for the special kind of risk that the project will go exactly as planned for certain period of time and will then suddenly cease altogether due to varied reasons like civil war, strike, natural disaster, introduction of new product by competitor etc. However it ignores the main risk of wrong forecasting of future cash flows due to lower sales, higher costs etc. The merit of this method is its simplicity and its ability to make allowance for risk.

3) Conservative Estimates of Cash Flows

In many cases, the revenues expected from a project are conservatively estimated to ensure the viability of the projects, is not easily threatened by unfavourable circumstances. The Project Sponsors are asked to estimate revenues conservatively and capital budgeting committee requires justification for revenue figures given by those who propose capital expenditures. This has a sobering effect on cash flows estimation.

4) Certainty Equivalent Approach

This approach is based on the premise that if cash flows are deemed risky, we must modify them to take a correct decision. It is another procedure to deal with risk and to reduce forecast of cash flows to some conservative level. Under Risk Adjusted

Discount Rate method we mixed the time, value and compensation for risk. Certainty Equivalent approach resolves this issue by segregating risk element and cash element of cash flows.

- Firstly convert the uncertain cash flows to certain cash flows to reflect the risk element of the project.
- Use the risk free rate as discount rate for certain cash flows to provide for time value of money.

The most common applied procedure for estimating certainty equivalent is to reduce the forecasts of cash flows to conservative levels. First we calculate a certainty equivalent coefficient by dividing a certain cash flow by risky net cash flows and then this coefficient is applied to cash flows to be used in various investment appraisal criterions i.e. NPV or IRR. The certainty equivalent coefficient assumes a value between 0 and 1 and varies inversely with risk. A lower rate will be used if greater risk is anticipated and higher rate will be used if lower risk is anticipated.

$$NPV = \sum_{t=1}^n \frac{\alpha_t NCF_t}{(1+r)^t} - CF_0$$

Where α_t = Certainty Equivalent Factor for period t ranging between 0 and 1

r_f = Risk Free Rate

The decision rule under this method is that Accept the Project if its certainty equivalent NPV is positive else reject it

But this method suffers from many complications in case of large enterprises. Firstly, a forecaster expecting the reduction that will be made in his forecast may inflate them in anticipation. This will not yield forecasts according to the best estimate. Secondly, if the forecasts have to pass through several levels of management, the effect may greatly exaggerate the original forecast where α_t is certainty equivalent coefficient and $\alpha_t = \text{Certain net cash flow} / \text{Risky net cash flow}$.

5) DCF Break Even Analysis

It focuses on the determination of minimum volume /revenue that would result in recovery of all expenses. As long as profit results; the variation in profit is considered a non issue by management as the management's main concern is not to make the loss. Break Even point provides an insight into the risk of the project. Under DCF break even analysis, managers make an assessment regarding possibility of not achieving the breakeven level of sales. The lower the breakeven point or farther the

expected level of operation from the Break Even point the safer is the project. This is referred to as Margin of Safety. Though a simplistic view of risk, it serves the objective of risk assessment. Break Even Analysis requires a minimum amount of data as no further inputs are required besides those already prepared for evaluation of data.

Each method has its own merits and demerits and utility of the stakeholders in the project. Whether a particular method is superior or inferior depends on the circumstances. For example it would be purely impractical and fruitless to run a Simulation exercise for a paltry investment. Similarly, financial institutions while providing financial assistance to a project rely heavily on Sensitivity Analysis. Scenario or Simulation Analysis is too cumbersome for them. However managers, who have to take a number of critical decisions, are more concerned with Scenario rather than Sensitivity Analysis.

2.9.2 Statistical and Sophisticated Techniques of Risk Assessment

Apart from these conventional ways of handling risks, there are certain complicated, statistical and sophisticated techniques of risk assessment. These tools are specific to determination of risk of the cash flows and handle specific nature of risk in their own ways. These include the following techniques:

1) Sensitivity Analysis

Sensitivity analysis helps in measuring the Sensitivity of a decision to the changes in the values of one or more parameters. It is a way of analyzing changes in the project's NPV for a given change in one of the variables. It indicates how sensitive the projects NPV or IRR are to the changes in a particular variable. The more sensitive is the NPV, the more critical is the variable. The following are the steps involved in the use of Sensitivity analysis:

- Identification of all these variables, which have an influence on the projects' NPV or IRR.
- Definition of underlying relationship between the variables.
- Analysis of the impact of the change in each of the variables on the project's NPV.
- The decision maker, while performing Sensitivity analysis, considers the projects' NPV or IRR for each forecast under three assumptions (a) Pessimistic (b) Expected (c) Optimistic. It allows asking "What if" questions.

For example, what (is the NPV) if the volume increases or decreases? What (is the NPV) if the selling price increases or decreases?

2) Scenario Analysis

While Sensitivity analysis is the most commonly used tool of assessing the risk of the project, the managers are often interested in knowing how the project would behave if several variables change at the same time. Scenario analysis is a tool that overcomes the limitation of the Sensitivity analysis. It measures the change in NPV of the project under different scenarios, changing several variables at a time because of interrelationship of variables among themselves. It is a process of analyzing possible future events by considering alternative possible outcomes. Several scenarios are demonstrated in a Scenario analysis to show possible future outcomes and it is useful to generate a combination of an optimistic, a pessimistic, and a most likely scenario. Experience has shown that around three scenarios are most appropriate for further discussion and selection. More scenarios could make the analysis unclear. Scenario analysis commonly focuses on estimating what a portfolio's value would decrease to, if an unfavourable event, or the "worst-case scenario", were realized.

While the concept of Sensitivity analysis is a simple one, it has four critical components:

- The first is the determination of the factors on which the scenarios will be built around.
- The second component is determining the number of scenarios to analyze for each factor.
- The third component is the estimation of asset cash flows under each scenario.
- The final component is the assignment of probabilities to each scenario.
- The output from a Scenario analysis can be presented as an expected value across scenarios (if the probabilities can be estimated in the fourth step).
- Finally, with the estimated probability of each scenario and its corresponding NPV values, Expected NPV of the project is calculated which is different from the NPV under normal scenario.

3) Simulation Analysis

Simulation is a computer based exercise that generates large number of situations and computes NPV of each of them to find out the distribution of NPV, its expected value and standard deviation as a measure of risk. The Monte Carlo Simulation or

Simulation analysis considers the interaction among variables and the probabilities of the change in the variables. It computes the probability distribution of NPV. The Simulation analysis involves the following steps:

- Identification of exogenous variables that influence cash inflows and outflows of a project and its NPV e.g. demand, selling price, variable costs, market size, market growth, variable and fixed cost etc.
- Understanding the relationships among the variables and NPV e.g. revenue depends on sales volume and price; sales volume depends on market size, market share etc.
- Specify the probability distribution for each of the exogenous variable.
- Lastly, develop a computer programme that randomly selects one value from the probability distribution of each variable and uses this value to calculate the projects' NPV.

4) Hiller Model

Hiller's Model argues that the uncertainty or the risk associated with a capital expenditure proposal is shown by the standard deviation of the expected cash flows. In other words, the more certain a project is lesser would be the deviation of various cash flows from the mean cash flows. He argues that working out the standard deviation of the various ranges of cash flow would be helpful in the process of taking cognizance of uncertainty involved with future projects. Hillier has developed a model to evaluate the various alternative cash flows that may arise from a capital expenditure proposal. He takes into account the mean of present value of the cash flows and the standard deviation of such cash flows, which may be determined with the help of the following formulae:

- **In case of Uncorrelated Cash Flows**-In such case the expected NPV and Standard Deviation of NPV are defined as follows:

$$\text{Expected NPV} = \sum_{t=1}^n \frac{\text{Expected CF}_t}{(1+i)^t} - I$$

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

where Expected CF_t = Expected Cash Flow for the year t , i is risk free rate of interest, I is Initial cash Outlay, $\sigma(\text{NPV})$ is standard deviation of NPV, σ_t is standard deviation of cash flow for the year t .

- **In case of Perfectly Correlated Cash Flows-** If cash flows are perfectly correlated than expected NPV and Standard Deviation of NPV are defined as follows:

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

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

5) Decision Tree Analysis

Decisions do not have isolated character; they follow a sequence over time. This problem can be handled by plotting decision trees. A Decision tree is a graphic representation of relationship between a present decision and future events, future decisions and their consequences. The sequence of events is shown in a format resembling branches of tree. The branches of the decision tree show the possible alternatives for a given decision and further, the possible outcome resulting from each alternative. The Decision tree branches depict the cost and return associated with each branch and the probabilities are estimated for each possible outcome. The alternative with the highest amount of expected monetary value is selected. Steps involved are:

- Identification of problem and finding out alternatives.
- Constructing decision tree indicating decision points representing the various managerial courses of action available at a given point of point and following by the chance events that follow each action that impacts the future courses of actions and is again followed by decision points.
- Assignment of probabilities of chance events and determination of monetary values of cash inflows of each decision point.
- These probabilities and cash flows are analysed from the end to arrive at a judicious decision.
- The alternative/decision with highest amount of expected monetary value is selected.

6) Utility Theory

On the basis of figures of the expected values and standard deviations, it is difficult to say whether a decision maker should choose a project with a high expected value and a high standard deviation or a project with a comparatively low expected value and a low standard deviation. The decision makers' choice would depend upon his risk preference. Individuals and firms differ in their attitudes towards risk. In contrast to the approaches for handling risk, utility theory aims at incorporation of decision makers' risk preference explicitly into the decision procedure. In fact, a rational decision maker would maximize his utility. Thus, he would accept the investment project, which yields maximum utility to him.

As regards the attitude of individual investors towards risk, they can be classified in three categories.

- Risk-averse investors attach lower utility to increasing wealth i.e. for a given wealth or return, they prefer less risk to more risk.
- Risk-neutral investors attach same utility to increasing or decreasing wealth i.e. they are indifferent to less or more risk for a given wealth or return.
- Risk-seeking investors attach more utility to the potential of additional wealth to the loss from the possible loss from the decrease in wealth. i.e. for earning a given wealth or return, they are prepared to assume higher risk.

It is well established by many empirical studies that individuals are generally risk averts and demonstrate a decreasing marginal utility for money function.

7) Probability Theory

Probability may be described as a measure of someone's opinion about the likelihood that an event will occur. Probability lies between 0 and 1. It may consist of a number of estimates. The classical concept of objective probability is of little use in analysing investment decisions because these decisions are non-repetitive and hardly made under independent identical conditions over time. In such cases knowledgeable persons may pool their experience and Judgement to define the probability distribution. Thus, these are referred to as subjective probability distributions.

When future estimates of cash influence have different probabilities, the expected monetary values may be computed by multiplying cash inflow with the probability assigned. Further the monetary values of the inflows may further be discounted to find out the present values. Project that gives higher Expected Net Present Value is

accepted. The Expected Net Present values can be found by multiplying the monetary value of the possible events (cash flows) by their probabilities.

$$\text{Expected Net Present Value} = \sum_{t=0}^n \frac{\text{ENCF}_t}{(1+k)^t}$$

where ENCF_t is the Expected Net Cash Flows (Inflows and Outflows in period t and k is the discount rate. Here, $\text{ENCF}_t = \sum_{j=1}^n \text{NCF}_{jt} * P_{jt}$ where NCF_{jt} is the net cash flow for the j^{th} event in period t and P_{jt} is the probability of net cash flow for j^{th} event in period t .

8) Calculated Bail Out Factor:

In accounting, bailout payback period shows the length of time required to repay the total initial investment through investment cash flows combined with salvage value. The shorter the payback period, the more attractive a company is. Bailout payback method is similar to payback period method. The difference between these two is that bailout payback model incorporates the salvage value of the asset into the calculation and measures the length of the payback period when the periodic cash inflows are combined with salvage value.

Section IV

Cost of Capital and Equity Capital Practices of Companies

2.10 Meaning and Significance of Cost of Capital

The Cost of capital of a firm is the minimum rate of return expected by its investors. It is the weighted average cost of various sources of finance used by a firm. According to James C. Van Horne, Cost of capital can be defined as “A cut off rate for the allocation of capital to investments of projects. It is the rate of return on a project that will leave unchanged the market price of the stock”. It comprises of three components-

- The expected normal rate of return at zero-level risk
- Premium for finance risk
- Premium for business risk

Thus, Cost of capital can be defined as the required rate of return that a firm must achieve in order to cover the cost of generating funds in the marketplace. Based on their evaluations of the riskiness of each firm, investors will supply new funds to a firm only if it pays them the required rate of return to compensate them for taking the risk of investing in the firm’s bonds and stocks. If, indeed, the cost of capital is the required rate of return that the firm must pay to generate funds, it becomes a guideline

for measuring the profitabilities of different investments. The bench mark or standard in Financial Management, against which the benefits of business/investment opportunities are compared to, is called the Discount rate or the hurdle rate. In most cases the hurdle rate happens to be the cost of capital. When there are differences in the degree of risk between the firm and its divisions, a risk-adjusted, discount-rate approach should be used to determine their profitability.

- As an acceptance criterion in capital budgeting – the acceptance or rejection of the project is decided by taking into consideration the cost of capital.
- As a determinant of capital mix in capital structure decision- the objective of maximizing the value of the firm and minimizing the cost of capital results in optimal capital structure.
- As a basis for evaluating the financial performance- the profitability is compared to projected overall cost of capital and the actual cost of capital of funds raised to finance the project.
- As a basis for taking other financial decisions- like Dividend policy, capitalization of profits, making the rights issue, working capital.

2.11 Computation of Cost of Capital

The cost of capital of various sources of funds used by a firm differs because of the difference in the risk-return profile of these sources. The cost of capital of each source of capital is known as the Component or specific cost of capital while the combined cost of all these components is called the Overall cost of capital. This is calculated by assigning weights to different components and later determining weighted average cost of capital. Once this cost of capital is calculated, the company's projects can be evaluated using this single rate as the cut off or hurdle rate unless the underlying business and financial market conditions change.

2.11.1 Costs of Specific Sources of Finance

The cost of different sources of finance used by a company is discussed below:

1. Cost of Debt (K_d)

It is the effective rate that a company pays on its current debt. This can be measured in either before- or after-tax returns; however, because interest expense is deductible, the after-tax cost is seen most often. A company will use various bonds, loans and other forms of debt, so this measure is useful for giving an idea as to the

overall rate being paid by the company to use debt financing. The measure can also give investors an idea as to the riskiness of the company compared to others, because riskier companies generally have a higher cost of debt.

Thus, Cost of debt is nothing but the coupon rate of interest that is payable by firm to holders of debt instruments or the yield to maturity of a debt instrument. After tax Cost of debt is used because interest payments are tax deductible for the firm.

i) Cost of Debt Issued at Par (before tax):

$$K_{db} = \frac{I}{P}$$

where, K_{db} = before tax cost of debt

I = Interest

P = Principle

ii) Cost of Debt Issued at Premium or Discount:

$$K_{db} = \frac{I}{NP}$$

where NP = Net proceeds

After tax cost of debt:

$$K_{da} = \frac{I(1-t)}{NP}$$

Or $K_{da} = K_{db}(1-t)$

where, K_{da} = After tax cost of debt

iii) Cost of Redeemable Debt (issued at discount/par and redeemable at par/premium):

The debt is issued and redeemed after a certain period at par during the life time of a firm.

$$K_{da} = \frac{i(1-t) + (f+d+pr-pi)/n}{(RV + NP) / 2}$$

Where NP = Net proceeds, RV = Redeemable value, f= floating cost, d= discount, n = maturity time, pr = premium on redemption, pi=premium on issue and K_{da} is after tax cost of Debt

or by Trial and error

$$B_0 = \sum_{t=1}^n \frac{INT_t}{(1 + k_d)^t} + \frac{B_n}{(1 + k_d)^n}$$

where B_0 is current market price of debt, INT is annual interest payment, n is the time of maturity and B_n is maturity value of debt. k_d is before tax cost of debt.

Post Tax Cost of Debt is given by the formula

$$K_d \text{ after taxes} = K_d (1 - \text{tax rate})$$

Effective annual rate of debt based on current market conditions (i.e. yield to maturity on debt) is used rather than historical rates (i.e. interest rate when issued; the stated rate).

2. Cost of Preferred Stock (K_p)

Preference Share capital carries a fixed rate of dividend and is redeemable in nature. Even though obligations of a company towards its preference shareholders are not as firm as those towards its debenture holders, it is assumed that preference dividend will be paid regularly. A fixed rate of dividend is payable on preference shares. It is considered much like a debenture or Bond with fixed commitments except that while Interest on debt is a tax deductible expense, the fixed amount of dividend paid to preference shareholders is not. Therefore, cost of preference is higher than cost of debt, but is less costly than common stock.

i) Cost of Irredeemable Preference Issued at Par

$$K_p = \frac{\text{PDIV}}{P_0}$$

where PDIV = Preference Dividend and P_0 = Preference Share capital proceeds

ii) Cost of Irredeemable Preference Shares Issued at Premium or Discount or (when floatation costs are incurred)

$$K_p = \frac{\text{PDIV}}{\text{NP}}$$

where PDIV = Preference Dividend and P_0 = Preference Share capital proceeds

iii) Cost of Redeemable Preference Shares:

$$K_p = \frac{D + (f+d+pr - pi)/n}{(MV + NP) / 2}$$

where f = floating cost, d = discount, pr = premium on redemption and pi = premium on issue, n = maturity time, MV = Maturity Value, NP = Net proceeds and K_p = Cost of Preference Shares.

Or by Hit and Trial

$$P_0 = \sum_{t=1}^n \frac{PDIV_t}{(1+K_p)^t} + \frac{P_n}{(1+K_p)^n}$$

Where P_0 = net proceeds of preference shares, $PDIV_t$ = Annual Dividend payment, n = time of maturity, P_n is maturity value of debt and k_p is Cost of preference

No adjustment is made for taxes because preferred stock dividends are paid after a corporation pays income taxes. Consequently, there is no difference in pre tax and post tax cost of preference capital

3) Cost of Equity (i.e. Common Stock (K_e) & Retained Earnings (K_r))

The Cost of equity is the rate of return that investors require to make an equity investment in a firm. Is the ‘maximum rate of return that the company must earn as equity financed portion of its investments in order to leave unchanged the market price of its stock. Common stock does not generate a tax benefit as debt because dividends are paid after taxes. Retained earnings are considered to have the same cost of capital as new common stock. Their cost is calculated in the same way, except that no adjustment is made for floatation costs.

i) CAPM (Capital Asset Pricing Model)

The CAPM is one of the most commonly used ways to determine the cost of common stock. This cost is the discount rate for valuing common stocks, and provides an estimate of the cost of issuing common stocks. As per the CAPM, the required rate of return on equity is given by the following relationship. Cost of equity, acc. to CAPM will be:

$$K_e = R_f + \beta_i (R_m - R_f)$$

where,

K_e = Cost of equity capital

R_f = Risk free rate of return

β_i = Beta co-efficient of the firm’s portfolio

R_m = Market return of a diversified portfolio

$(R_m - R_f)$ = (Market return of a diversified portfolio – risk free return) i.e. Market Risk Premium

ii) Dividend Yield Model (Dividend/Price ratio method)

According to Dividend Price Approach, we can calculate cost of capital by just dividing dividend per share with market value of per share. Cost of equity is the

discount rate that equates the present value of expected future dividends per share with the Net proceeds (or Current market price) of a share.

$$K_e = \frac{D}{NP \text{ or } MP}$$

where NP = Net proceeds

MP = Market price per share

iii) Gordon's Dividend Discount Model (Dividend Growth Model /Dividend Yield plus forecast growth rate/)

According to Dividend Discount model the cost of equity capital, k_e , is the discount rate that equates the present value of all expected future dividends with the current market price of the equity stock.

$$P_0 = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \dots + \frac{D_\infty}{(1+k_e)}$$

$$P_0 = \sum_{t=1}^n \frac{DIV_t}{(1+K_e)^t}$$

- *Cost of existing equity share capital is calculated as below:*

When the dividend of the firm are expected to grow at a constant rate “g” forever & the dividend pay-out ratio is constant the constant dividend growth assumption reduces the model to

$$k_e = (D_1 / P_0) + g$$

where P_0 = Market price (current), D_1 = Expected dividend per share at the end of the year

g = Rate of growth in dividends, D_0 = Previous year's dividend

- *Cost of new issue cost of equity share capital is calculated as below:*

$$k_e = (D_1 / NP) + g \text{ or } \frac{D_0(1+g)}{NP} + g$$

where NP=Net Proceeds (instead of Market Price P_0)

iv) Bond Yield plus Risk Premium Approach

This approach is based on the logic that the return required by the investors is directly based on the risk profile of the security. Since the risk borne by the equity investors is higher than that of the bond holders or preference shareholders, therefore

the rate of return required by them will also be higher. Hence, the required rate of return on equity or cost of equity capital, k_e is the sum of the before-tax cost of debt or long term bonds and a risk premium in expected return for common stock over debt.

Thus, Required rate of return on equity = $k_e = k_d + \text{Risk Premium}^*$

where k_d is yield on long term bonds of the company and

Risk premium is arrived at after considering the various operating and financial risks faced by a firm.

v) The Earning/Price approach /Earning Price Ratio method

Cost of equity capital in case of a no growth firm is equal to the ratio of current earnings per share to the market price per share i.e. the E/P ratio.

$$k_e = \frac{\text{DIV}_1}{P_0} + g$$

$$k_e = \frac{\text{EPS}_1(1-b)}{P_0} + br \quad (g = br)$$

$$= \frac{\text{EPS}_1}{P_0} \quad (b = 0)$$

Where $b = \text{Retention Ratio} = 1 - \text{dividend payout}$; $\text{EPS}_1 = \text{Expected Earnings per share}$, $r = \text{Return on Equity}$, $g = b$ multiply by r (br)

This approach tells us that we should not co-relate dividend per share with market value per share but we should use total earning and try to co-relate it with market value of shares. We have to just write earning per share of company instead writing dividend per share. It will be helpful to void the effect of dividend policy on calculation of working capital.

vi) Realised yield approach

This approach is an improvement in dividend price approach for calculating cost of capital. In this, the returns earned on a security in the past are taken as a proxy for returns required in the future by the investors. In this approach, we calculate cost of capital after analysis past payments of dividends. After this, we add some rate of growth percentage in basic formula of cost of equity capital. In Realised Yield Approach, dividend on per share will be real value not expected value. This approach is based on the following assumptions:

- Actual returns have been as per expected returns
- Equity investors expectations from the security does not change in future

Realised Return over n-year period is given by the formula
$$r = (w_1 \times w_2 \times w_3 \times \dots \times w_n)^{1/n} - 1$$

where w_1, \dots, w_n is wealth ratio calculated on basis of past dividend payments

vii) Multi factor model (Damodaran Approach)

Many times CAPM results in incorrect imprecise estimates in emerging global markets that have varying degrees of risks and returns. An alternative approach to the equity cost models is the multi factor model that incorporates several risks. Local CAPM (LCAPM) for investors who diversify locally uses local inputs and, International CAPM (ICAPM) that captures investors risks, if he diversifies internationally are some of the commonly used multi factor models. However it doesn't indicate the appropriate risk factors, may be uneconomical and is not a significant improvement over the CAPM Cost of Equity Capital. Further, it is computationally troublesome, does not resolve the existing problems of estimating beta, market returns or risk free rate of return. Therefore, Multi Factor Approaches are not a much improvement over the CAPM.

Apart from these methods propagated by academic theory, certain other informal methods, like calculating cost of equity capital on basis of Average Historical Return on Common Stock that is average of dividends earned in the past by shareholders, or by regulatory Decisions may be used. Further, companies also rely on whatever their investors tell them they require i.e. the expectation of investors for calculating cost of capital.

4) Cost of Retained Earnings

Though, the firm is not obliged to pay dividend or interest on the retained earnings but still the Cost of retained earnings is the opportunity costs in terms of the dividend foregone by/withheld by the equity shareholders. Thus, a firm is implicitly required to earn on retained earnings at least equal to the rate that would have been earned by shareholders, if they were distributed to them. k_e is generally used as k_r but the latter is generally lower than the former due to differences in floatation costs and due to dividend payment tax.

2.11.2 Weighted Average Cost of Capital (WACC)

The firm's WACC is the cost of Capital for the firm's mixture of debt and stock in their capital structure. It is a single composite number that reflects the claims of all suppliers of capital on an aggregate basis. It is also known as composite or overall cost of capital, which may be used as a hurdle rate that must be overcome if the

project has to be accepted. Crossing WACC as a hurdle rate would mean that all capital suppliers are satisfied by the benefits of the project. Mathematically, it can be expressed as:

$$K_o = k_1w_1+k_2w_2+k_3w_3+\dots\dots\dots$$

where k_1, k_2, k_3, \dots are component costs and w_1, w_2, w_3, \dots are weights /proportions of various types of capital employed by the companies.

Or simply

$$WACC = (\text{After tax cost of debt}) \times w_d + (\text{cost of preference}) \times w_p + (\text{cost of equity}) \times w_e + (\text{cost of retained earnings}) \times w_r$$

where w_d =Proportion/weight of debt (i.e. fraction of debt in the firm's capital structure)

w_p = Proportion/weight of preference capital

w_e = Proportion/weight of stock

w_r = Proportion/weight of retained earnings

