Daffodil Institute of Information Technology (DIIT)
Third Year, Sixth Semester
BBA (Honors) in Tourism and Hospitality Management (THM)
Fundamentals of Finance
Chapter-5
INTRODUCTION TO CAPITAL BUDGETING

1. Do you think profitability index method is superior to net present value method? Why?
Yes, In case of capital budgeting decision profitability index is considered the best method than NPV. Because of the following situation PI is superior to NPV:
   1. If there is an unequal initial investment & I am asked to take the accept-reject decision, than profitability index will be a better technique than the NPV.
   2. In PI method at first the cash flows net present value are calculated & after that profitability index is calculated. As a result, the PI becomes more preferable.

2. What do you mean by NPV and IRR?
NPV: Net present value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows over a period of time. NPV is used in capital budgeting and investment planning to analyze the profitability of a projected investment or project. A project having Positive NPV will increase shareholders value and will be profitable, while projects with negative NPV won't be profitable and will decrease shareholders value. So these projects should be rejected.
IRR: Internal Rate of Return is the discount rate used in the capital budgeting. This discount rate is used to bring the present value of all the cash flows of the project to zero. Thus higher the expected rate of return the higher will be the IRR. Higher IRR is always preferable to the one with a lower IRR. This IRR can be used to rank the proposed projects in the business. Therefore it shows that how much rate of growth a project can make. The actual result can be different from the estimated IRR. This could be due to unexpected market conditions. But the project with a higher IRR is always expected to have higher returns than the others.

3. Under what condition would the IRR & NPV always give similar accept-reject decision on a project?
Through NPV & IRR both are different technique, but in some cases both seem to same. In case of independent project the NPV and IRR criteria always lead to the same accept-reject decision.
   ❖ If a project's NPV is positive, its IRR will exceed cost of capital
   ❖ If NPV is negative, cost of capital will exceed the IRR.
So in the above case both NPV & IRR may become equal or same.

4. What are the basic conditions that can lead to conflicts between the NPV and IRR methods?
   Or. Under what circumstance do the NPV and IIR methods differ?

In case of two mutually exclusive projects have NPV profiles that intersect, then there may be a conflict between the NPV and IRR methods. Two basic conditions can lead to conflicts between NPV and IRR:

- ❖ Project size (or scale) differences exist; that is, the cost of one project is larger than that of the other.
- ❖ Timing differences exist such that cash flows from one project come in early years and most of the cash flows from the other project come in later years.

5. Differentiate between NPV and IRR.

NPV and IRR both provide important information regarding capital budgeting and investing, but the metrics they produce should be used differently. Here are a few of the differences between NPV and IRR:

NPV:
- ❖ **Representation:** NPV is represented as a dollar amount. It provides the amount of money the project should make for the company over a period of time.
- ❖ **Goal:** The goal of NPV is to calculate the surplus of a project.
- ❖ **Decision-making:** NPV is generally a useful tool for investors, as the calculation considers many factors.
- ❖ **Project complexity:** NPV is useful for projects that have a variety of cash sources and other complexities.
- ❖ **Discount rate:** NPV uses the discount rate which can provide unreliable value calculations.

IRR:
- ❖ **Representation:** IRR is represented as a percentage. It provides the overall rate of return on a project for the company over a period of time.
- ❖ **Goal:** The goal of IRR is to calculate the breakeven cash flow level of a project.
- ❖ **Decision-making:** IRR is not considered a useful tool for investors as the calculation relies on a very small pool of information.
- ❖ **Project complexity:** IRR is useful for simple projects that only have one cash source and no other complexities.
- ❖ **Discount rate:** IRR uses the actual underlying cash value rather than the discount rate, which leads to more reliable outcomes.

6. Give arguments in favor of NPV compared to IRR.

Arguments in favor of NPV compared to IRR: NPV is the better approach to the capital budgeting. The advantage to using the NPV method over IRR is that NPV can handle multiple discount rates without any problems. Each year's cash flow can be discounted separately from the others making NPV the better method.

7. Which method is superior NPV or IRR? And why?
Or. Which of the NPV method & IRR method is superior & why?
### Or. Which of the capital budgeting technique NVP or IRR is the best & why?

On a purely theoretical basis, NPV is the better approach to the capital budgeting. In spite of the theoretical superiority of NPV, financial manager prefer to use IRR approach because:

  1. Business people prefer rates of return rather than actual taka return. In that sense IRR is preferable.

  2. Financial decision marker finds NPV less intuitive because it does not measure benefits relative to the amount invested.

3. A variety of techniques is available for avoiding the difficulty of the IRR.

8. Describe how NPV profiles are constructed.(2012,2007)

A net present value (NPV) profile is a graph that shows the relationship between a projects' NPV and various discount rates (required rates of return). The NPV profile crosses the Y-axis at the undiscounted NPV (k = 0), while it crosses the X-axis at the IRR. The point where a project's net present value profile crosses the horizontal axis indicates a project's internal rate of return.
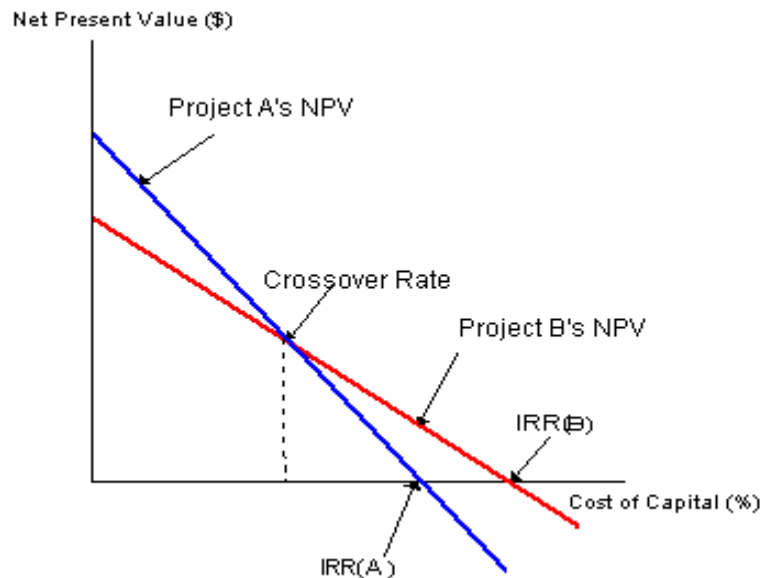
Some observation:
1. The IRR is the discount rate that set the NPV to 0.
2. The NPV profiles declines as the discount rate increase.
3. The crossover rate is the discount rate at which the NPV profiles of two projects cross and, thus, at which the projects' NPVs are equal.

9. What is MIRR? How it is defer with regular IRR.

MIRR: The modified internal rate of return (commonly denoted as MIRR) is a financial measure that helps to determine the attractiveness of an investment and that can be used to compare different investments. Essentially, the modified internal rate of return is a modification of the internal rate of return (IRR) formula, which resolves some issues associated with that financial measure.

The MIRR is primarily used in capital budgeting to identify the viability of an investment project. For instance, if the MIRR of a project is higher than its expected return, an investment is considered to be attractive.

Conversely, it is not recommended to undertake a project if its MIRR is less than the expected return. In addition, the MIRR is commonly employed to compare several alternative projects that are mutually exclusive. In such a case, the project with the highest MIRR is the most attractive.

Reasons for difference of MIRR with regular IRR:

The decision criterion of both the capital budgeting methods is same, but MIRR defines better profit as compared to the IRR, because of two major reasons, i.e. firstly, reinvestment of the cash flows at the cost of capital is practically possible, and secondly, multiple rates of return don't exist in the case of MIRR. Therefore, MIRR is better regarding measurement of the true rate of return.

10. Briefly discuss how modified IRR (MIRR) is calculated?
Calculation of Modified Internal Rate of Return: Calculating the MIRR considers three key variables:
1. The future value of positive cash flows discounted at the reinvestment rate,
2. The present value of negative cash flows discounted at the financing rate, and
3. The number of periods.

Mathematically, the calculation of the MIRR is expressed using the following equation:

$$\text{MIRR} = \sqrt[n]{\frac{\text{FVCF}}{\text{PVCF}}} - 1$$

Where:
- FVCF – the future value of positive cash flows discounted at the reinvestment rate
- PVCF – the present value of negative cash flows discounted at the financing rate
- n – the number of periods

11. Differentiate between IRR and MIRR.
IRR and MIRR are two capital budgeting techniques that measure the investment attractiveness. These are commonly confused, but there is a fine line of difference between them, which is presented in the article below.

Basis for comparison	IRR	MIRR
Meaning	IRR is a method of computing the rate of return considering internal factors, i.e. excluding cost of capital and inflation.	MIRR is a capital budgeting technique, that calculate rate of return using cost of capital and is used to rank various investments of equal size.
What is it?	It is the rate at which NPV is equal to zero.	It is the rate at which NPV of terminal inflows is equal to the outflow, i.e. investment.
Assumption	Project cash flows are reinvested at the project's own IRR.	Project cash flows are reinvested at the cost of capital.
Accuracy	Low	Comparatively high

12. What are the advantages of Modified Internal Rate of Return (MIRR) over traditional IRR in capital budgeting?

The advantages of Modified Internal Rate of Return (MIRR) over traditional IRR in capital budgeting are:

❖ Internal Rate of Return or IRR implies a method of reckoning the discount rate considering internal factors, i.e. excluding the cost of capital and inflation. On the other hand, MIRR alludes to the method of capital budgeting, which calculates the rate of return taking into account cost of capital. It is used to rank various investments of the same size.

❖ The internal rate of return is an interest rate at which NPV is equal to zero. Conversely, MIRR is the rate of return at which NPV of terminal inflows is equal to the outflow, i.e. investment.

❖ IRR is based on the principle that interim cash flows are reinvested at the project's IRR. Unlike, under MIRR, cash flows apart from initial cash flows are reinvested at firm's rate of return.

❖ The accuracy of MIRR is more than IRR, as MIRR measures the true rate of return.

13. What are the advantages and disadvantages of IRR?
Advantages IRR:
1. **Time Value of Money**: The IRR Method gives due consideration to the Time Value of Money which makes it highly reliable. The time value of money considers the money on the basis of the time which makes it dependable. This feature is not available in many of the other projects which is a drawback.

2. **Simplicity**: The best thing about IRR is that it is easy to interpret. It is easy to use and the results of IRR can be easily studied and taken into consideration unlike other results in other methods. These results are highly reliable. Due to its easy accessibility the managers use this method unless any other peculiar situation arises in which other methods are suitable to be applied.

3. **Hurdle Rate**: Hurdle Rate is the Required Rate of Return. It is a difficult task to ascertain a hurdle rate that is reliable enough to draw the results. But the IRR method does not consider the Required Rate of Return while examining the results which gives this method a cover of any risk of wrong interpretations.

4. **Required Rate of Return is a Rough Estimate**: The required rate of return is a rough estimate and is not completely used by the IRR method. Once IRR is found then it can be compared with the Required Rate of Return. The managers can safely take the decision without any risk because the IRR is not linked with the required rate of return.

Disadvantages of IRR:
1. **Ignores Economies of Scale**: The IRR method ignores the economies of scale completely. It ranks the projects on the basis of the returns they will produce. For example there are two projects: Project with investment of $5000 and earning 20% return and another is investing $ 1000 and earning 50% return. The project with $5000 will be given preference over $1000 just because it is earning a good amount i.e. $1000 as compared to $500. But IRR will Plan with $1000 before $5000 just because of the Rate of Return.

2. **Mutually Exclusive Projects**: Mutually Exclusive Projects means that if one project is accepted the other cannot be accepted. Thus it is a difficult task to ascertain which project gives a better return not just on the percentage basis but also the quantitative basis.

3. **A mix of positive and negative future cash flows**: The IRR is based on the project's cash flows in future discounted at a rate to bring them to present value. The cash flows could be positive as well as negative. Thus IRR is based on a multiple IRR basis which renders it unreliable for results and interpretation.

14. What are the advantages and disadvantages of NPV?
Advantages of NPV Method:
1. **Maximizes Company Value**: Most of the methods undertake the requires rate of return as the basis to select the desired plan or project but NPV Method focuses on the Net present value derived. It could be possible to have a project giving a rate of return of 10% and NPV of $100,000 and similarly a project with a return of 20% but NPV of just $50,000. In this case the NPV method will give preference to the one with higher NPV. Thus it helps in increasing the value of the firm which is profitable for the shareholders.

2. **Use of Time Value of Money**: The time value of money shows the value of money today as compared to the one in future. Similarly NPV works in ascertaining the future cash flows of the projects in present. Thus it provides reliability in the taking up of this model.

Disadvantages of NPV Method:
1. **Prone to Forecasting Errors**: There are estimates used in the NPV largely. The longer the tenure of the project the more will be the risk in the errors. The estimate for a short project can be fairer than the estimates for a longer tenured project. Therefore the forecasting errors may render the NPV Method inefficient.

2. **Reliability on Discount Rate**: The basis for the NPV Method is the Discounting factor. This discounting factor is basically the rate which is calculated on an estimation basis. If by any chance this rates incorrect the whole result will be misleading.

15. Why sunk cost is not included in capital budgeting decision?
Sunk cost: A sunk cost is a cost that has already occurred and cannot be recovered by any means. Sunk costs are independent of any event and should not be considered when making investment or project decisions. Only relevant costs (costs that relate to a specific decision and will change depending on that decision) should be considered when making such decisions. The sunk cost fallacy arises when decision-making takes into account sunk costs. By taking into consideration sunk costs when making a decision, irrational decision making is exhibited. Sunk costs are excluded from future decisions because the cost will be the same regardless of the outcome.

Sunk cost is also known as past cost, embedded cost, prior year cost, stranded cost, sunk capital, or retrospective cost. Example of sunk cost, Raiyan purchases a movie ticket online for $12.50 and upon arriving at the theatres to watch the movie, Tom realizes that the movie is really boring and does not appeal to him. Tom decides to sit through the entire movie because he already bought a ticket.

Here are four examples of sunk cost:
1. Marketing expense
2. Research and development expense
3. Training expense
4. Hiring expense

Formula of Introduction to Capital Budgeting

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1. <u>For uniform cash inflow</u>

    Payback period (PBP) $= \dfrac{\text{Initial Investment}}{\text{Average cash flow}}$

2. <u>For not uniform cash inflow</u>

Payback period (PBP) $= A + \dfrac{NCO - CNCB_A}{NCB_{Next}}$

    A=Year preceding the payback period.

    NCO= Net cash outflow/initial investment/initial outlay/cash outflow/cost of machine/cost of project/opening for beginning capital.

    $CNCB_A$=Cumulative net cash flow of year A.

    NCB_{Next}=Net cash flow of the immediate year following the year A.

    Depreciation= $\dfrac{\text{Cost of the Equipment} - \text{Salvage value/ Scrap value/Residual value}}{\text{Expected life of the Equipment}}$

3. Average rate of return (ARR)= $\dfrac{\text{Average Net Earnings/Average Net Profit After Tax}}{\text{Average Investment}} \times 100$

    ==Average Investment= Working Capital + $\dfrac{\text{Investment+Salvage value/ Scrap Value/Residual value}}{2}$==

4. Net Present Value(NPV)= $\left[\dfrac{NCB_1}{(1+i)^1} + \dfrac{NCB_2}{(1+i)^2} + - - - - - - + \dfrac{NCB_1}{(1+i)^1}\right] - NCO$

    NCB= Net cash Benefit/ Net Expected Cash Flows/ Cash Inflows/ Cash Flows after Tax (CFAT)

    NCO= Net Cash Outflow/ Initial Investment

    i = Interest Rate/ Discount Rate/ Required Rate of Return/ Opportunity Cost/ Cut off Rate/Hurdle rate

5. Certainty Equivalent Net Present Value(CENPV)= $\left[\dfrac{CEF_1 \times CIF_1}{(1+i)^1} + \dfrac{CEF_2 \times CIF_2}{(1+i)^2} + - - - - - - + \dfrac{CEF_n \times CIF_n}{(1+i)^n}\right] - NCO$

    Where,

        CIF= Cash Inflows / Net cash Inflows/ Net cash Benefit/ Net Expected Cash Flows/ Cash Flows after Tax (CFAT)

        NCO= Net Cash Outflow/ Initial Investment

        I= Interest Rate/Discount Rate/Required Rate of Return/Opportunity Cost/Cutoff Rate/ Hurdle Rate/ Cost of Capital.

6. Internal Rate of Return(IRR)= $Lr + \dfrac{NPV_{Lr}}{NPV_{Lr} - (-NPV_{Hr})}$ (Hr-Lr)

    Lr= Lower Discount Rate

    Hr= Higher Discount Rate

    NPV_{Lr}= Net Present Value of lower discount Rate.

    NPV_{Hr}= Net Present Value of higher discount Rate

7. Profitability Index(PI)/ Benefit Cost Ratio (BC)= $\dfrac{\text{Present value of all cash inflows}}{\text{Present value of all cash outflows}}$

8. Return on Original Investment (ROI)= $\dfrac{\text{Average net profit after tax}}{\text{Original Investment}} \times 100$

9. Modified Internal Rate of Return (MIRR)

$$PV = \frac{\text{Future Value}}{(1+MIRR)^n}$$

FV/TV= $NCB_1(1+i)^2 + NCB_2(1+i)^1 + NCB_3(1+i)^0$

PV=Initial Investment

Or.

MIRR= $\sqrt[n]{\dfrac{TV}{PV\ cost}} - 1$

    Where,

        n= Number of Years

        TV/FV= Terminal Value/ Future Value

        PV= Initial cost/ Investment

10. Net Profitability Index(NPI)= $\dfrac{\text{Net Present Value}}{\text{Present value of all cash outflows}}$