Capital Budgeting-Part II

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Risk Management

- Risk indicates extent of uncertainty of future cash flows
- Risk assessment and its incorporation in final decision is integral part of financial analysis
- Object of decision making is not to avoid risks but to take only bearable risks, with adequate reward
- Discount rate has to be suitably adjusted to accommodate risk assessed.
- Adequate adjustment not possible unless risk is measured properly

Sources of Risks

- Project/firm specific risks arising out of internal factors like quality of management or development of new products, labour troubles or development of new products & other weaknesses.
- Competitive risk arising from increased competition or acts of competitors.
- Industry specific risks arising out of factors like technological developments, regulatory changes.

Sources of Risks--contd

- Market risk on anticipated changes in macro economic factors GDP, interest route, inflation and demand.
- International risk arising out of fluctuation in exchange rate and political risk (wars)

Perspectives

- Project Risk(Stand Alone)-Unique Risk
- Firm risk (Corporate weakness) i.e. disputes in management/owners-unique risk
- Market Risk or systematic risk
- Financial Risk (currency fluctuation)

Stand alone Risks

- Easier to measure
- Sponsors interested in it
- Capital Budgeting committee only considers stand alone risks and considers other risks as given
- Contractual arrangement to mitigate these risks

Risk Management Issues

- Riskiness of an financial asset is measured in terms of riskiness of its, future cash flows.
- Stand alone/portfolio context-more in stand alone
- Diversifiable risk (Unique risk) gets distributed and executed out in a portfolio.
- Investors are generally risk averse and therefore wish to be compensated for bearing extra risk.
- Linear relationship between market risk and expected return in efficient market.

Measurement of Risk

- This is based on following factors
- Probability distribution: Probabilities of different outcomes have to be assessed from experiences.

Example:

State of Economy	Probability of occurrences	ROR A	B
Boom	0.30	16	40%
Normal	0.50	11%	10%
Recession	0.20	6%	-20%

Measurement of Risk contd

- Expected return of project $(ER)_A$=weighted average of possible Outcomes=03x16%+0.5x11%+0.2x6%=11.5%
- Expected return of Project B

  $(ER)_B$=0.3x40%+0.5x10%-0.20x20%=13%
- Dispersal of a variable around most likely value and can be measured by variance or standard deviation

Measurement of Risks-Variance

- Sum of the squares of the deviations of the actual return from expected return, weighted by associated probability
- Variance $\sigma^2 = \sum Pi\{Ri-E(R)\}^2$

  R=Variance, Pi = Probability associated with the possible outcome, Ri = Return for the possible outcome, E(R)=Expected return on normal outcome
- Standard deviation (square root of variance)
- $\sigma^{2\ 1/2} = \sigma$

Measurement of Risks- Variance --contd

- Example
- $\sigma^2_A = 0.3(0.16-11.50)^2+0.5(11-11.5)^2+0.2(6-11.5)^2 = 0.3x(4.5)^2+0.5(-0.5)^2+0.2(-5.5)^2 = 12.25$
- $\sigma_A = 3.5\%$
- $\sigma^2_B = 0.3(40-13)^2+0.5(10-13)^2+0.2(-20-13)^2 = 0.3x(27)^2+0.5x(-3)^2+0.2(-33)^2 = 1089$
- $\sigma_B = 21\%$
- Project B is more risky (21%) than project A (3.5%)

Risk Incorporation

- Adjustment in rate of return or discount rate. Or adjust cash flows
- People normally agree to take lower amount with certainty than higher amount with uncertainty.
- Risky investment must offer higher return to induce people to invest

Risk Incorporation--contd

- Unique risk can be eliminated/minimized by diversification in different proposals cancel each other.
- A favourable development in one project can cancel the unfavourable development in other.
- Market risk depends upon economy factors affecting all firms uniformly and hence can be managed with different hedging instruments.

Implications for investment Planning

- Project Diversification helpful
- Too much diversification does not help
- High risk-higher return.

Financial Appraisal -Investment Analysis Methods

- Non – discounting methods
  - Pay back
  - Accounting rate of Return (ARR)
- Discounting Methods
  - Net Present value method
  - Benefit cost ratio
  - Internal Rate of Return (IRR)
  - Discounted pay back

Non Discounting Methods

- Pay back period (PBP)
  - Length of time required to recover the initial cash outlay of the project.
  - Cut off year prescribed by top management/BOD.
  - Accept if PBP is less than cut off year.
  - Reject if PBP is more than cut off year.

Advantage

- Simple to understand & use.
- Rough method to deal with risk.
- Suitable for firm having liquidity problem.
- Like BE point.

Limitations

- Ignore time value of money .
- Ignores cash flow beyond PBP
- Considers only capital recovery and not profitability
- Liquidity is not purpose

Example-PBP

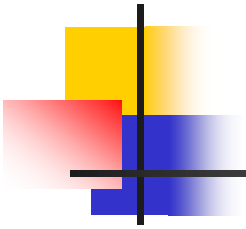
Year	Cash flow project-A Rs	Cash Flow project-B Rs
D	(100,000)	(100,000)
1	50,000	20,000
2	30,000	20,000
3	20,000	20,000
4	10,000	10,000
5	10,000	50,000
6	-------	60,000
PBP	3 years	4 years

Example-PBP--contd

- Average annual value = 24,000
- ARR =24000/70,000
  =34%

Advantages

- Simple to calculate
- Based on readily available accounting figures.
- Can be used with limited data



Disadvantages

- Based on accounting profit and not cash flows
- Ignores time value of money

Accounting Rate of Return(ARR)

- ARR = (Profit After Tax)/(Average Book value of investment)
- Profit After Tax- Average annual post tax profit over the life of the project
- Book value of Investment-Average book value of fixed assets committed to project.

ARR Example

Year	Books value of fixed assets	Profit after Tax(PAM)
1	90,000	20,000
2	80,000	22,000
3	70,000	24,000
4	60,000	26,000
5	50,000	28,000
Total	3,50,000	1,20,000

Net Present Value Method

- If Net Present Value of all cash flows expected to occur over the life of the project is above zero, then accept otherwise reject. Rank as per NPV and then decide.
- $NPV=A_1/(1+r)+A_2/(1+r)^2+----A_n/(1+r)^n- I$

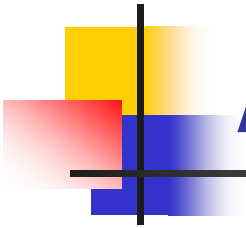
A_n = Cash flow at the end of year n

n = Life of the project

r = Discount rate.

I = Investment

- NPV indicates Net benefit over & above the compensation for time & risk.



Assumption

- Intermediate cash flows are reinvested at the discount rate.

Advantages of NPV Method

- Value of firm can be expressed as sum of NPVs of project in place and future projects.
- Disinvestments / Termination of a project with negative NPV leads to increase in value of the firm by that amount.
- Undertaking new project with negative NPV decrease the value i.e it is in value destroying activity.

Advantages of NPV method--Contd

- Disinvestments – If price being obtained is more than NPV then value increases and vice versa.
- Acquisition – If acquisition price being paid is more than NPV then value will decrease and vice-versa.
- It permits time varying discounting rates as cost of capital may change with capital structure changes and interest rates or change in risk profile of project during its life.

Disadvantages of NPV method

- Ignores scale of investment.
- Biased towards longer life projects - more risk.
- Discount rate may be difficult to ascertain
- Cost of capital varies with capital structure, which is flexible in infrastructure projects

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Benefit Cost Ratio (BCR)

- BCR = $\frac{PVB}{(I)}$ or NBCR = $\frac{PVB - (I)}{(I)}$

PVB = Present value of benefits.

I = Initial Investment

BCR > 1 then accept otherwise reject.

Advantages of BCR

- Measures NPV per Rupee invested i.e considers the scale of investment.
- Projects can be ranked in order of decreasing capital productivity.

Disadvantages of BCR

- No aggregation benefit for projects of different size into a package in comparison with large project.
- Has to be estimated if investment is spread out in several years by taking PV of cash outflow

Internal Rate of Return(IRR)

- Used when discount rate is not known.
- IRR is discount rate at which NPV = 0

  i.e $I = \Sigma^{n}_{t=1} c_t/(1+r)^{t}$

  Finds IRR by trial & error method.

IRR Example

- Example M/s X Ltd has following cash flows

Year	0	1	2	3	4
Cash Flow	(100,000)	30000	30000	40000	45000

So $100{,}000 = \frac{30000}{(1+r)} + \frac{30000}{(1+r)^2} + \frac{40000}{(1+r)^3} + \frac{4500}{(1+r)^4}$

If r = 15%

Then Net Present Value (NPV)is 802

If r = 16%

Then NPV = -1359

IRR Example contd

- Step II --Find sum of absolute value of

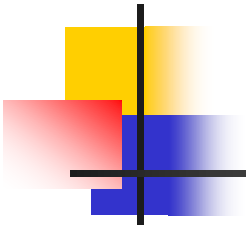
NPVs = 802+1359 = 2161

- Step III ---Calculate ratio of NPV of smaller discount rate in Step I to the sum obtained in Step III

i.e. 802 /2161 = 0.37

IRR example contd

- Step IV Add the number obtained in Step III to smaller discount rate
- i.e 15 + 0.37 = 15.37%
- This is approximate method.
- Computer programme can do this for us.



Decision

- Accept if IRR > Cost of Capital.
- Reject if IRR < Cost of Capital.

NPV vs IRR Method - Comparison

- Both give same result if cash flows are sequential i.e. first negative (outflow) then positive (Inflow.)
- Projects must be independent.
- If Cash flow signs change frequently then IRR method can give more than one IRR.
- Not suitable for ranking projects of different scale.

Modified IRR Method - Procedure

- Calculate present value of project cost using estimated cost of capital as discount rate

  PVC = $\Sigma^{n}_{t=1}$ Cash outflow /(t) $(1+r)^{t}$ =
  Calculate Terminal value (TV) of cash inflows expected from the project

  TV = $\Sigma^{n}_{t=1}$ Cash flow C_t $(1+r)^{n-t}$
- Step III Find MIRR as under
- PVC=TV /$(1+MIRR)^{n}$

Modified IRR Example

Year	0	1	2	3	4	5	6
C F*	-120	-80	30	60	80	100	120

Cost of Capital = 15%

Now PVC = 120 + 80/(1.15) = 189.60

TV = $(30)1.15^4 + 60(1.15)^3 + 80(1.15)^2 +$
$100(1.15)+120$

= 467

* CF = Cash Flow

Modified IRR---Example

- Now $189.6 = 467/(1+MIRR)^6$

- i.e., $(1+MIRR)^6 = 2.443$
- $1 + MIRR = (2.443)^{1/6} = 1.162$
- $MIRR = 0.162 = 16.2\%$

Advantages of MIRR over IRR

- No Problem of multiple IRR.

Discounted Pay Back Period

- Step I-Cash flows are discounted
- Step II- Total the discounted cash flow up to the year when value exceeds the initial investment.
- Step III- No. of year is the pay back period