write paper in proper manner

module - 7

Capital Budgeting: Nature and type of Investment decision, Net Present value (NPV), Internal Rate of Return (IRR), Payback period, Profitability Index, Nature and Behavior of Cost. **5 hour**

Capital budgeting

- Capital refers to the total investment of a company or firm in money, tangible and intangible assets.
- Budgeting :- the art of building budgets

- Some examples :
- Fixed assets, plant and machinery, goodwill etc…
- Expenditure related to addition, expansion, improvement and alteration to the fixed assets
- The replacement of fixed assets.
- Research and development project. R & D

- According to **Charles T. Hrongreen,** “capital budgeting is a long-term planning for making and financing proposed capital outlays**.**

Need and Importance of Capital Budgeting

Q: What is CB and Importance

- 1. Long-term implications:
  - A capital budgeting decision has its effect over a long time span and inevitably affects the company's future cost structure and growth.
  - Wrong decision and long-term survival
  - Lack of investment and competitive position

- 2. Involvement of large amount of funds:
  - Need substantial amount of capital outlay
  - underlines the need for thoughtful, wise and correct decisions

Need and Importance of Capital Budgeting

- 3. Irreversible decision:
  - ➢ Once the decision is taken for purchasing a permanent asset, it is very difficult to dispose off those assets without involving huge losses
  - ➢ Irreversible because it is difficult to find a market for such assets

- 4. Risk and uncertainty:
  - ➢ Investment is present and return is future
  - ➢ The future is uncertain and full of risk
  - ➢ Longer the period of project, greater may be the risk and uncertainty

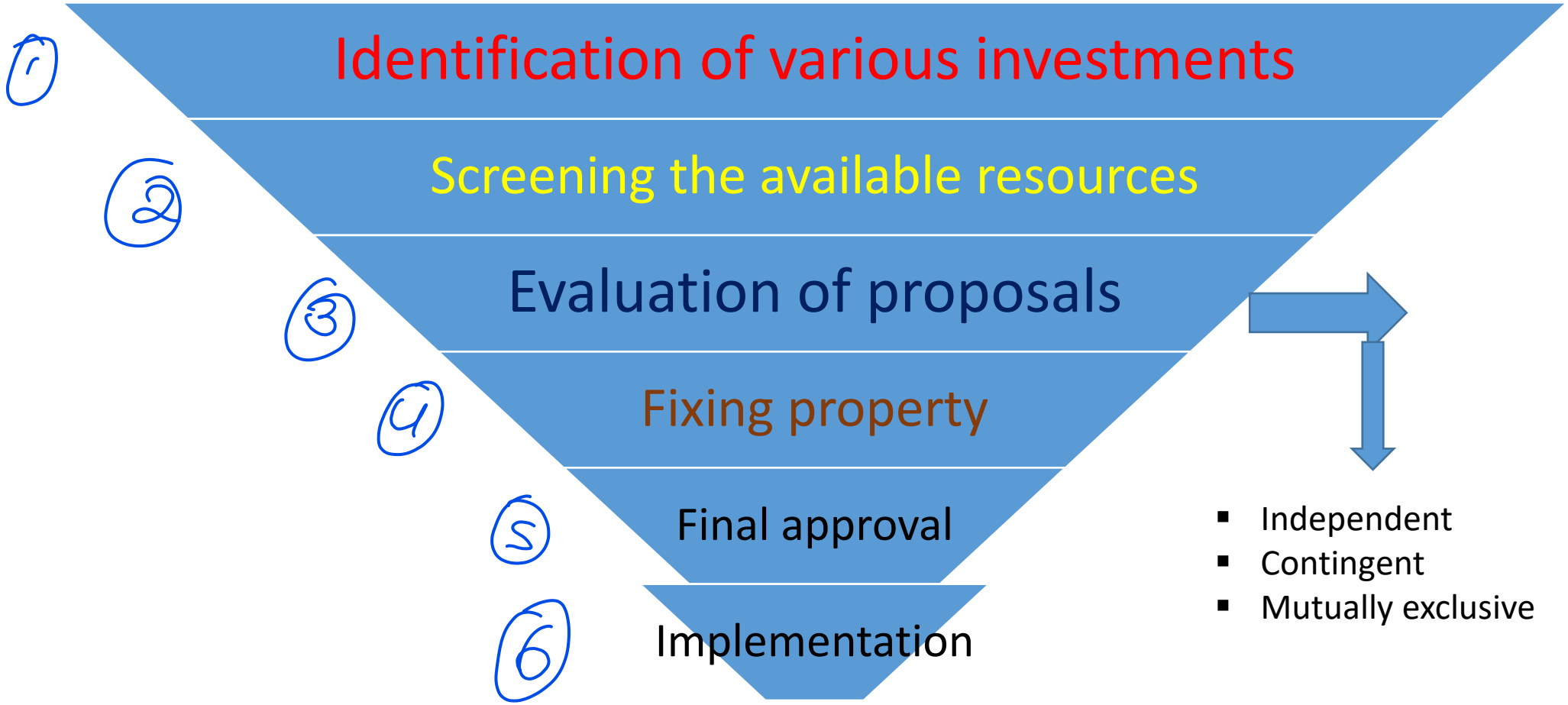
Need and Importance of Capital Budgeting

- 5. Difficult to make decision
  - ➢ Is a difficult and complicated exercise as it require an over all assessment of future events which are uncertain
  - ➢ Estimation of future benefits and cost correctly in quantitative terms subject to the uncertainties caused by economic-political social and technological factors
- 6. Permanent commitment of funds
- 7. Maximize the worth of Equity Shareholders

Money can't be used in other purpose.

Goal to maximize Shareholder Equity

Capital budgeting process



Project Evaluation methods

Kinds of capital budgeting decision

1

- Traditional methods
  i. pay-back period methods
  ii. post-pay-back methods
  iii. accounting rate of return

2

- Modern methods
  i. NPV
  ii. IRR
  iii. PI Methods

Pay-back period

- Pay-back period is the time required to recover the initial investment in a project.
- Pay-back period= $\frac{Initial\ investment}{Annual\ Cash\ inflows}$ Even cash flow
- Project cost is Rs. 30,000 and the cash inflows are Rs. 10,000, the life of the project is 5 years. Calculate the pay-back period.
- PBP= $\frac{Rs\ 30{,}000}{Rs\ 10{,}000} = 3\ Years$
- ***Accept /Reject criteria***
- If the actual pay-back period is less than the predetermined pay-back period, the project would be accepted. If not, it would be rejected.

⇒ UNEVEN Cash flow

- One projects require an initial cash outflow of Rs. 25,000. The cash inflows for 6 years are Rs. 5,000, Rs. 8,000, Rs. 10,000, Rs. 12,000, Rs. 7,000 and Rs. 3,000.
- Pay-back period= 3 years + 2000/12000 x 12 months
- = 3 years 2 months

1 5000

2 5000 + 8000 = 13000

3 13000 + 1000 = 23000

(4) 2000 — 2000 / 12000 ← (now only 2000 req in complete year I will get

- **Limitation:**
- It does not consider the cash inflows earned after pay-back period
- Considers the receivable after the pay-back period
- **Exercise:**
- 1. from the following particulars compute: a) pay-back period, post pay-back profitability , and c) post pay-back profitability index
- Cash outflow: RS 100,000
- Annual cash inflow: Rs 25,000
- Estimated life: 6 years

- Soultion:
- a) pay-back period: $\frac{Initial\ investment}{Annual\ Cash\ inflows}$
- : $\frac{100{,}000}{25{,}000}$ = 4 years
- b) post pay-back profitability: = Cash inflow(Estimated life-pay-back period)
- = 25,000(6-4)
- = Rs 50,000
- C) post pay-back profitability index= $\frac{50{,}000}{100{,}000}$ x 100 = 50%

Accounting rate of return(ARR)

Average Rate of Return

It should be high

- Average rate of return is being considered for project evaluation
- **Merits:**
  - 1. It is easy to calculate and simple to understand.
    2. It is based on the accounting information rather than cash inflow.
    3. It is not based on the time value of money.
    4. It considers the total benefits associated with the project.
- **Demerits:**
  - 1.It ignores the time value of money.
    2. It ignores the reinvestment potential of a project.
    3. Different methods are used for accounting profit. So, it leads to some difficulties in the calculation of the project.

$$ARR = \frac{\text{Avg. Annual profit after tax}}{\text{Avg. Investment}}$$

- **Method:**
- ***ARR= Average annual profit/average investment***
- Average annual profit = total profit over investment period/Number of years
- Average Investment= (Book value at year 1+ Book value at the end of useful life)/2

- **Criteria to accept or reject:**
- If the actual accounting rate of return is more than the predetermined required rate of return, the project would be accepted. If not it would be rejected.

- XYZ Company is looking to invest in some new machinery to replace its current malfunctioning one. The new machine, which costs ₹420,000, would generate annual revenue by ₹ 200,000 and annual expenses by ₹ 50,000. The machine is estimated to have a useful life of 12 years and zero salvage value.

Annual Profit before depreciation = Annual Revenue - Annual Expenses

depreciation = Initial investment - Salvage value / useful life

Avg. Annual value after depreciation = ——— - Depreciation

Depreciation = Initial Cost - Salvage value / useful life

- Average annual profit:
- Total revenue = 200,000 x 12
  = **2,400,000**
- Annual expenses = 50,000 x 12
  = **600,000**
- Depreciation = 420,000

420,000 - 0 = 35000 / 12

- Total profit = **1,380,000**
- Average profit = TP/12 = 115,000

1,50,000 - 35000 = 115,000

- Average investment = (420,000+0)/2 =210,000

- ARR = ₹115,000/ ₹210,000 = .5476
  = 54.67%

- Average Investment= (Initial cost + Installation expenses- salvage value) / 2 +Additional Net Working Capital + Salvage Value.

- If the initial investment of the XYZ ltd. in buying a machine is Rs 1, 21, 000, salvage value is Rs 11,000, working capital is Rs 12000 & life of the machine is 5 years. SLM of depreciation is adopted. Calculate the average investment.

$$\text{Depreciation} = \frac{1,21,000 - 11,000}{5} = \frac{1,10,000}{5}$$

$$\Rightarrow 1,50,000$$

Modern methods

NPV, IRR, PI

Net Present value method ⇒ NPV ⇒ CI - CO

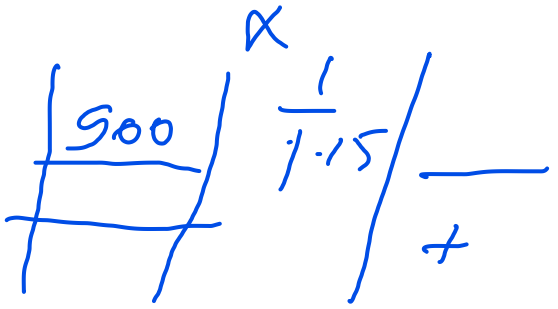
- Cash flows of the investment project should be forecasted based on realistic assumption
- Appropriate discount rate (OCC)
- PV of cash flows should be calculated using the OCC as discount rate
- The project should be accepted if NPV>0

- NPV= difference between PVs of COFs and CIFs

- NPV= $\left[\frac{C_1}{1+k} + \frac{C_2}{(1+k)^2} + \frac{C_3}{(1+k)^3} + \text{-----} + \frac{C_n}{(1+k)^n}\right] - C_0$

Example

- The project X costs Rs.2,500 now and is expected to generate year end cash inflows of Rs.900, Rs.800, Rs.700,Rs.600, and Rs.500 in years 1 to 5. The opportunity cost of capital is assumed to be 15%. Find out the NPV of the project.
- NPV= $\left[\frac{C_1}{1+k}+\frac{C_2}{(1+k)^2}+\frac{C_3}{(1+k)^3}+\frac{C_4}{(1+k)^4}+\frac{C_5}{(1+k)^5}\right]- C_0$



- NPV= $\left[\frac{900}{(1.15)}+\frac{800}{(1.15)^2}+\frac{700}{(1.15)^3}+\frac{600}{(1.15)^4}+\frac{500}{(1.15)^5}\right]- 2500$

- NPV= (782.60 + 605 + 460.2 + 343.1 + 248.59)-2500
- 2439.49-2500 = **-60.51**

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

Evaluation of NPV method

- NPV is the most acceptable method:
  - Time value
  - Measure of true profitability
  - Value-additivity
  - Share holders value
- Limitations
  - Cash flow estimation
  - Discount rate (non constant and difficult)

Internal rate of Return (IRR)

this we have to calculate

1. IRR is that rate of discount that equates the investment outlay with the present value of cash inflows received after one period
2. It is the rate of discount that makes the NPV of all cash flows equal to zero
3. It is the annual rate of growth that an investment is expected to generate

- $C_0 = \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \text{-----} + \frac{C_n}{(1+r)^n}$
-
- $\sum_{t=1}^{T} \frac{C_t}{1+r)^t} - C_0 = 0$

Calculating IRR by trial and error method

- Select any discount rate to compute the present value
- If the calculated PV of the expected cash inflow is lower than the PV of cash outflows, a lower rate should be tried
- If the calculated PV of the expected cash inflow is higher than the PV of cash outflows, a higher rate should be tried

- The process will be repeated until the NPV becomes zero

Example 1

- Level Cfs
- Let us assume that an investment would cost Rs 20,000 and provide annual cash inflows of Rs 5430 for six years.
- NPV=0
- → NPV= -20,000 + RS 5430 $(PVAF_{6,r}) = 0$
- 20,000= 5430 $(PVAF_{6,r})$
- $(PVAF_{6,r})$ = 20,000/5430 = 3.683

Example 2

- **Uneven Cfs**
- Invest $2,000 now, receive 3 yearly payments of $100 each, plus $2,500 in the 3rd year.
- Let us try a **10%** interest rate
- $= \frac{100}{(1.1)} + \frac{100}{(1.1)^2} + \frac{100}{(1.1)^3} + \frac{2500}{(1.1)^3} - 2000$
- = 90.91+ 82.64+ 75.13+ 1878.29-2000
- = $126.97 (+ve)

- Let’s try 12%
- NPV= 89.29+ 79.72+ 71.18+1779.45-2000
- = **19.64**

- Let’s try 12.4%

- 1760.52+70.42+79.15+88.97-2000= **-0.94**

$$L + \frac{PV_L - CO}{PV_L - PV_H} \times H - L$$

- For accurate IRR
- IRR= Base factor+$\left[\left(\frac{Positive\ NPV}{Difference\ in\ Positive\ and\ negative\ NPV}\right) X\ \mathrm{DP}\right]$

- For example : Rate of discounts 10 % 15%
- NPV 544 -600
- IRR = $10\% + \frac{544}{544-(-600)}\ X\ 5$
- $= 10\% + \frac{544}{1144}\ X\ 5 = 10\% + .47\ X\ 5$
- $= 10 + 2.35 = 12.35\%$

if NPV is ⊕ve go for higher rate

NPV and IRR conflict

- Independent project: the conflict does not arise
- Mutually exclusive projects:
  - One project may have higher NPV, but the other may have higher IRR
- It may arise due to:
  - Relative size of the project
  - Due to the different cash flow distribution

- Since NPV is an absolute measure, it will rank a project adding more dollar value higher regardless of the initial investment required
- IRR is a relative measure, and it will rank projects offering best investment return higher regardless of the total value added.

- In case of NPV IRR conflict, always accept the project with higher NPV

- Reason:
- It is because IRR inherently assumes that any cash flows can be reinvested at the internal rate of return.
- This assumption is problematic because there is no guarantee that equally profitable opportunities will be available as soon as cash flows occur.
- NPV does not suffer from such a problematic assumption because it assumes that reinvestment occurs at the cost of capital, which is more realistic and conservative

Conflict: Example (size)

	Project A	Project B
C_0	10 million	1 million
C_1	10 million	2 million
C_2	10 million	1 million
NPV (10%)	7.4 Million	1.6 million
IRR	61.8%	141.4%

Conflict: Example (CF)

	Project C	Project D
C_0	10 million	10 million
C_1	15 m	0 m
C_2	10 m	30 m
NPV (10%)	11.9 m	14.8 m
IRR	100 %	73.2

6. Profitability Index

- Measures the ratio between the present value of future Cfs and the initial investment.
- it allow us to quantify the amount of value created per unit of investment
- PI = PV of future CF/ Initial investment
- if the PI > 1, the project generates value

	Project A	Project B
Year 0	-1,500,000	-3,000,000
Year 1	150,000	100,000
Year 2	300,000	500,000
Year 3	500,000	1,000,000
Year 4	200,000	1,500,000
Year 5	600,000	200,000
Year 6	500,000	500,000
Year 7	100,000	1,000,000
Discount rate	10%	13%

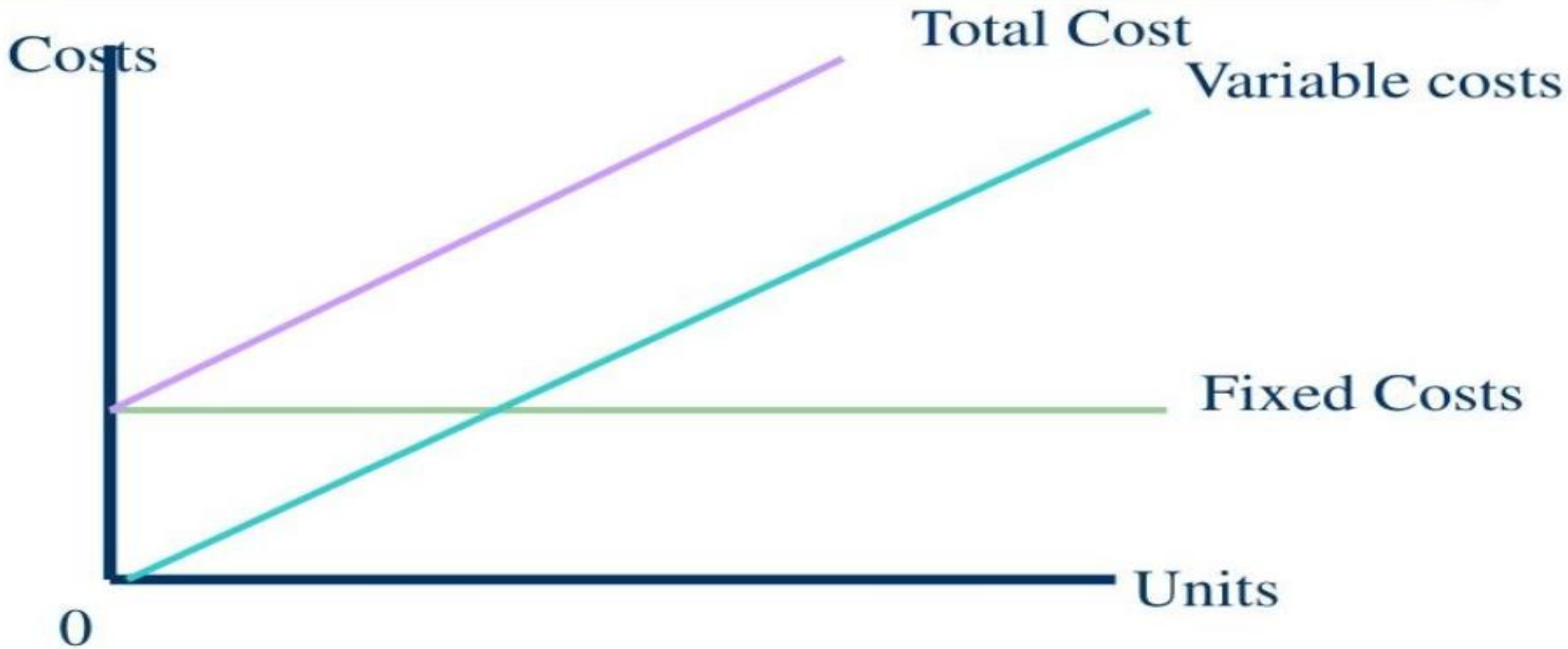
$\frac{150,000}{1+\frac{10}{100}}$

$PI = \frac{1602663.18}{1500000} = 1.0684$

	Project A	PV	Project B	
Year 0	-1,500,000		-3,000,000	
Year 1	150,000	136,363.64	100,000	88,495.58
Year 2	300,000	247,933.88	500,000	391,573.34
Year 3	500,000	375,657.40	1,000,000	693,050.16
Year 4	200,000	136,602.69	1,500,000	919,978.09
Year 5	600,000	372,552.79	200,000	108,551.99
Year 6	500,000	282,236.97	500,000	240,159.26
Year 7	100,000	51,315.81	1,000,000	425,060.64
Discount rate	10%		13%	
	PV	1,602,663.18		2,866,869.07
PI		**1.0684**		**0.96**

Cost Concepts

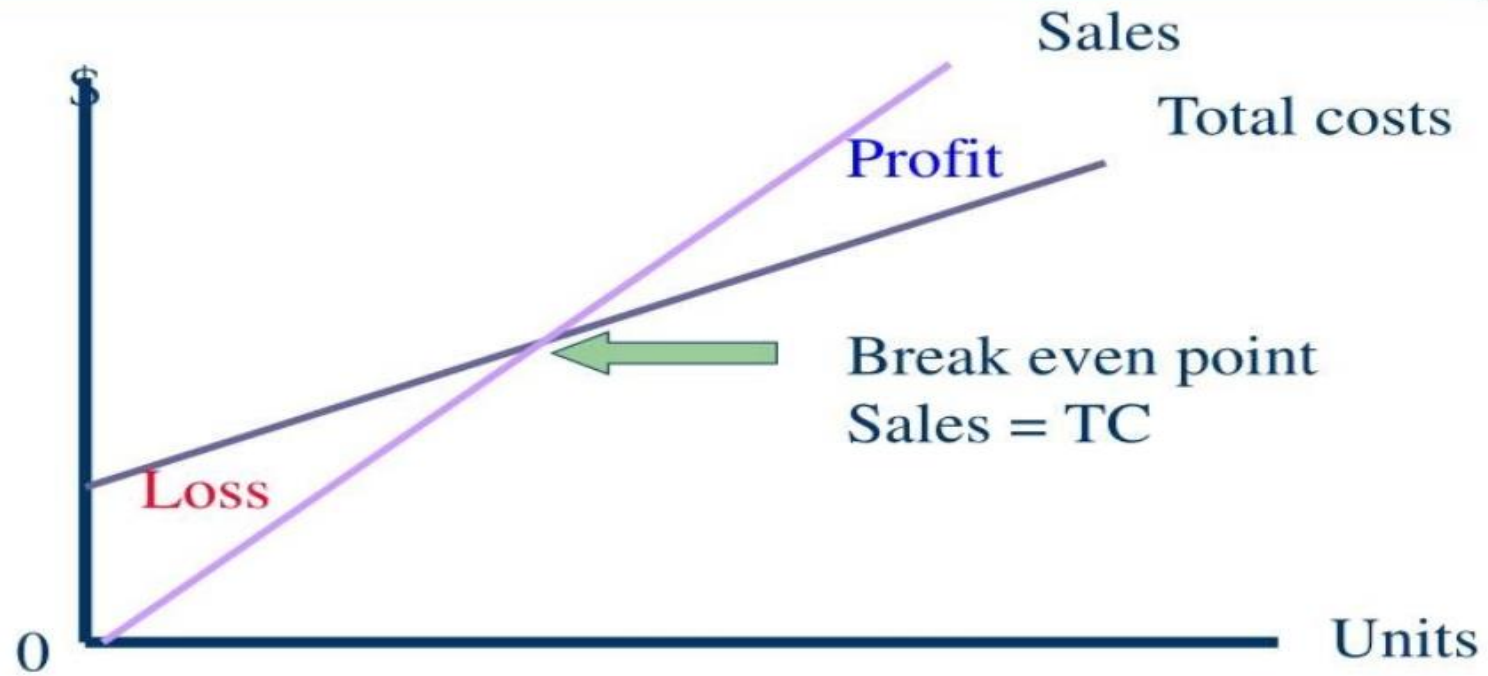
Graphical



Break-Even Point

- Is the level of operations at which a business' revenues and expired costs are exactly equal
- No income or loss
- BEP = $\frac{\text{Fixed Costs}}{\text{Unit Contribution Margin}}$

Graphical – Break even point



Desired Profit

- Firms would like to earn a profit and not just to break even
- BEP = $\frac{\text{FC + Desired Profit}}{\text{Unit CM}}$

- Example: 1
- A company has sales of $ 1,000,000, variable cost of $800,000.

- Contribution margin= Sales-VC = $1,000,000 - $800,000
  = $200,000

- Contribution margin ratio = (Sales-VC)/ Sales = 20 %

- Example 2:
- Suppose that selling price is $35,variable cost is $15, and fixed costs are $90,000.
- BEP= $\frac{Fixed\ Costs}{Sales-Vc}$
- $= \frac{\$90{,}000}{\$35-\$15}$ = 4500 Unit.