17-07-2017

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Engineering Economics

Economics : (i) **Wealth** [धनको विज्ञान (लक्ष्मी)]

- Economics is the science of wealth. - Adam Smith

(ii) **Welfare** [कल्याण] मानिसको भलाई हुने गरी आय आर्जन गर्ने

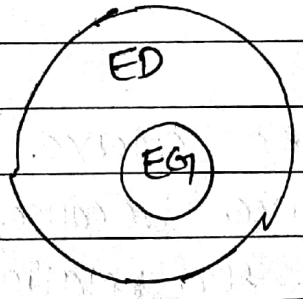
(iii) **Scarcity** [Limited resources but unlimited needs]

- Unlimited wants can be fulfilled by optimum allocation of resources.

(iv) **Growth** [Latest view]

- The effort of economics should be aligned to achieve sustainable Economic Growth (EG)

EG :- Economic Growth
ED :- Economic Development



For Nepal,

7.2%	7%
EG	ED
↓	↓
(quantitative)	(qualitative)

EG :- economic को capacity [strength] 7.2% ले बढ्छ।
as just a number. (quantitative)

EG ↑ poverty ↓

Economics :- Science of road. [only rational Man]

- naturally र policy effect measure गर्ने
→ to do that, first natural growth लाई 0% मा राख्ने र त्यसपछि effect measure गर्ने

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Economics is the science. It is the study of rational human behavior. According to the wealth definition of economics, it is only the study of wealth | money. According to the welfare defn of economics, it is the science which utilizes wealth or money to maximize the welfare of the human being. According to scarcity definition of economics, it is the science and art that uses limited resource to fulfill the unlimited wants of human being in efficient ways. According to the growth definition of economics, the economic effort should be alligned to achieve sustainable economic growth.

Finally, economics is both art and science which allocates resources in efficient manner.

Why economics is science?

soln → Economics is science because:

- economics trace the relationship between cause and effect.

science → cause : If Tax↑
→ Effect : Consumption ↓

If i (interest rate) ↑

S (savings) ↑ (I) Investment ↓

- these laws can be tested by observation and experiment.
- economics can make prediction.
- economics is self corrective in nature.
- economics have universal validity.
- economics has objectivity.
- It has it's own methodology of study i.e. induction and deduction.
- It has ability to forecast.
- Methodology of economics is also the methodology of science.
- economics is an art.

because, it is practical which shows the solution to various economics problem.

Example: to control inflation, the proper and suitable combination betn fiscal (राजकोष) and monetary (मुद्रा) policy is necessary. This combination can be achieved by what is art.

18-07-2017

Law of Demand , **Law of Supply**

↓ from buyer's perspective

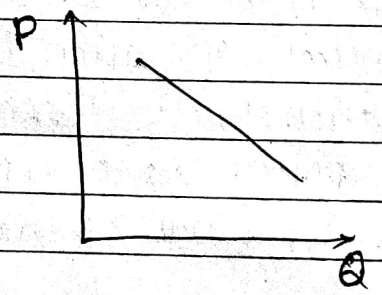
↓ supplier's perspective

Demand Vs Desire

Demand - ख़रीद शक्ति है।

Desire - ख़रीद नहीं पाते भी है।

$\boxed{\text{Ceterious peribus}}$ → other things remaining constant.



Slope in economics

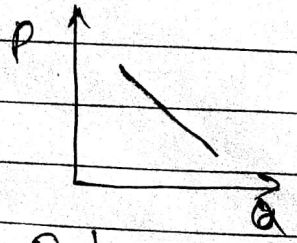
$5x+3y=9$

$5+3\frac{dy}{dx}=0$

$\boxed{\frac{dy}{dx}=-5/3}$

Laws of Demand :

According to the law of demand, if the price of commodity increases the quantity consumption decreases and vice-versa under ceterious peribus condition.



P↑ → Q↓

P↓ → Q↑

] → -ve slope होती है।

St. line नहीं पाते भी है।

From the above figure it can be seen that the demand curve for particular commodity is negatively sloped, it is because :-

- law of diminishing marginal utility.
- Change in number of consumer.
- Various use of commodity.
- Income effect
- Substitution effect
- the demand for particular commodity is the function of,

$$D = f(P, P_r, T, Y ...) \quad - \quad (1)$$

where,

D = demand for particular commodity
f = functional relationship
P = price of that commodity
P_r = price of relative commodity
Y = income of the consumer

For simplicity,

$$D = f(P)$$

Types of goods,

1) Giffen :- price ↑ मा consumption ↑ हुन्छ।
2) Inferior :- low class goods, it is related with income. Income ↑ Inferior ↓
3) Complement :- एउटाको मूल्य बढे अर्कोको पनि बढ्छ।
   Petrol ↑ Fare ↑
4) Substitutes

Note:- एउटाको comparison मा मात्र Giffen र Inferior हुन्छ।
(single compare गरिएको (राम्रो वा नराम्रो))

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Dumping: Competitive market मा आफ्नो product लाई सस्तो low cost मा high production गर्ने

BOP [balance of payment]

— Nepal has highly +ve. because of remittance. But low export and high import छ।

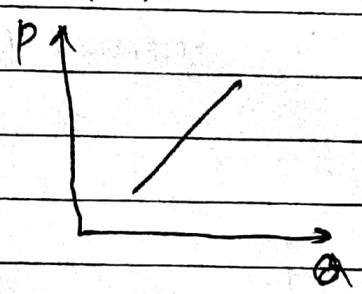
PEG Exchange rate:

purchasing power Vs powerful

Indian Rs — Nepali Rs.

Law of supply

According to law of supply, if the price of commodity increases, the quantity consumption also increases and vice-versa under ceteris paribus condition.



$P \uparrow \rightarrow Q \uparrow$
$P \downarrow \rightarrow Q \downarrow$] +ve slope

The supply of a commodity is the function of

$$S = f(P, P_r, T, Y \ldots) \quad \text{--- (11)}$$

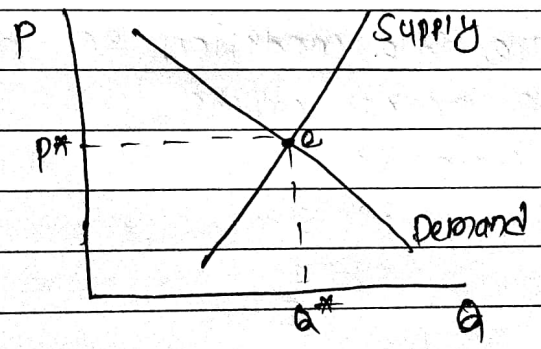
For simplicity,

$$S = F(P)$$

price determination

In a perfectly competitive market, equilibrium price of the product is determined through a process of interaction between the aggregate of market demand and aggregate of market supply. Equilibrium price is the price at which the market demand becomes equal to market supply.

The buyers and sellers both remain satisfied and for at the said price the sellers supply what the buyers demand and the buyers demand what the sellers supply. None of them is dissatisfied, and so, none of them would want a change in the price. That is why this price is called the equilibrium price.



The individual demand and supply curves are summationed and the aggregate demand curve AD and the aggregate supply curve AS, are drawn. The equilibrium market price is determined at the equilibrium quantity demanded and supplied.

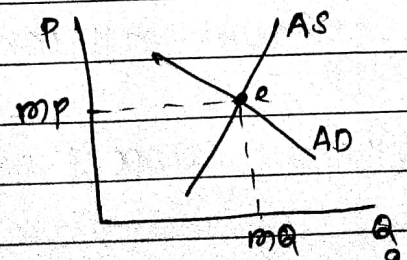


Figure: price determination

19-07-2017

Principles of Economics

Followings are the major principles of economics

① **Rationality :**

Economics is the study of rational human being. (ration)

② Consistency and transitivity of choices

choice পরিবর্তনের কারণ ① $A > B > C$ – সর্বদা একই হবে

② $A < B > C$ → transitivity তে গিয়ে হবে।

③ Test the calculated risk

– certainity & uncertainity probability cal. করে

④ Consumer tries to buy more commodity at lower price and vice versa.

⑤ Discriminating monoply earns more profit in both short and long run.

সর্বদা একই হবে → Raw material এর sole property,

⑥ Perfectly competitive market and pure monoply market are idle condition i.e. monopolistic competitive market exists.

⑦ Interest rate is

$i \propto S$

$i \propto \frac{1}{I}$

⑧ Controlled inflation supports economics growth.

⑨ economic growth is directly proportional to number of labour force (population) existing in country.

⑩ economy tries to maximize the welfare of the people by optimum allocation of limited resource.

⑪ Fragmented market support for price discrimination

(11) Risk is directly proportional to the return.

(12) Do not put all eggs in one basket.
— diversify your investment.

(13) economic development is more related with institution development, ~~avail~~ exploitation of natural resources, human resources and technological development.

~~(14)~~

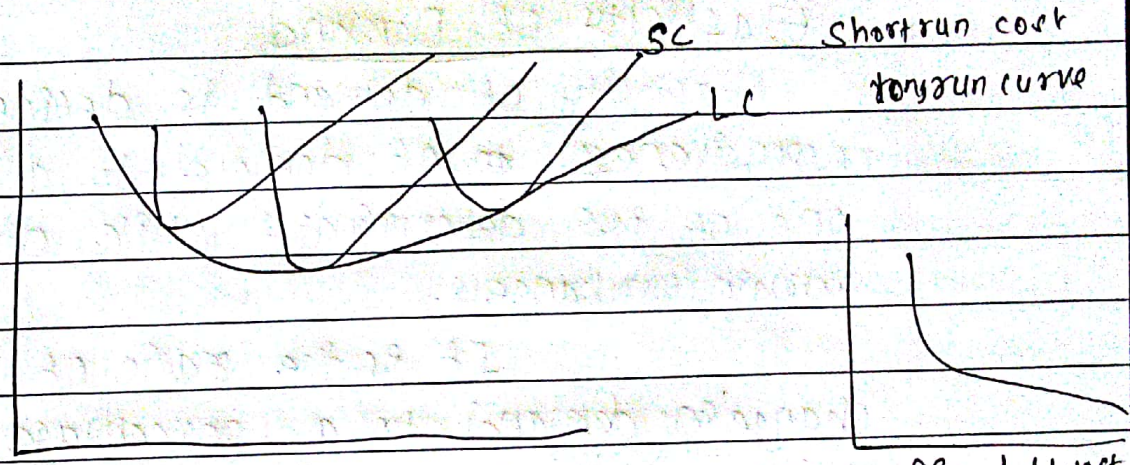


fig a: earlier fig b: latest

(15) Unit cost can be minimize by changing technology and increasing the output scale i.e. ~~econ~~ economy of scale.

(16) Cost and price are different thing.

(17) Government policy refers to influence the economy only in the short run with certain time lags.

(18) policy formulation process should be inclusive, participative and realistic.

(19) For proper economic growth suitable combination betn fiscal policy monetory policy any national plan.

(20) Export such commodities which are more aboundant and have less unit cost to produce and import such commodity ~~which~~ which are less abundant in nature and ~~have~~ have high unit cost to produce.

(21) Technology increases the production efficiency and decreases the unit cost.

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(29) Inflation is positively related with money supply.

Elasticity

Elasticity of Demand

Elasticity of demand is defined as the responsiveness ~~to~~ of demand to a change in one of its determinats while other determinats remain unchanges.

It is the ratio of percentage change in demand to a percentage change in price.

Responsiveness of demand to a changing price. It is denoted by e_p =

$$e_p = \frac{\text{porportionate change in demand}}{\text{porportionate change in price}}$$

$$= \frac{\Delta Q / Q}{\Delta P / P}$$

$$= \frac{\Delta Q}{\Delta P} * \frac{P}{Q}$$

∴ less elastic ছিলাকে মূল্যবৃদ্ধিত কৃষিত। অর্থাৎ : চাহিদা, দাম

20 - 07 - 2017

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Measurement of price elasticity of demand

(1) percentage or ratio or proportional

According to this method, price elasticity of demand is,

$$e_p = \frac{dQ}{dP} \times \frac{P}{Q}$$

(2) Total outlay method

$$TO = P * Q$$

TO :- total outlay

$$ME = \frac{d}{dP}(P*Q)$$

[ME: marginal expenditure]

$$= Q + P\frac{dQ}{dP}$$

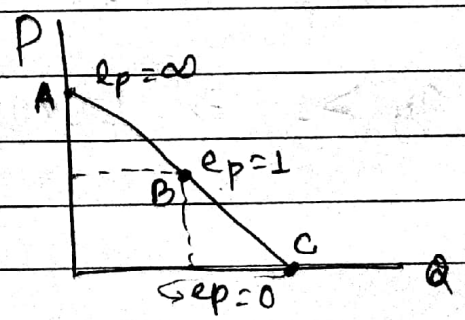
$$= Q\left[1 + \frac{P}{Q} \cdot \frac{dQ}{dP}\right]$$

$$= Q[1 + e_p]$$

$$\boxed{ME = Q(1 + e_p)}$$

(3) point or geometric method

According to this method elasticity of demand is given by



$$e_p = \frac{\text{lower segment}}{\text{Upper segment}} = \frac{BC}{AC}$$

(4) The ARC method

When the price and quantity change are very small then arc method is used.

$$e_p = \frac{Q_2 - Q_1}{P_2 - P_1} * \frac{P_1 + P_2}{Q_1 + Q_2}$$

$$= \left(\frac{Q_2 - Q_1}{Q_2 + Q_1}\right) * \left(\frac{P_2 + P_1}{P_2 - P_1}\right)$$

~~Elas~~

Income elasticity of demand

It is the responsiveness of quantity demanded with respect to income of the consumer. It is given by,

$$e_y = \frac{\Delta Q / Q}{\Delta Y / Y} = \frac{\Delta Q}{\Delta Y} * \frac{Y}{Q}$$

1) If $e_y = 0$ ⇒ Neutral or basic

(2) If $0 < e_y < 1$ ⇒ Necessity

(3) If $e_y > 1$ ⇒ Luxurious

elasticity → unit less quantity

slope ⇒ unit ~~रुपये~~ $\frac{dy}{dx} \Rightarrow \frac{dp}{dq}$

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cross elasticity of demand

It is defined as the ratio of percentage change in quantity of good A to percentage change in price of good B.

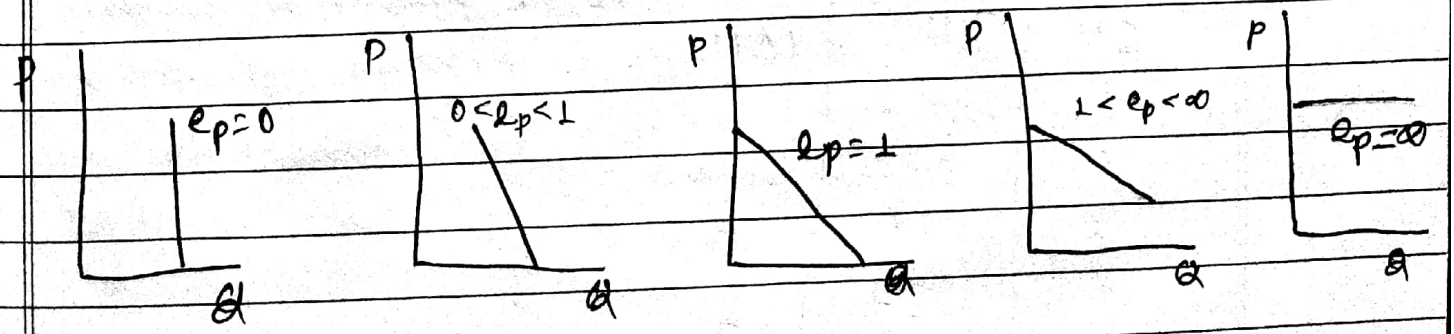
$$e_c = \frac{\left(\frac{\Delta Q}{Q}\right)_A}{\left(\frac{\Delta P}{P}\right)_B}$$

if $e_c = 0$ ⇒ independent good

if $e_c > 1$ ⇒ substitute $\left(\frac{\Delta Q}{Q}\right)_A \uparrow = \left(\frac{\Delta P}{P}\right)_B \uparrow$

if $e_c < 1$ ⇒ complement $\left(\frac{\Delta Q}{Q}\right)_A \downarrow = \left(\frac{\Delta P}{P}\right)_B \uparrow$

~~Law of diminishing utility~~



Law of diminishing (decreasing) marginal Utility

Let us assume that, the total utility of any consumer is given by.

$$TU = aQ^3 + bQ^2 - cQ + D$$

then the marginal utility is given by, the change in utility i.e.

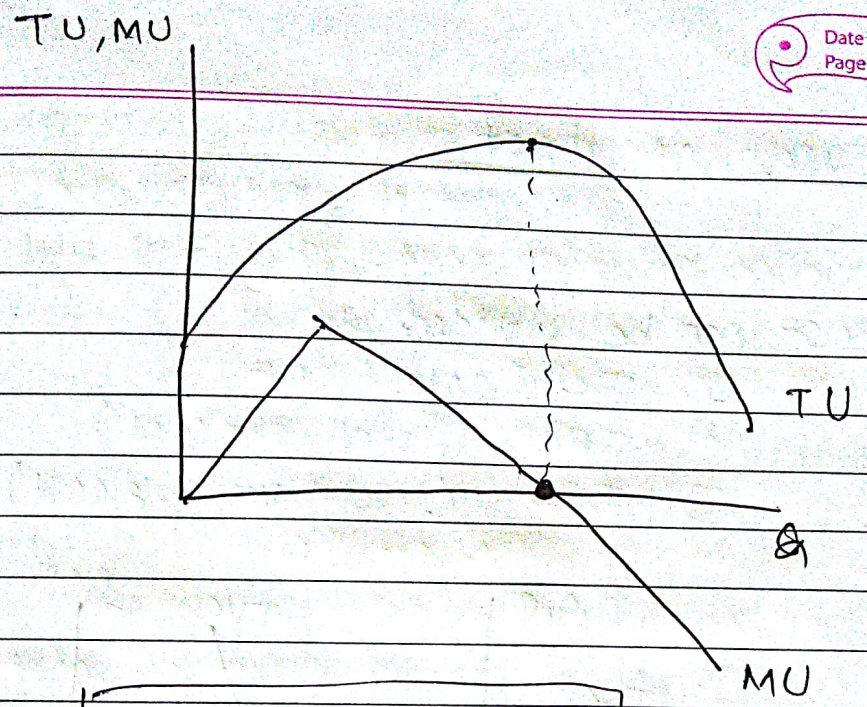
$$MU = \frac{d}{dQ}(TU) = 3aQ^2 + 2bQ - c$$

Under ceteris paribus conditions, on consuming the commodities, the marginal utility derived from its successive units goes on falling hence consumer purchase more unit at lower price.

The consumption of mango for particular consumer is

SN	TU	MU
1	10	0
2	20	10
3	25	5
4	27	2
5	28	1
6	28	0
7	21	–
8	16	5
9	5	11
10	-5	-10
11	-10	-15

∴ TU max जब MU is zero.



$$MU = TU_2 - TU_1$$

change in total utility

21-07-2017

Anything that is incured in production of good and service is known as cost. It indicates the manufacturing efficiency of industry and utilisation of plant, technology and manpower. Lower the cost higher will be efficiency and better use of plant and technology and vice-versa. cost and price are different things. cost indicates the manufacturing efficiency but price indicates the marketability of goods and service. price is always associated with tax but the cost is not associated with tax.

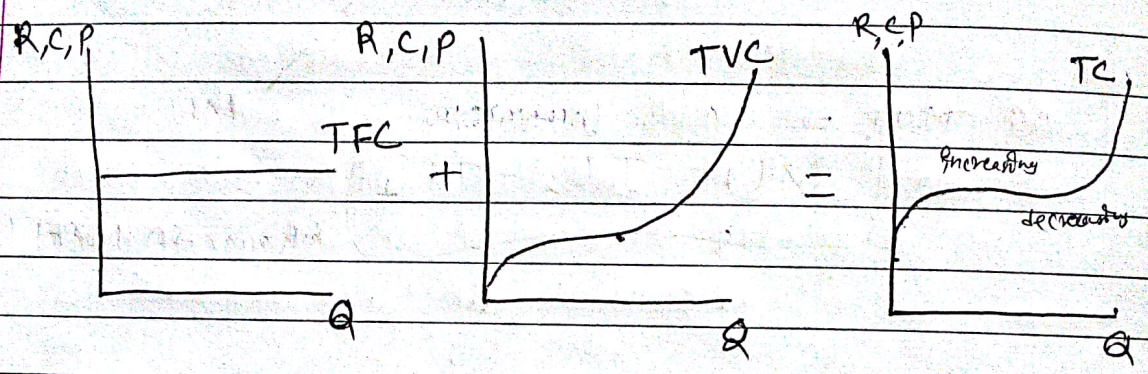
Therefore in general case price is always greater than cost due to inclusion of tax.

Types of cost

cost can be divided as

1) TC (Total cost)
2) TFC (Total fix cost)
3) TVC (Total variable cost)

Revenue, cost, price



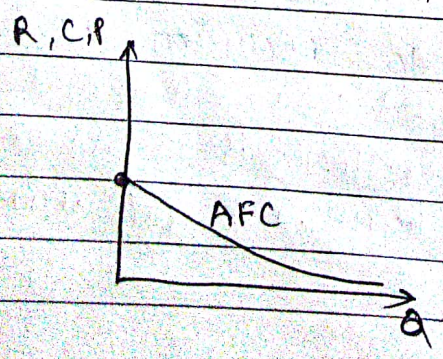
Total fix cost doesnot depends on the unit of production as shown in figure. so it is parallel to quantity axis.

Total variable cost is directly proportional to the output unit produced. It increases when the unit of production increases.

The total cost is obtained by adding TFC and TVC i.e.

$$\boxed{TC = TFC + TVC}$$

$$TC = A + b \times q$$

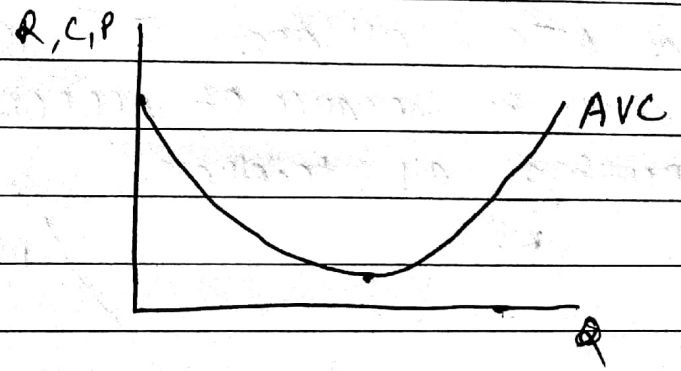


Average fix cost (AFC)
[Q↑ तो AFC कम होता है]

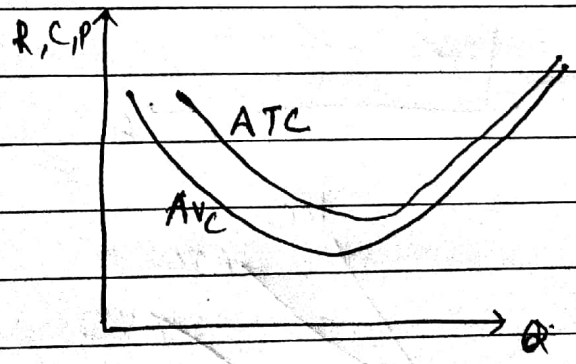
cost is obtained by dividing total fix cost by quantity output. It is rectangular hyperbola in shape because the numerator terms remains fix and the denomerator term (quantity output) goes on increasing.

Similarly, average variable cost is obtained by dividing total variable cost by quantity output.

It is 'U' shape in nature because the ~~[illegible]~~ A.V.C decreases at first, reaches to



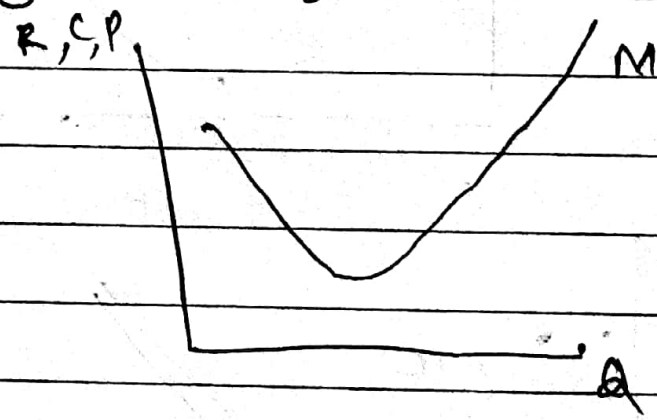
Average variable cost (AVC)

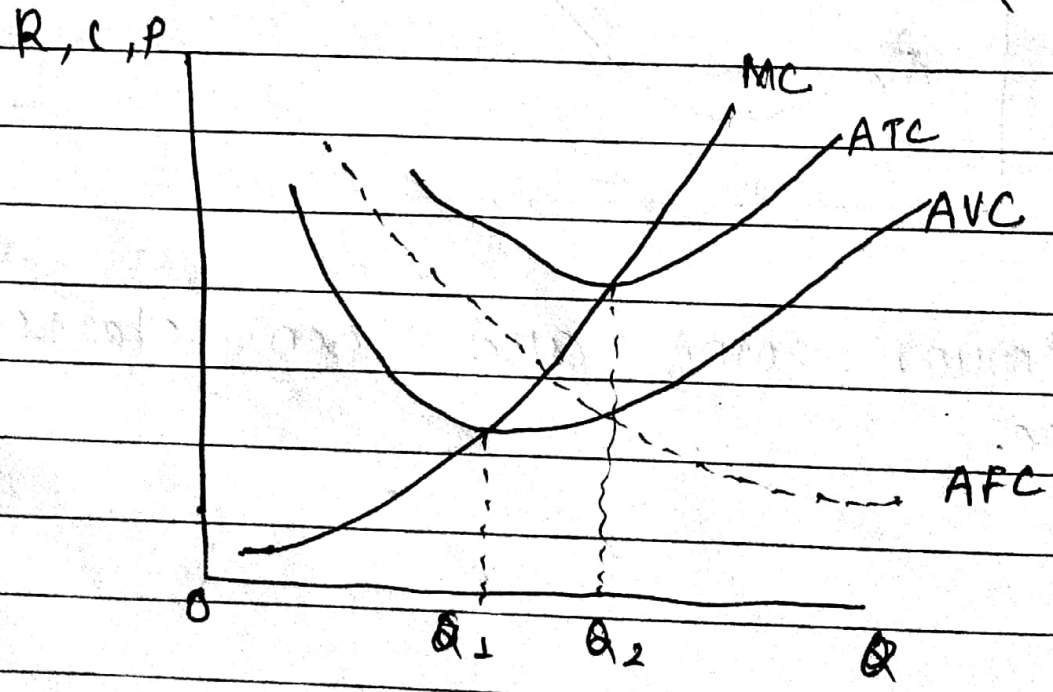


minimum point and then starts to increase.

= slope of TC

According to traditional theory of cost MC, AVC and ATC all are U shaped in nature, this is because of economies of scale. putting all together.





Marginal cost can be defined as extra unit of cost that is required to increase output by one unit.

Upto $0\ Q_1$: AVC ↓ & AFC ↓ ⇒ ATC ↓

beyond Q_1 : AVC ↑ & AFC ↓ ⇒ AVC ↑ >> AFC ↓
so, ATC ↑

Relationship between MC and AC [ATC]

$$AC = \frac{TC}{Q}$$

Differentiating both sides w.r. to Q

$$\frac{d(AC)}{dQ} = \frac{d\left(\frac{TC}{Q}\right)}{dQ}$$

$$\Rightarrow \frac{d(AC)}{dQ} = \frac{Q\frac{d(TC)}{dQ} - TC}{Q^2} = \frac{Q}{Q^2}\frac{d(TC)}{dQ} - \frac{1}{Q^2}(TC)$$

When AC is minimum AC is constant, therefore derivative of constant is zero. so,

$$0 = \frac{Q}{Q^2}\frac{d(TC)}{dQ} - \frac{1}{Q^2}(TC)$$

$$\Rightarrow \frac{Q}{Q^2}\frac{d(TC)}{dQ} = \frac{1}{Q^2}(TC)$$

$$\Rightarrow \frac{MC}{\cancel{Q}} = \frac{1}{\cancel{Q}} \cdot \frac{TC}{Q}$$

$$\Rightarrow \boxed{MC = AC}$$

Writing in another way,

(1) When AC is falling,

$$AC > MC$$

or,

$$\left.\begin{array}{l} ATC \downarrow \\ AVC \downarrow \end{array}\right\} \rightarrow \begin{array}{l} ATC > MC \\ AVC > MC \end{array}$$

(2) When, AC is minimum

$$AC = MC$$

(3) When AC is rising

$$MC > AC$$

Glover park - book

27-07-2017

opportunity, marginal, cost ?

Importances of E. Economics ?
→ write in points [principles]

$$MC :- TC_{n+1} - TC_n$$

$$TC_n - TC_{n-1}$$

$$MC = \frac{d(TC)}{dQ}$$

Cost can be defined as amount of resource for gone for production process. It is something that given up to get something. In other word, the amount of money paid for a resource / things is called cost.

(1) Total cost (TC)

$$TC = TFC + TVC$$

(2) Sunk cost : cost past मा incure भएको present मा आधार नहोस्

It is that cost which can not be recovered when the forms leaves from industry (past cost in nature).

It has no relevence in current decision making and future decision making.

Example: - Decoration cost
- Licencing cost
- Design cost
- Registeration cost.

(3) Opportunity cost

MC = $50,000 :- Choose गरिएको

T = $48,000 → छोडेर पछाडि cost is opportunity cost.

The cost of best rejected opportunity to earn return. It is hidden cost in nature. If we have multiple options or opportunities to select then best option is selected and the second best option is rejected. The cost associated with this second best option is opportunity cost. For example:

$\frac{d(TC)}{dQ}$

(4) Marginal cost

It is the incremental cost by employing (using) extra unit of factor.

Or

If the amount of output is to be increased by one unit then the amount of increase (change) cost is the marginal cost.

cost ↑ 1 unit ↑

Input → O/P

O/P 1 unit cost मतलब Input.

It can be given as rate of change of total cost with respect to quantity.

$$MC = \frac{d(TC)}{dQ}$$

$$= TC_n - TC_{n-1}$$

$$= TC_{n+1} - TC_n$$

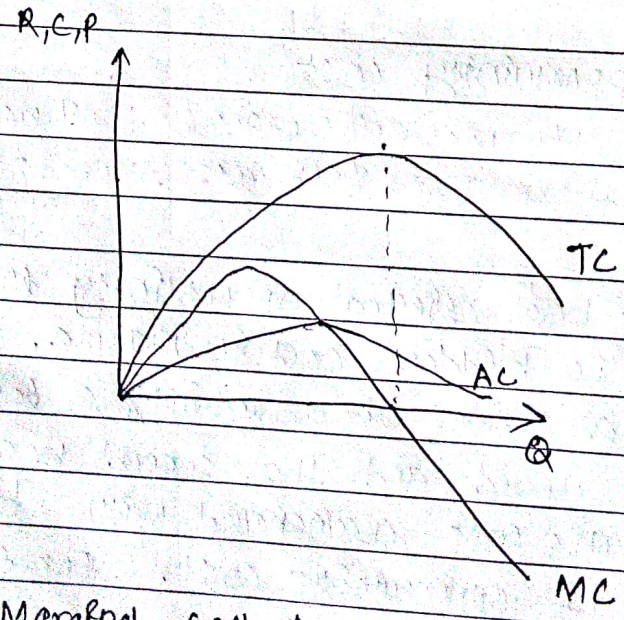
[∵ TC = Total cost]

where,

TC_n :- Amount of TC for production of n.

TC_{n-1} :- Amount of total cost for production of (n-1)

Q :- Quantity O/P



- Marginal cost becomes zero when total cost is maximum.
- When AC is max^m then MC is equal to AC.
- Marginal cost indicates the slope of Total cost.

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(5) Average cost :

When the Total cost is divided by the output quantity is known as Average cost.

$$AC = \frac{TC}{Q}$$

When AC is max^m it becomes equal to MC.

When AC does not meet MC,

~~AC ⇒ MC~~

$AC < MC$

When AC is max^m,

$AC = MC$

~~When~~ ~~AC~~ After that max^m point

$AC > MC$.

but AC never meets the output axis.

[AC कभी भी zero नहीं होता]

(6) Direct cost : production से related cost

Eg: labour wage, raw material cost

(7) Indirect cost (overhead cost) : Overall fixed cost not directly related to production cost.

30-07-2017

H/W Manufacturing Vs Non manufacturing cost.

Differential cost & revenue

Let TR = Total Revenue &
TC = Total cost
Then profit (π) = TR − TC ---- (1)

Let Q = Amount of Quantity produced (output)

(I) Then for maximum profit $\frac{d(\pi)}{dQ} = 0$

i.e. $\frac{d(\pi)}{dQ} = \frac{d(TR)}{dQ} - \frac{d(TC)}{dQ} = 0$

$= MR - MC = 0$

$\Rightarrow \boxed{MR = MC}$

(II) $\frac{d^2(\pi)}{dQ^2} < 0$

i.e. $\frac{d(MR - MC)}{dQ} < 0$

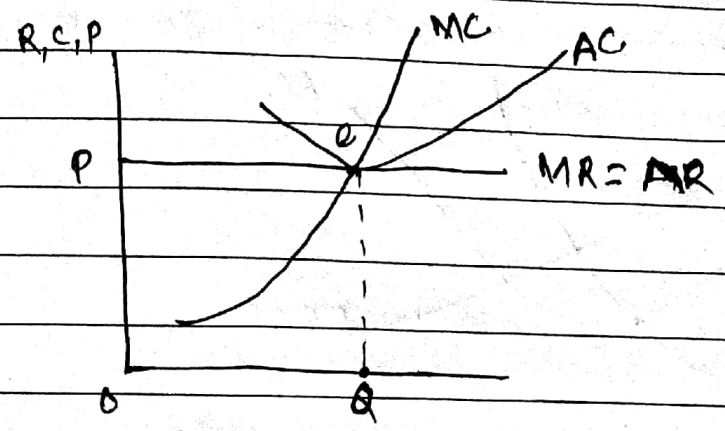
i.e. $\frac{d(MR)}{dQ} < \frac{d(MC)}{dQ}$

$\Rightarrow$ Slope of MC > Slope of MR
i.e. MC cuts MR from below

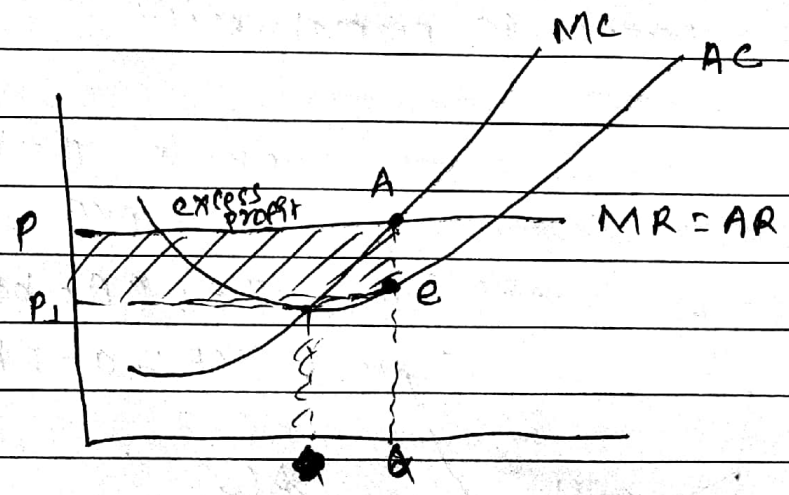
$\boxed{TC = \uparrow \text{cost}}$

For perfectly competetive market

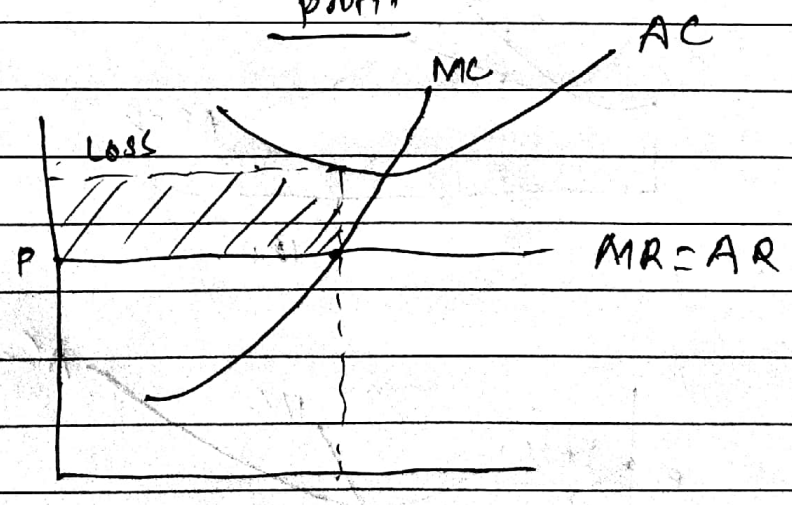
(product की price सभी firm same, user determine price) buyer



Normal profit



profit



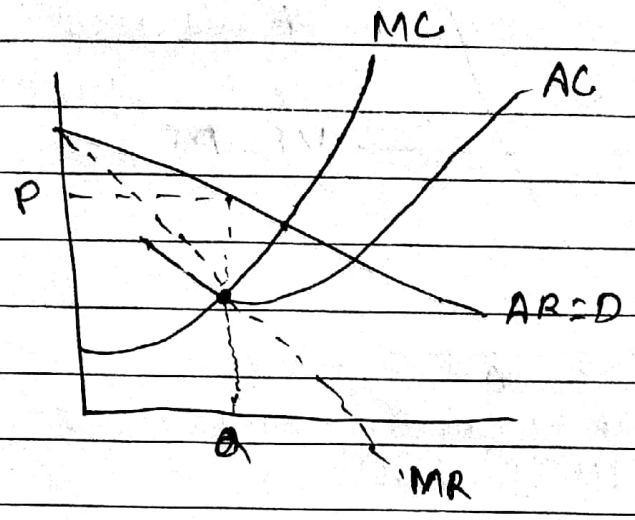
Loss

Q:- NEA

Monopoly [Firm = Industry]

Firm :- particular

Industry :- all the collection of firm.



Monopoly in normal profit

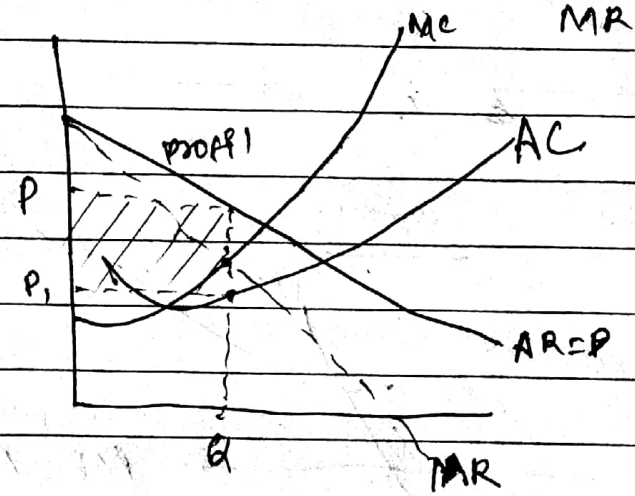
AC & profit & loss determine o/p

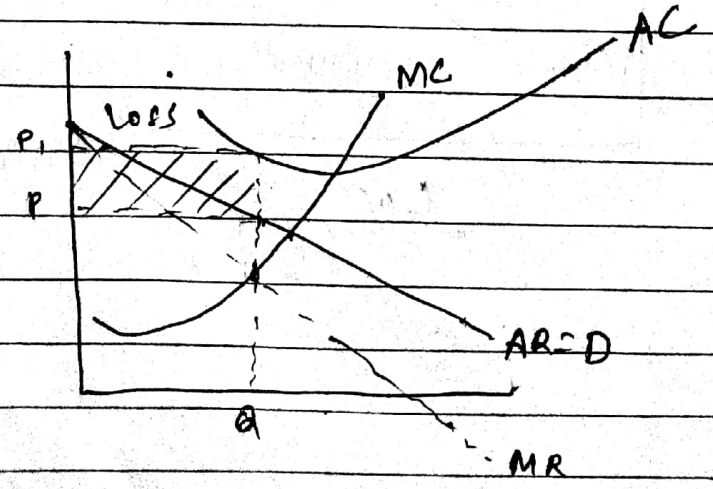
$AR = P = a - bQ$

$TR = P \times Q$

$TR = aQ - bQ^2$

$MR = a - 2bQ$





Chalkus park BOOK

CH#3 Time Value of Money

Interest Rate

The one rupees today is not equal to one rupees tomorrow and the one rupees tomorrow is not equal to one rupees today. The time value of money makes this difference.

$$|1_{today} - 1_{tomorrow}| \neq 0$$

Interest Rate: (ब्याज दर)

Interest is the amount ~~of~~ charged that should be paid for using money (capital). ~~Interest~~ When interest is expressed in percentage, it becomes interest rate. Interest rate can be simple, compound, fixed & variable.

According to productivity theory of interest rate, the capital is productive and scare (limited) so for using such scare & productive resource (money), interest should be paid.

According to intertemporal choice theory, delayed future consumption should be compensated by paying certain interest.

Continuous compounding [second ले व्याज लाएंगे]

$$i = \left(1 + \frac{r}{m}\right)^m - 1$$

interest rate की दिशा में

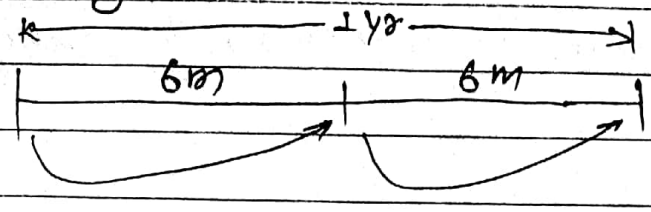
$m \to \infty$

$$\boxed{i = e^r - 1}$$

31-07-2017

Interest rate

Let us suppose that interest rate is compounded semiannually then



Let i = effective interest rate

r = Nominal interest rate

m = No. of periods (i.e. compounding period)

Then $i = \frac{r}{m}$

now compounding,

$F = P(1+i)^m$

$\Rightarrow \quad P\left(1+\frac{r}{m}\right)^m = P(1+i)^1$

$\boxed{F = P(1+i)^1}$ for 1 year

$$\boxed{i_{eff} = \left(1+\frac{r}{m}\right)^m - 1}$$

In case of continuous compounding,

$m \to \infty$

$$\boxed{i_{eff} = e^r - 1}$$

1 वर्षमा कतिचोटि compounding

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Semi anually ⇒ $m = 2$

quaterally ⇒ $m = 3$

(F ⇒ future , P ⇒ present)

$F = P(1+i)^N$ functional form $(F/P, i\%, N)$

$P = F(1+i)^{-N}$ functional form $(P/F, i\%, N)$

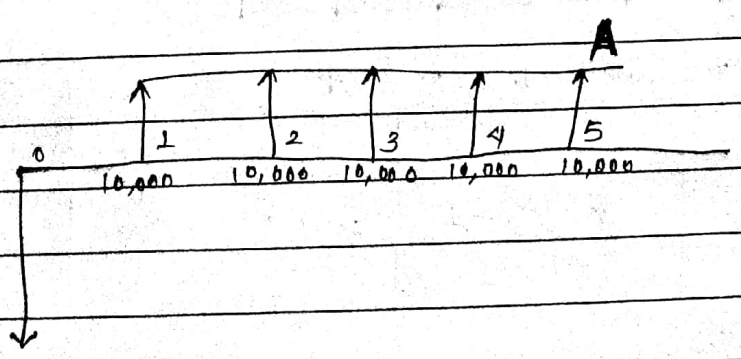
$= = A\left[\frac{(1+i)^N - 1}{i}\right]$ $(F/A, i\%, N)$

$A = F\left[\frac{i}{(1+i)^N - 1}\right]$ $(A/F, i\%, N)$

$P = A\left[\frac{(1+i)^N - 1}{i(1+i)^N}\right]$ $(P/A, i\%, N)$

$A = P\left[\frac{i(1+i)^N}{(1+i)^N - 1}\right]$ $(A/P, i\%, N)$

Annuity :⇒ प्रत्येक वर्ष equal amount मा payगर्ने



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Continuous compounding

$$F = P \cdot e^{rn}$$

$$F = A \cdot \frac{e^{rn} - 1}{e^{r} - 1}$$

$$P = A \cdot \frac{e^{rn} - 1}{e^{rn}(e^{r} - 1)}$$

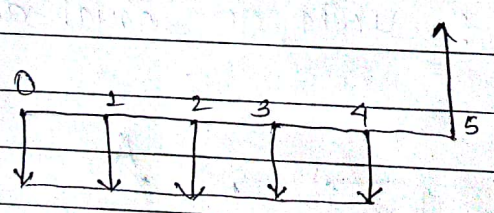
(Q.2) 2017

Calculate the future worth of the following cash flow, deposited at 8% compounded continuously for 5 year.

(i) RS 50,000 at the begining of each year

(ii) RS 50,000 at the end of each year

Soln → Note:- begining of each year मतलब 0 year मा pay गर्नुपर्ने



$$F = A \cdot \left[\frac{e^{rn} - 1}{e^{r} - 1} \right] * e^{r}$$

→ begining मध्ये यसै एउटा component थप्नु आउछ।

Given,

$n = 5$

$r = 0.08$

$A = 50,000$

$F = ?$

$$= 50000 \left[\frac{e^{0.08*5} - 1}{e^{0.08} - 1} \right] * e^{0.08}$$

$$= 50000 * 5.905 * 1.083$$

$$= 319755.75$$

$\therefore$ F = RS 3,19,755

(ii)

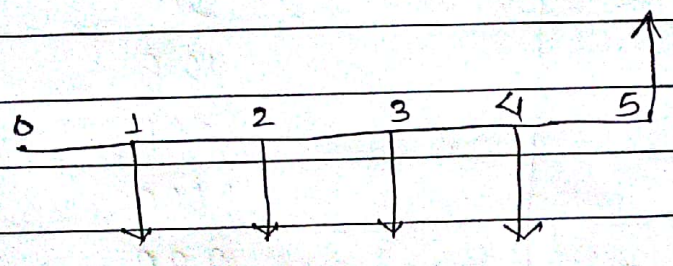


Fig: cash flow diagram

$$F = A \left[\frac{e^{rn} - 1}{e^{r} - 1} \right]$$

$$= 50000 \left[\frac{e^{0.08*5} - 1}{e^{0.08} - 1} \right]$$

$$= 50000 * 5.905$$

$$= 295250$$

$\therefore$ F = RS 2,95,250

2017

3(a) Evaluate the following project whose cash flows are given below. Use simple payback period, present worth and future worth method.

MARR is 10% per year

END of Year	Net Cash Flows (RS)
0	-600
1	-500
2	125
3	300
4	1000
5	220
6	320

Soln

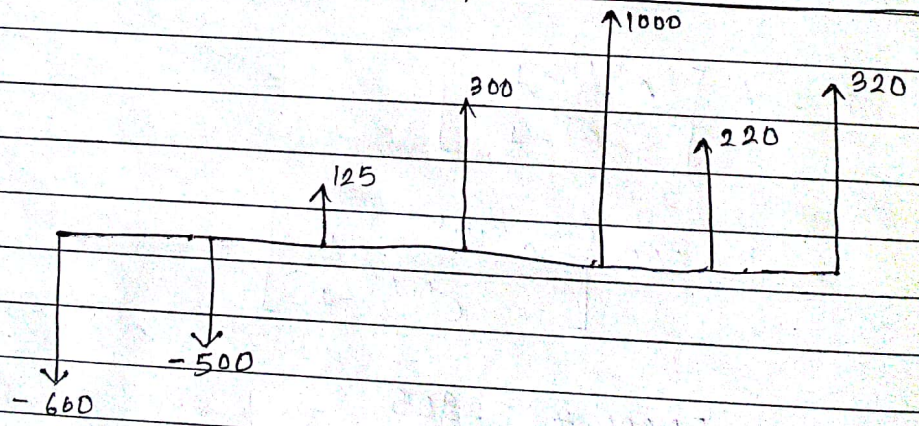


Fig: Cash flow diagram

MARR ⇒ Minimum Attractive Rate of Return

Note: 1 year पछिको 500 आहिलेको भएर यसलाई छुट्टै so divide [आहिलेको convert गर्न]

PW :- present worth

Given, $i = 10\% \Rightarrow 0.1$

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$$PW = -600 - \frac{500}{(1+i)^1} + \frac{125}{(1+i)^2} + \frac{300}{(1+i)^3} + \frac{1000}{(1+i)^4}$$

$$+ \frac{220}{(1+i)^5} + \frac{320}{(1+i)^6}$$

$$= 274 \quad //$$

Now, For future worth, FW

$$FW = -600(1+i)^6 - 500(1+i)^5 + 125(1+i)^4 + 300(1+i)^3 + 1000(1+i)^2 + 200(1+i)^1 + 320(1+i)^0$$

$$= 485 \quad //$$

OR

$$FW = PW * (1+i)^6$$

$$= 274 * (1+0.1)^6$$

$$= 485 \quad //$$

03-08-2017

Q) If you deposit Rs 2000 per months for two years, what will be the amount at end of 5 years if the bank interest rate is 3% percent in every 6 months.

Soln:

Given,

$A = 2000$

$i_{semi} = 3\% = 0.03$

$F_5 = ?$

$$i_{year} = (1 + i_{semi})^m - 1$$

$$= (1 + 0.03)^2 - 1$$

$$= 0.0609$$

$$i_{monthly} = (1 + i_{yearly})^{1/12} - 1$$

$$= (1 + 0.0609)^{1/12} - 1$$

$$= 0.0049$$

$$F_2 = 2000 \left[\frac{(1+i)^n - 1}{i} \right]$$

$$= 2000 \left[\frac{(1 + 0.0049)^{24} - 1}{0.0049} \right]$$

[∴ n = 24 2 years का monthly निकाला है]

$= Rs.50804$ //

$F_5 = ?$

$= 50804 (1 + 0.069)^3$

$= Rs\ 60662$ //

A man aged 40 years now had borrowed Rs. 5,00,000 from bank for his future study at the age of 20 years. Interest was changed at 11% per year compounded quaterly. He used to pay the loan in semi annual equal installment with first installment begining 5 years after receiving the loan. He has just cleared the loan now. What amount did he pay in each installment.

Given,

$P = Rs\ 5,00,000$

$A = ?$

$i_{quat} = \frac{i_{annual}}{4} = 0.0275 = 2.75\%$

$i_{semi} = (1 + i_{quator})^2 - 1$

$= (1 + 0.0275)^2 - 1$

$= 5.57\%$

Now let us find the future worth of Rs 500000 after 20 years.

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$$F = P(F/P, i\%, n)$$

$$= 500\,000(1+i)^n$$

$$= 500\,000(1+0.0557)^{40}$$

$$= 4371101$$

जम्मा amount = RS 4371101 //

Now,

$$4371101 = A\left[\frac{(1+i)^n - 1}{i}\right]$$

$$\Rightarrow 4371101 = A\left[\frac{(1+0.0557)^{30} - 1}{0.0557}\right]$$

[n = 30, 5 years पछि तिर्नुपर्ने 15 औ 2]

$\therefore$ A = RS 59,613 //

Q) Mr. X receives a loan of RS 1,20,000 from a bank at an interest of 12% per year. He wish to repay the loan in monthly installment with RS 3000 per month. How many installment are necessary to complete his payment.

Soln

$$i_{monthly} = (1 + i_{yearly})^{1/12} - 1$$

$$= (1+0.12)^{1/12} - 1$$

$= 0.00948$

$\Rightarrow 0.948\%$

$P = 120000$, $A = 3000$

$$P = A\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right]$$

$$120000 = 3000\left[\frac{(1+0.948)^n - 1}{0.948(1+0.948)^n}\right]$$

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Q) How many deposite of Rs 25000 each should Mr. A make each month so that the final accomulated amount will be Rs 10,00,000 in the bank, interest rate is 12% per year? [Ans 34]

Soln

Given,

$A = 25000$
$F = 10,00,000$
$i = 12\%$
$n = ?$

$i_{monthly} = (1 + i_{yearly})^{1/12} - 1$

$= (1.12)^{1/12} - 1$
$= 0.0094$
$= 0.94\%$

now,

$F = (F/A, 0.94\%, n)$

$\Rightarrow 1000000 = 25000 \left[\frac{(1+0.0094)^n - 1}{0.0094} \right]$

$\Rightarrow 40 = \left[\frac{(1.0094)^n - 1}{0.0094} \right]$

$\Rightarrow 0.376 = (1.0094)^n - 1$

$\Rightarrow 1.376 = (1.0094)^n$

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Taking log on both side

$$\log(1.376) = \log(1.0094)^n$$

$$0.1386 = n \log(1.0094)$$

$$\Rightarrow n = \frac{0.1386}{\log(1.0094)} = \frac{0.1386}{0.00406}$$

$$\therefore n = 34.137$$

Therefore, Mr. A must deposite 34 times. //

Q) If a finance company charges 0.5% per month interest on loan. what is the effective interest rate if,

(a) compounded yearly
(b) " quaterly
(c) " daily
(d) " continuously

Sol) We know that,

$$i_{eff} = (1+r)^m - 1$$

(a) compounded yearly,

$$i_{eff} = (1+0.005)^{12} - 1$$
$$= 0.0616$$
$$= 6.12\% \quad //$$

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(b) $i_{eff} = (1+0.005)^4 - 1$

$= 0.02$

$= 2\%$

(c) $i_{eff} = (1+0.005)^{1/30} - 1$

$= 0.0166\%$

(d) $i_{eff} = e^{r} - 1$ → this is yearly for continuous

$= e^{0.0616} - 1$

$= 0.0635$

$= 6.35\%$

Note: कोई भी नहीं बताई है interest rate yearly है।

Manufacturing cost	Non-Manufacturing cost
1. Manufacturing costs refer to those that are spent to transform materials into finished goods.	1. Non-manufacturing costs refer to those incurred outside the factory or production department.
2. The labour and material costs directly associated with a product or service or a construction activity.	2. This is the overhead cost which is the sum of indirect material cost, indirect labour cost and all other indirect expenses.
3. Manufacturing costs include direct materials, direct labor and factory overhead. • Direct materials: cost of item that form an integral part of the finished product. Example: paper in book, water in bottled drink. • Direct labor: cost of labor expended directly upon the materials to transform them into finished goods. example: salary of employees. • Factory overhead: cost of design and drawing, tax, insurance etc.	3. Non-manufacturing costs includes selling expenses and general expenses. • Selling expenses: also called selling and distribution expenses. Example: advertising costs, shipping and delivery cost. • General expenses: also called administrative expenses. example: executive salaries, legal expenses, research and development cost, training cost etc.

06-08-2017

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CH:4 \ CH:5

2018
Q.3(a) CH4
Q.3(b) CH5

Capital Budgeting (CB)

is the planning, evaluation and selection of capital proposal. It is the firm's formal process for the aquisition and investment of capital. CB is the process of planning and management of expenditure on long term assets. Following are the features of CB:

1. CB decisions are irreversible decision.
   ⇒ If decisions are reverted huge amount of money will be lost.
2. CB decision have long term effect on growth.
3. CB decision requires large amount of fund
4. CB decisions are complex.
5. CB decisions have national importance
6. CB decisions may change the risk position of the firm.

Techniques of Capital Budgeting

(a) Non - time adjusted techniques
(b) Time adjusted techniques

Non - time adjusted techniques

1. Average Rate of Return (ARR) method:
   ARR is the average annual yield on project.

- $\boxed{ARR}$

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$$ARR = \frac{\text{Average Annual Profit After Tax}}{\text{Average Investment}}$$

CFAT :- cash flow after tax

MARR : Minimum attractive Rate Of Return

Decision

Condition	Explanation	Decision
ARR ≥ MARR	Investment is excepted to increase the wealth/value of the project.	Accept
ARR < MARR	Investment is excepted to decrease the wealth/value of the project	Reject

The ranking of the project according to ARR method is done in such a way that the project with highest ARR is ranked as one and so on.

Merits and Demerits

Merits	Demerits
(1) Easy to understand and calculate	(1) Ignores the time value of money.
(2) consider the entire life-time profit / cash flow of the project	(2) There is no objective way to determine the MARR.
(3) Use the accounting data which are familiar to managers	

(2) Payback period method (PBP)

It is the period within which the entire cost of the project is excepted to completely recovered by the way of cash inflow.

Calculation of PBP

(a) When cash flows are even / Equal

$$PBP = \frac{\text{Initial Investment}}{\text{Annual cash inflow}}$$

(b) When C.F. are uneven

$$PBP = \text{minimum Year} + \frac{\text{Amount to recover}}{\text{Next year cash flow}}$$

Accept / Reject table

Decision

Condition	Explanation	Decision
PBP ≤ minimum Acceptable PBP	Investment is excepted to increase the value / wealth of the project	Accept
~~PBP~~ PBP > minimum Acceptable PBP	Investment is excepted to decrease the value / wealth of the project	Reject

The ranking of the project according to PBP method is done in such a way that the project with lowest PBP is ranked as 1 and so on.

Merits and Demerits

Merits	Demerits
(1) Easy to understand and calculate	(1) Ignores the time value of money.
(2) consider entire cash flow before PBP.	(2) Ignores the cash flow after PBP.
(3) Deals with Risk.	(3) It is not the measure of profitability
(4) It use cash flows rather than accounting data	(4) There is not the objective way to determine the minm acceptable PBP.

Cont...

Imp

Q) Point out the difference betn nominal and effective interest rate.

nominal ⇒ stated

effective ⇒ related with inflation and purchasing power money

RS 1000 → 10% ⇒ nominal rate of interest

after 1 year

1100

⇒ 1000 * 1.1

⇒ 1100

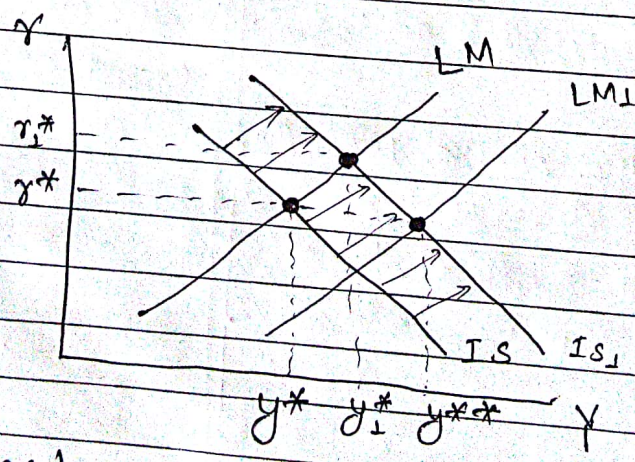
$$\left(1+\frac{r}{m}\right) = \left(1+\frac{10}{100}\right) = 1100$$

Inflation rate 20%

1000 * 1.2

⇒ 1200

$\boxed{r_{eff} = -10\%}$ अर्थात purchasing power घट गई।



IS and LM same रखना होता है।

IS ⇒ related to government (t, G)
(Investment Saving)

t → tax Rate of

G → Government expenditure (सरकारी खर्च)

IS

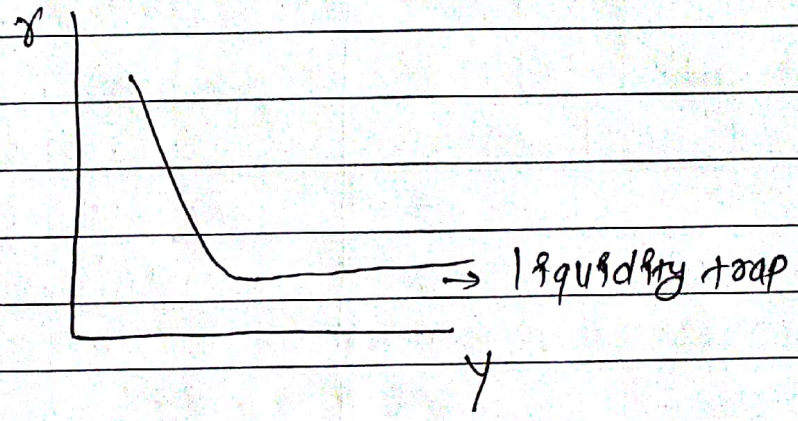
$\boxed{\text{Investment} = \text{Saving}}$

LM = Related to Central Bank

Tax ⇒ deprived sector

loan ⇒

$$r\uparrow \longrightarrow I\downarrow \longrightarrow S\uparrow \longrightarrow \underset{\text{no job}}{N\downarrow} \longrightarrow \underset{\text{aggregate Demand}}{AD\downarrow} \Rightarrow \text{surge inflation}$$



Q> Bank A offers 6.25% per year compounded daily but bank B offers 6.5% compounded monthly, which bank do you prefer, why?

Sol> For bank A,

$$r_{eff} = \left(1 + \frac{0.0625}{365}\right)^{365} - 1$$

$$= 6.448\ \%$$

$$\boxed{r_{eff} = \left(1 + \frac{r}{m}\right)^{m} - 1}$$

For bank B,

$$r_{eff} = \left(1 + \frac{0.065}{12}\right)^{12} - 1$$

$$= 6.697\%$$

$\therefore$ We prefer Bank B.

Note:

per year $\rightarrow$ daily $\Rightarrow$ m का value 365

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07-08-2017

Eg. There are two projects with initial investment Rs 5000

Year	A	B
1	1000	2000
2	2000	2000
3	3000	2000
4	1000	2000
5	1000	2000

Find ARR & PBP (simple PBP)

Soln Re-writing the above information,

end of year (EOY)	A	B	cumulative cash flow A	cumulative cash flow B
0	-5000	-5000	-5000	-5000
1	1000	2000	-4000	-3000
2	2000	2000	-2000	-1000
3	3000	2000	+1000	+1000
4	1000	2000	+2000	+3000
5	1000	2000	+3000	+5000

For project A

For uneven cash flow

$$PBP = \text{min}^m \text{ year} + \frac{\text{Amount to recover}}{\text{Next year cash flow}}$$

$$= 2 + \frac{2000}{3000}$$

$$= 2.667 \text{ year}$$

For project B

~~For uneven cash~~ flow

$$= 2 + \frac{1000}{2000}$$

$$= 2.5 \text{ year}$$

$$= \frac{5000}{2000}$$

$$= 2.5 \text{ year}$$

The project B has the min^m pay back period (PBP) so, B is ranked as first and project A is ranked second.

Now, For ARR

For project A

Average profit of project A $= \frac{1}{5}(1000 + 2000 + 3000 + 1000 + 1000)$

$$= 16000$$

Average Investment of project A =

$$= \frac{1}{2}(\underbrace{5000}_{\text{starting}} + \underbrace{0}_{\text{ending}})$$ [ending of investment]

$$= 2500$$

$$ARR = \frac{\text{Average annual profit}}{\text{average investment}}$$

$$= \frac{1600}{2500}$$

$$= 0.64$$

$$= 64\%$$

For project B,

Average profit of project B $= \frac{1}{5}(2000 + \ldots + 2000)$

$$= 2000$$

Average investment of project B

$= \frac{1}{2}(5000 + 0)$

$= 2500$

$ARR = \frac{2000}{2500}$

$= 0.8$

$= 80\%$

The project B

4 (b)

Q) What do you mean by payback period? Find the simple and discounted PBP and justify investment with following information.

Initial investment RS 4,00,000

Annual revenue RS 1,50,000

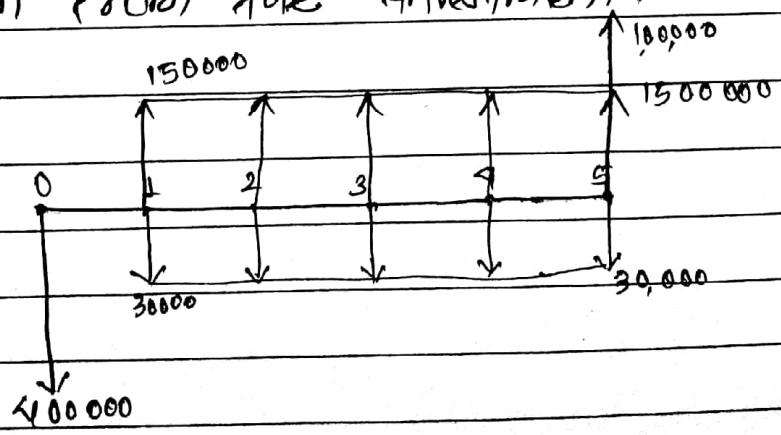
Annual cost RS 30,000

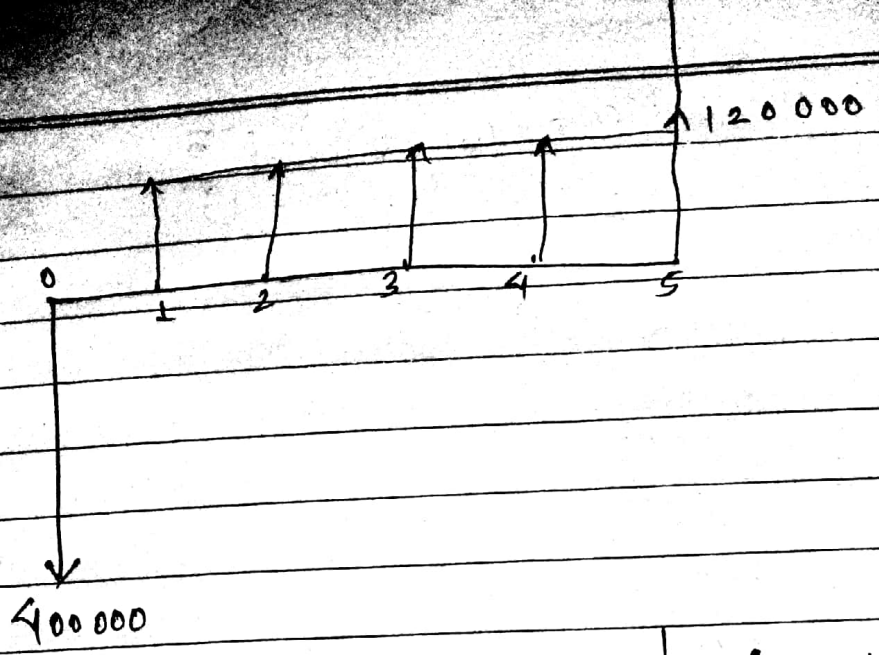
Salvage value RS 100 000

Useful life 5 year

MARR 10%

Sol → Payback period is defined as the time in year to return back from the investment.





Year	Normal cash flow	Cumulative cash flow
0	−400000	−400,000
1	120000	−280000
2	120000	−160000
3	120000	−40,000
4	120000	80,000
5	220,000	102,000

$$PBP = \text{min}^m \text{ year} + \frac{\text{Amount to recover}}{\text{Next year cash flow}}$$

$$= 3 + \frac{40000}{120000}$$

$$= 3.33 \text{ year}$$

09-08-2017

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Time adjusted Techniques: consider the time value of money

① Discounted payback period (DPBP):

It is the period within which the entire cost of the project is excepted to be recovered completely by the way of discounted cash inflows. Cash inflows means earning after tax but before depreciation. Discounted cash inflows means present value of cash inflows using cost of capital (COC) as the discount rate.

Calculation formula

Discounted payback period = min^m year + $\frac{\text{amount to recover}}{\text{present value of cash flow during the year (next year)}}$

The lower the DPBP, higher the chance to accept the project.

Decision

Condition	Explanation	Decision

While ranking the project, the project with shortest DPBP is ranked as one and so on.

Merits and Demerits

Merits	Demerits
- easy to understand and calculate.	- It ignores the cash flows occurring after the PBP.
- It emphasis the liquidity by considering earlier cash flows.	- There is no objective way to find the min^m (max^m) acceptable PBP.
- It deals with risk.	- It does not necessarily max^m the shareholders wealth.
- It use cash flow rather than accounting data.	- It does not measure the profitability of the firm/industry.

contd...

Year		Discounted CF
0	-4,00,000	$-400000 = -4,00000$
1	120 000	$120000/1.1 = 1,09,090$
2	120000	$120000/(1.1)^2 = 99,174$
3	120 000	$120000/(1.1)^3 = 90,157$
4	120000	$120000/(1.1)^4 = 81,961$
5	220000	$220000/(1.1)^5 = 1,36,602$

$$DPBP = 4 + \frac{19618}{136602}$$ → do not write negative

$= 4.1436$ year //

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② NPV (Net present Value) / present PW (present worth Method)

NPV technique is one of the discounted cashflow technique which takes into account the time value of money.

NPV refers to the difference betn PV of all cash inflows and PV (present value) of all cash outflows associated with the project.

$$NPV = \frac{CIF_1}{1+K} + \frac{CIF_2}{(1+K)^2} + \dots + \frac{CIF_n}{(1+K)^n} - \left[\frac{COF_1}{(1+K)^1} + \frac{COF_2}{(1+K)^2} + \dots + \frac{COF_n}{(1+K)^n}\right] - CF_0$$

Cumulative DCF
-4,00,000
-2,90,910
-191736
-101579
-19618
116984

$$= \frac{CIF_1 - COF_1}{(1+K)} + \frac{CIF_2 - COF_2}{(1+K)^2} + \dots + \frac{CIF_n - COF_n}{(1+K)^n} - CF_0$$

$$= \sum_{t=1}^{n} \frac{CIF_t - COF_t}{(1+K)^t} - CF_0$$

where,

[∵ CF_0 ⇒ cash outflow at zero year ⇒ negative]

K ⇒ Cost of capital, interest rate

n ⇒ no. of year of the project or life of project

CIF_t ⇒ cash inflow in t^{th} year

COF_t ⇒ cash outflow in t^{th} year

CF_0 ⇒ initial cash flow.

$$NPV/PW = -4,00,000 + \frac{120000}{(1.1)^1} + \frac{120000}{(1.1)^2}$$

$$+ \cdots + \frac{220000}{(1.1)^5}$$

$$NPV/PW = 1,16,984$$

Now its +ve so, project should be accepted.

IMP. compare NPV/PW

Merit Vs Demerits

Merits	Demerits
- It consider the time value of money.	- It involves difficult method of calculation.
- It consider the entire cash flow of the project.	- It requires calculation of cost of capital (COC), to be used as discounting rate.
- It is consistent with the objective of wealth maximization.	- It may not provide the satisfactory result incase of project having different lives.
- It is the measure of profitability of the firm.	- It is an absolute measure.

IF	It means	Decision
NPV > 0	The investment is expected to increase the share holder's wealth	accept the project
NPV < 0	The investment is expected to decrease the share holder's wealth	Reject the project
NPV = 0	The investment is not expected to change the share holder's wealth.	Indifferent

10-08-2017

IRR

It is discounted cash flow technique which takes into accounts the time value of money.

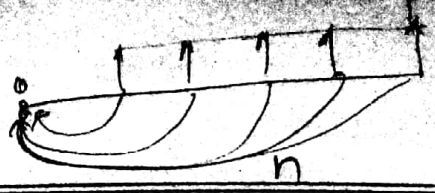
IRR refers to the rate at which the PV (present value) of cash inflows are equal to PV of cash outflows i.e. NPV = 0.

It is called IRR because the rate of return solely depends upon the cash inflows and outflows associated with project and not on any rate determine out side the project.

Mathematically

IRR

$$\frac{CIF_1}{1+K} + \frac{CIF_2}{(1+K)^2} + \cdots + \frac{CIF_n}{(1+K)^n} - \left[\frac{COF_1}{1+K} + \frac{COF_2}{(1+K)^2} + \cdots + \frac{COF_n}{(1+K)^n}\right] - CF_0 = 0$$



$$\sum_{q=1}^{n} \frac{CIF_n}{(1+k)^n} = \sum_{q=0}^{n} \frac{COF_n}{(1+k)^n}$$

$$NPV = -400000 + \frac{120000}{(1+q)} + \frac{1200000}{(1+q)^2} \ldots$$

OR

$$NPV = -400000 + 120000\left[\frac{(1+q)^5 - 1}{q(1+q)^5}\right] + \frac{100000}{(1+q)^5}$$

At IRR, NPV = 0

$$\frac{400,000}{\cancel{100000}} = 120000\left[\frac{(1+q)^5 - 1}{q(1+q)^5}\right] + \frac{100000}{(1+q)^5}$$

$$\Rightarrow \quad 0 = -40 + 12\left[\frac{(1+q)^5 - 1}{q(1+q)^5}\right] + \frac{10}{(1+q)^5}$$

18%
q = 19%
20%

Now doing Hit & Trial method

$\Rightarrow$

$$NPV_{18\%} = -40 + 12\left[\frac{(1+0.18)^5 - 1}{0.18(1+0.18)^5}\right] + \frac{10}{(1+0.18)^5}$$

$$= 18,971$$

$$NPV_{20\%} = -938.786$$

[Note: the one value must be +ve and other value must be -ve.]

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$$\boxed{\begin{aligned} NPV_{10\%} &= 11{,}698 \\ NPV_{20\%} &= -980 \end{aligned}}$$

Now, Interpolating

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$$

$$\boxed{\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}}$$ → Interpolation Formula

$$\Rightarrow \frac{NPV_{IRR} - NPV_{18\%}}{NPV_{20\%} - NPV_{18\%}} = \frac{IRR - 18\%}{20\% - 18\%}$$

$$\Rightarrow \frac{0 - 18971}{-938.786 - 18971} = \frac{IRR - 18\%}{2\%}$$

$$\Rightarrow +1.905 = IRR - 18$$

$$\Rightarrow IRR = 19.905\%$$

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Q) What are the drawback of IRR?

Q) Pokhara photocopy center is consider to purchase a new p/c machine, costing Rs 100 000 and expected sawage value of 30000 at the end of 10th year. The machine will save Rs 20000 by consuming electricity of Rs 6000 per year. Find IRR and interprete your result when MARR is 8%.

[Ans 9.5%]

→ Cashflow

→ MARR > IRR ✗ Rejected

→ MARR < IRR ✓ accepted

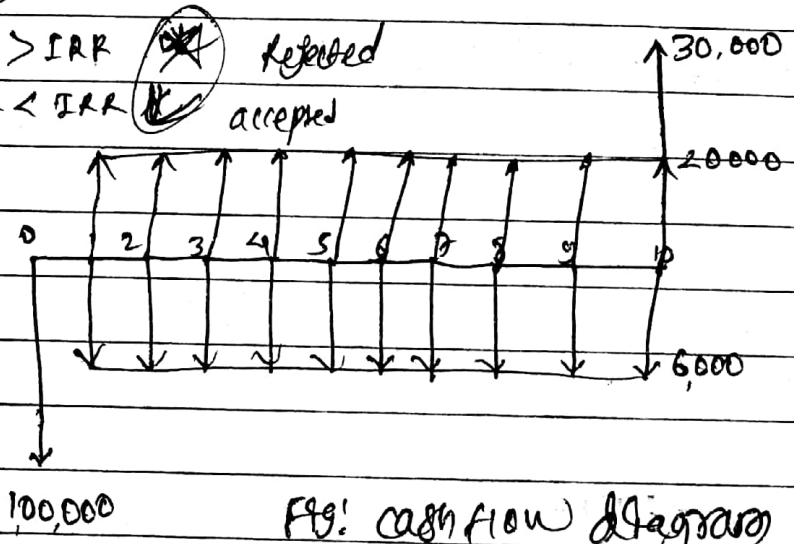

Fig: cash flow diagram

$$NPV = -100,000 + (20000-6000)\left[\frac{(1+i)^{10}-1}{i(1+i)^{10}}\right] + \frac{30000}{(1+i)^{10}}$$

AT IRR, NPV = 0

$$0 = -100000 + 14000\left[\frac{(1+i)^{10}-1}{i(1+i)^{10}}\right] + \frac{30000}{(1+i)^{10}}$$

Now doing hit and trial method

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NPV at 5%,

$$NPV_{5\%} = -100000 + 14000\left[\frac{(1+0.05)^{10}-1}{0.05(1+0.05)^{10}}\right] + \frac{30000}{(1+0.05)^{10}}$$

$$\boxed{NPV_{5\%} = 26521}$$

NPV at 15%

$$NPV_{15\%} = -100000 + 14000\left[\frac{(1+0.15)^{10}-1}{0.15(1+0.15)^{10}}\right] + \frac{30000}{(1+0.15)^{10}}$$

$$\boxed{NPV_{15\%} = -22321}$$

Now Interpolating,

$$\frac{NPV_{Rrr} - NPV_{5\%}}{NPV_{15\%} - NPV_{5\%}} = \frac{IRR - 5\%}{15\% - 5\%}$$

$$\Rightarrow \frac{0 - 26521}{-22321 - 26521} = \frac{IRR - 5\%}{10\%}$$

$$\Rightarrow 5.429\% = IRR - 5\%$$

$$\Rightarrow \therefore \boxed{IRR = 10.429\%}$$

NPV at 10%

$$NPV_{10\%} = -100000 + 14000\left[\frac{(1+0.10)^{10}-1}{0.10(1+0.10)^{10}}\right] + \frac{30000}{(1+0.10)^{10}}$$

$$\therefore \boxed{NPV_{10\%} = -2409.76}$$

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Now Interpolating,

$$\frac{0 - 26521}{-2409.76 - 26521} = \frac{IRR - 5\%}{10\% - 5\%}$$

$\therefore$ $\boxed{IRR = 9.58\%}$

Here IRR > MARR, Hence project is accepted.

$\boxed{11\text{-}08\text{-}2017}$

Accept Reject Rule

IF	This means	Decisions
IRR > K (COC) (MIRR)	Investment is expected to increase the shareholder wealth	Accepted
IRR < K (COC) (MIRR)	Investment is expected to decrease the shareholder wealth.	Reject
IRR = K	Investment is expected to not change the wealth	Indifferent (Do nothing)

Merits	Demerits
- It consider the time value of money	- Tedious and complicated trial and error calculation.
- It consider the entire cash flow associated with project	- Intermediate cash flows are assumed to reinvested which is not always true
- It is consistent with wealth maximization action	- It may produce multiple IRR

	- It may produce negative IRR - Does not hold value additive principle - Project with higher IRR may not be profitable.

Comparision betn NPV (PW) & IRR

(a) Similarities:

- Both method: (1) consider the time value of money.
  (2) considers all cashflow occuring in the project.
  (3) consistent with objective of wealth maximization.
  (4) Gives same decision in case of conventional investment
  (5) Project with positive NPV has also IRR > MARR

Imp

(b) Differences:

IRR	NPV
- Relative measure	- absolute measure
- Project return is measured in percent	- Project return is measured in Rs. (rupees)
- It assumes intermediate cash flows are re-invested at IRR.	- It assumes intermediate cash flows are re-invested at cost of capital.
- may yield negative result.	- may yield positive, negative or zero.
- One project might have multiple IRR.	- has only one NPV

Why NPV and IRR contracts their decision?

→ NPV and IRR contracts their decision. To prove this let us take following example:

	project A	project B
0	−1000	−1000
1	500	1000
2	400	300
3	300	400
4	100	6000

$$NPV_A = -1000 + \frac{500}{1+k} + \cdots \frac{100}{(1+k)^4} \quad \text{— (1)}$$

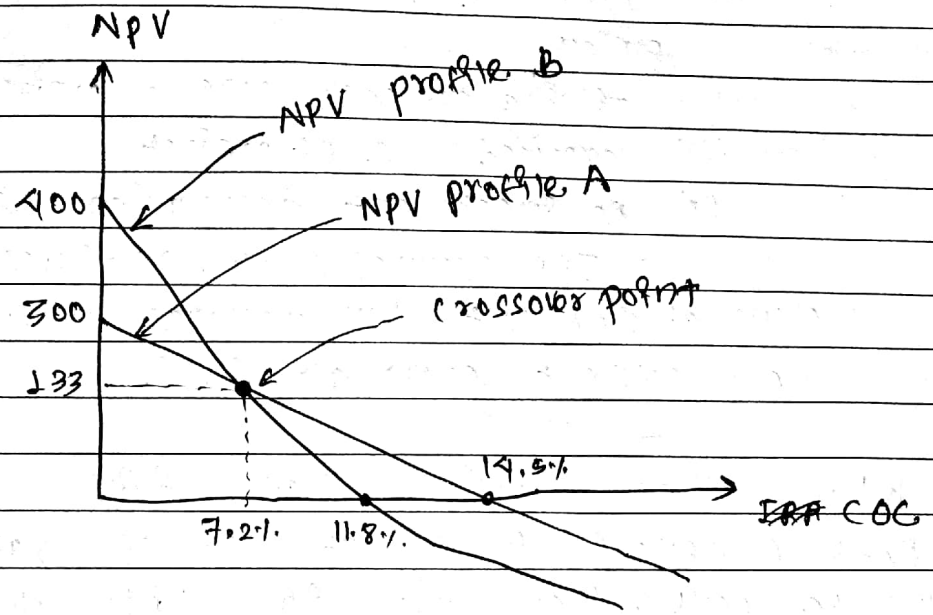
$$NPV_B = -1000 + \frac{100}{1+k} + \cdots \frac{600}{(1+k)^4} \quad \text{— (2)}$$

K %	NPV_A	NPV_B
0	300	400
5%	180	206
10%	78	49
15%	−8	−80

~~NOW for IRR~~

$NPV_A = 0$ at 14.5%

$NPV_B = 0$ at 11.8%



At the COC = 7.2%. the NPV of both project are equal, so this is called cross over rate.

(2) The fig. shows that NPV profile of both of the project slopes downward as COC increases. Project B has higher NPV before cross over point and project A has higher NPV after cross over point.

- If IRR technique is used,

$IRR_A > IRR_B$, select project A

- If NPV is used:

(a) before crossover point $NPV_B > NPV_A$

Select project B

(b) After crossover point $NPV_B < NPV_A$

select project A. which is consistent with IRR

Why this conflict arise:

- the conflict betn NPV and IRR exist due to difference in:

(i) estimated cash outflow of the project

(ii) Timing of cash flows of project

(iii) expected life of project

(iv) Re-investment assumption i.e.

- IRR assumes that, re-investment occur at IRR but NPV assumes that re-investment occur at C.O.C.

-

Why NPV is superior than IRR:

(1) Re-investment of funds at cut-off rate (COC) is more possible than at IRR, which at times may be very high.

(2) NPV method takes into accounts the scale of investment.

Conclusion:

Therefore NPV method using a fixed cut-off rate is more reliable in ranking two or more project than IRR.

13-08-2017

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MIRR (ERR) : Modified Internal Rate of Return

Major shortcomings of IRR :

The equation for calculation of IRR is,

$$\sum_{t=0}^{n} \frac{CF_t}{(1+r)^t} = 0 \quad \text{— (1)}$$

equation (1) is linear if $n=1$ but, in most case project life is greater than one year so, eqn (1) resolves more than one solution i.e. single project can have multiple IRR. To eliminate such limitation of IRR, MIRR / ERR is introduced.

MIRR is that rate at which the PV of project cost is equal to the PV of project terminal value. It is given by

$$\boxed{\text{PV of cost} = \frac{\text{FV of income}}{(1+\text{MIRR})^n}}$$

Note :

"Decision is same as IRR".

(लाभ) लागतों का कैसे सामना ।। एक year का अंतर Future का → फिर [illegible]

Merits	Demerits
- It considers the time value of money.	- Difficult calculation
- Gives the single correct answer.	- Gives wrong decision in case mutually exclusive project.
- It considers the entire cash flow occuring in the project life	
- It is consistent with the objectives of wealth maximization	

Difference betn IRR

IRR	MIRR
- It assumes that, intermediate CIFs are re-invested at IRR.	- It assumes that, intermediate CIFs are re-invested at COC.
- IRR may yield multiple or negative rate.	- MIRR does not give multiple rate.

Question set 2015 → 2017

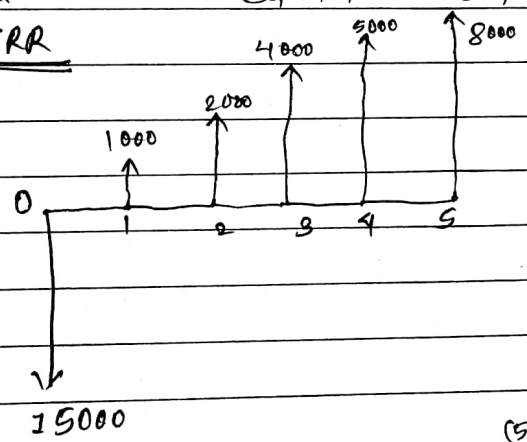
Q.

	Project A	Project B
0	-15000	-15000
1	1000	4000
2	2000	4000
3	4000	4000
4	5000	4000
5	8000	4000

Calculate the. ① Payback period (PBP)
② DPBP
③ NPV
④ IRR
⑤ MIRR

at cost of capital 10%. Also rank the project.

Sol^n For MIRR



$$-15000 = \frac{1000(1.1)^4 + 2000(1.1)^3 + \dots + 8000}{(1+MIRR)^5}$$

(5-1)

or, $-15000 = \frac{22466.1}{(1+MIRR)^5}$

or, $(1+MIRR)^5 = \frac{22466.1}{-15000} = -1.4977$

2016-Spring Q(a)

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(Q) What are the drawback of IRR? Evaluate the following project with the help of ERR for external re-investment rate 20% per year and MARR = 18% per year.

Initial investment = 400 000
Expected life = 8 Year
Salvage value = 3,20,000
Annual revenue = 50,000
Annual expenses = 1,60,000

(Q) Evaluate the following project with having cash flow with both type of B/C ratio.

Initial investment = 10,00,000
SV = 150000
AR = 1,90,000
A Expenses = 5000
MARR = 12%
project life = 12 year

	Conventional B/C Ratio	modified B/C Ratios
1. PW method	$\frac{PW(B)}{PW(I) - PW(S) + PW(O\&M)}$	$\frac{PW(B) - PW(O\&M)}{PW(I) - PW(S)}$
2. FW method	$\frac{FW(B)}{FW(I) - FW(S) + FW(O\&M)}$	$\frac{FW(B) - FW(O\&M)}{FW(I) - FW(S)}$
3. AW method	$\frac{AW(B)}{AW(I) - AW(S) + AW(O\&M)}$	$\frac{AW(B) - AW(O\&M)}{AW(I) - AW(S)}$

AW ⇒ Annual worth
FW ⇒ future worth
PW ⇒ Present worth
S ⇒ Salvage value, B = Benefits
I ⇒ Investment

$$\boxed{B/C = \frac{PW(B)}{PW(C)}}$$

If, $B/C \geq 1 \Rightarrow$ Accept project

$B/C < 1 \Rightarrow$ Reject project

PW method → B এর 3000 year এর মোট discounted
S এর " " "
(annual expenses) O&M " " " " "
I ⇒ do nothing

Q) Find the B/C ratio using PW, FW and AW method.

I = 90,000
AR = 50,000
A. Cost = 2000
S.V = 20,000
MARR = 12%
Life = 10 year

PW(I) = 90000
A. cost ⇒ PW(O&M) = 2000 (P/A, 12%, 10) ⇒ 11,300

PW(B) = 50000 (P/A, 12%, 10) ⇒ 282,510

PW(SV) = 20,000 (P/F, 12%, 10) ⇒ 6440

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$$PW(O\&M) = 2000 * \left[\frac{(1.12)^{10} - 1}{0.12\,(1.12)^{10}} \right] = 11300$$

Now,

$$B/C = \frac{PW(B)}{PW(I) + PW(O\&M) - PW(S.V)}$$

(खर्च +, आमदानी −)

$$= \frac{282,510}{90000 + 11300 - 6440}$$

$\therefore B/C = 2.97$ which > 1 so Accepted

Modified B/C

$$\frac{282510 - 11300}{90000 - 6440}$$

$\therefore B/C = 3.24$ which is > 1 so Accepted

16-08-2017

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IMP

Given the following data

	A	B
Initial Investment	350,000	5,00,000
Annual Revenue	1,30,000	~~5,00,000~~ 175000
Annual cost	15000	25000
S.V.	35000	50 000
Useful life	5 year	8 year
MARR	10%	

note: same year हो; NPV or IRR, PBP से decide होगा but

Select the best alternative betn these two using: ① repeatability assumption
② core termination assumption when study period is 8 years.
③ core termination assumption when study period is 5 years.

repeatability :- 1 cycle लिये & repeat करो [Revenue +, cost −]

1)

→ 8 times repeat करेंगे

0	5	10	15	20	25	30	35	40
A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	

initial investment

$$PW_A = -3,50,000\left[1 + \frac{1}{(1.1)^5} + \dots + \frac{1}{(1.1)^{35}}\right] +$$

(150000)

Note :- 40 वर्ष कोलाई नलिने (we do not invest on last year)

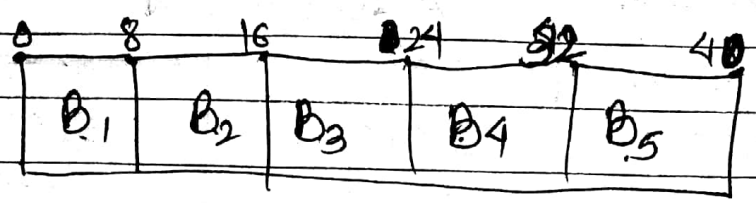
$$1,15,000\left[\frac{(1.1)^{40}-1}{0.1 * (1.1)^{40}}\right] + 35000\left[\frac{1}{1.1^5} + \dots \frac{1}{(1.1)^{40}}\right]$$

investment 0 हुन्छ, salvage V. एउटा मा आउने भएकोले लगत हाल्ने गरिने

PW_A

Ans [2,77,762]

For project B,



$$PW_B = -500000\left[1 + \frac{1}{(1.1)^8} + \cdots + \frac{1}{(1.1)^{32}}\right]$$

$$+ 150,000\left[\frac{1.1^{40} - 1}{0.1 * 1.1^{40}}\right] +$$

$$50,000\left[\frac{1}{1.1^8} + \cdots \frac{1}{1.1^{40}}\right]$$

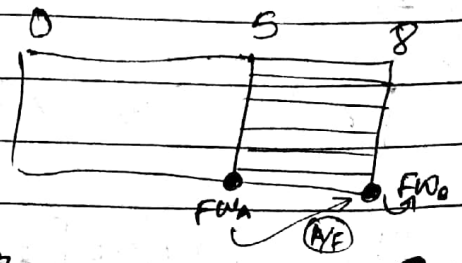
$$\Rightarrow \boxed{\text{Ans } 593103}$$

PW_B is greater than PW_A, therefore project B is selected.

Ans (2)

$FW_B = ?$

$FW_A = ?$



$$FW_B = -500000(1.1)^8 + 150,000\left(\frac{(1.1)^8 - 1}{0.1}\right)$$

$$+ 50,000$$

$$= 6,93,588$$

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$$FW_A = \left[-350,000(1.1)^5 + 115,000\left(\frac{1.1^5 - 1}{0.1}\right) + 35,000 \right] * (1.1)^3$$

3 years extend করার জন্য

$$= 2,30,806$$

Here, $FW_B > FW_A$, therefore project B is accepted.

Ans 3 Calculate Imputed market value (IMV) :- salvage value থাকলে সেই গুলো study period শেষে।

Here,

$$IMV = \left[500,000 \left[\frac{0.1 * 1.1^8}{1.1^8 - 1} \right] - 50000 * \frac{0.1}{1.1^8 - 1} \right] * \left[\frac{1.1^3 - 1}{0.1 * 1.1^3} \right]$$

3 years পর amount এর add এর amount to future 3 years

$$IMV = \left[I\left[A/P, 9\%, N\right] - S.V\left(A/F, 9\%, N\right) * \left(P/A, 9\%, n\right) \right]$$

annuity এর equivalent (প্রতি বছর এর মান কত)

$$IMV = \left[I\left[A/P, 9\%, N\right] - S.V\left(A/F, 9\%, N\right) \right] * \left(P/A, 9\%, n\right)$$

$$= 2,22,199$$

Now,

$$FW_B = -500,000\left[1.1\right]^5 + 150,000 * \frac{(1.1)^5 - 1}{0.1 * (1.1)^5} + \frac{50000}{(1.1)^3} + IMV(A) \rightarrow 2,22,199$$

SV এর পরে 3 years এর equivalent

$$= 2,50,827$$

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$$FW_A = -3,50,000\,(1.1)^5 + 115000\left(\frac{1.1^5 - 1}{0.1}\right) + 35000$$

$=$

35,000

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Incremental Analysis:

(1) In case of comparing more than two alternatives the following steps are necessary for incremental analysis:

(i) List all project in order of increasing capital/investment.

(ii) Calculate the IRR of 1st project and check if IRR > MARR or not.

(iii) Repeat step (ii) for all project.

(iv) Go for incremental analysis.

(v) Select base project and subtract one project from base project and calculate ΔIRR. And check whether ΔIRR > MARR. If so leave base project and choose the another base project.

(vi) Repeat step (v) for all project.

Decision:

(vii) – If ΔIRR > MARR, choose the higher cost alternative.

– If ΔIRR < MARR, choose the lower cost alternative.

Q7 Use IRR method to select the best project. MARR = 15%. [Use incremental analysis if necessary]

Projects	A	B	C	D	B-A
I	10000	15000	27000	20000	5000
Annual income	5000	7000	12000	9000	2000
Useful life	4	4	4	4	4
S.V.	2500	5000	8000	10,000	2500

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Step 1:

$$IRR_A = -10000 + 5000\left[\frac{(1+i)^4-1}{i(1+i)^4}\right] + \frac{2500}{(1+i)^4}$$

note: [illegible] use hit and trial

$IRR_A = 39.38\%$

$IRR_A > MARR$

Similarly,

$$IRR_B = -15000 + 7000\left[\frac{(1+i)^4-1}{i(1+i)^4}\right] + \frac{5000}{(1+i)^4}$$

$IRR_B = 36.95\%$

$IRR_B > MARR$

$$IRR_C = -27000 + 12000\left[\frac{(1+i)^4-1}{i(1+i)^4}\right] + \frac{8000}{(1+i)^4}$$

$= 33.7\%$

$IRR_D =$

$= 37.82\%$

IRR বের করে project A select করা হবে

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Step 2:
Incremental analysis

Take 'A' as a base alternative $\Rightarrow (B-A)$

now,

$$IRR_{(B-A)} = -5000 + 2000\left[\frac{(1+i)^4-1}{i(1+i)^4}\right] + \frac{2500}{(1+i)^4}$$

0.3 — 0.35 (30%) (35%)

$IRR_{(B-A)} = 32.25\%$

$IRR_{(B-A)}$

Since $IRR_{B-A} > MARR$, so A is removed from base alternative.

Now, take 'B' as the base alternative, $= C-B$

C-B
12000
5000
4
3000

$IRR_{(C-B)} = 29.78\%$

Here, $IRR_{(C-B)} > MARR$, so B is removed from base alternative

A B D C

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Removing 'B' as base alternative and taking 'D' as base alternative.

C-D
7000
3000
4
-2000

$$IRR_{(C-D)} = -7000 + 3000\left[\frac{(1+i)^4-1}{i(1+i)^4}\right]$$

$$IRR_{(C-D)} = 18.31\%$$

$IRR_{(C-D)} > MARR$, so, it is justified so select project C.

justified hai

NOTE:
If, $IRR_{(C-D)} = 5\%$
justified nhi so take lower cost.
So select project D

Q) Select which project is feasible to invest among two following alternative project, whose cash flows are as follow. MARR is 12% per year. Use IRR method and incremental analysis if necessary.

Projects	A	B
I	6,50,000	5,00,000
Annual income	2,50,000	2,00,000
Annual cost	50,000	40,000
S.V	75,000	50,000
Useful life	8 year	8 year

Step 1

Sol: Here, arranging in ascending order.

projects	B	A	A-B
I	650000	500000	150,000
Annual income	250000	200000	50,000
Annual cost	50000	40000	10,000
S.V	75000	50000	25,000
Useful life	8 year	8 year	8 year

$$IRR_B = -500,000 + 160,000\left[\frac{(1+i)^8-1}{i(1+i)^8}\right] + \frac{50000}{(1+i)^8}$$

Here, AT IRR, NPV = 0

$$0 = -500,000 + 160000\left[\frac{(1+i)^8-1}{i(1+i)^8}\right] + \frac{50000}{(1+i)^8}$$

Now doing hit and trial method

NPV at 26%

$$NPV_{26\%} = -500,000 + 160000\left[\frac{(1+0.26)^8-1}{0.26(1+0.26)^8}\right] + \frac{50000}{(1+0.26)^8}$$

$$\boxed{NPV_{26\%} = 26386}$$

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NPV at 28%

$$NPV_{28\%} = -500,000 + 1,60,000\left[\frac{(1+0.28)^8 - 1}{0.28(1+0.28)^8}\right] + \frac{50000}{(1+0.28)^8}$$

$$\boxed{NPV_{28\%} = -934}$$

Now inter polating,

$$\frac{NPV_{IRR} - NPV_{26\%}}{NPV_{28\%} - NPV_{26\%}} = \frac{IRR - 26\%}{28\% - 26\%}$$

$$\Rightarrow \frac{0 - 26386}{-934 - 26386} = \frac{IRR - 26\%}{2\%}$$

$$\Rightarrow IRR = 26\% - \frac{52772}{(-27320)}$$

$$\Rightarrow IRR = 26\% + \frac{52772}{27320}$$

$\therefore$ IRR = 27.93 %

Here $\boxed{IRR_8 > MARR}$

Similarly,

For project A,

$$NPV = -650000 + 2,00,000\left[\frac{(1+i)^8 - 1}{i(1+i)^8}\right] + \frac{75000}{(1+i)^8}$$

At IRR, NPV = 0, so

$$0 = -650000 + 200000\left[\frac{(1+i)^8 - 1}{i(1+i)^8}\right] + \frac{75000}{(1+i)^8}$$

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Now using hit and trial method

NPV at 25%.

$$NPV_{25\%} = -650,000 + 200,000\left[\frac{(1+0.25)^8-1}{0.25(1+0.25)^8}\right] + \frac{75000}{(1+0.25)^8}$$

$$\boxed{NPV_{25\%} = 28365}$$

NPV at 27%

$$\boxed{NPV_{27\%} = -7632}$$

Now interpolating,

$$\frac{0-28365}{-7632-28365} = \frac{IRR-25\%}{27\%-25\%}$$

or, $$\frac{-28365}{-35997} = \frac{IRR-25\%}{2\%}$$

or, $$IRR = 25\% + \frac{56730}{35997}$$

$$\therefore IRR_A = 26.57\%$$

Here $\boxed{IRR_A > MARR}$

now

$$IRR_{(A-B)} = -150000 + 40000\left[\frac{(1+r)^8-1}{r(1+r)^8}\right] + \frac{25000}{(1+r)^8}$$

At IRR, NPV = 0

$$NPV = -150000 + 40000\left[\frac{(1+r)^8-1}{r(1+r)^8}\right] + \frac{25000}{(1+r)^8}$$

$$0 = -150000 + 40000\left[\frac{(1+r)^8-1}{r(1+r)^8}\right] + \frac{25000}{(1+r)^8}$$

Now using hit and trial method

NPV at 20 %

$$NPV_{20\%} = -150000 + 40000\left[\frac{(1+0.2)^8-1}{0.2(1+0.2)^8}\right] + \frac{25000}{(1+0.2)^8}$$

$$\boxed{NPV_{20\%} = 9300}$$

NPV at 22 %.

$$NPV_{22\%} = -150000 + 40000\left[\frac{(1+0.22)^8-1}{0.22(1+0.22)^8}\right] + \frac{25000}{(1+0.22)^8}$$

$$\boxed{NPV_{22\%} = -185}$$

now, performing interpolation,

$$\frac{0 - 9300}{-135 - 9300} = \frac{IRR - 20\%}{22\% - 20\%}$$

or, $$\frac{-9300}{-9435} = \frac{IRR - 20\%}{2\%}$$

or, $$IRR = 20\% + \frac{18600}{9435}$$

$$\therefore \boxed{IRR_{(A-B)} = 21.97\%}$$

Here, $\boxed{IRR_{(A-B)} > MARR}$ so it is justified,

Select project A.

Ans (2a)

What are the drawback of IRR? Evaluate the following project with the help of ERR for external re-investment rate 20% per year and MARR = 18% per year.

Initial investment = 4,00,000
Expected life = 8 years
Salvage value = 3,20,000
Annual revenue = 50,000
Annual expenses = 1,60,000

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(2) Compute the base project using ERR.

Assumptions → E = 14% & MARR = 20%.

EOY	A	B
0	-6,400	-7,500
1	2620	2050
2	2900	4046
3	3020	4000
4	3100	3900
5	3100	3900
6	2600	3400

Outflow - zero
Inflow → 6th year

Sol^n MARR [illegible] ERR [illegible] given (E) → ERR

① Discounting all CoFs on zero year.

For project A,

$$= 6400 + \frac{2620}{(1.14)^1} + \frac{2900}{(1.14)^2} + \frac{3020}{(1.14)^3} + \frac{3100}{(1.14)^4} + \frac{3100}{(1.14)^5} + \frac{2600}{(1.14)^6}$$

$$= 6400$$

Compounding all CF on 6th year.

$$= 2600 + 3100(1.14)^1 + 3100(1.14)^2 + 3020(1.14)^3 + 2900(1.14)^4 + 2620(1.14)^5$$

$$= 24579$$

[note :- -ve [illegible] neglate [illegible]

Now,

$$6400 = \frac{24579}{(1+ERR)^6}$$

$\Rightarrow$ 25%.

CAPITALIZED Worth Method (CW):

"Same as AW"

$$CW = \frac{AW}{i}$$

Some times the project life is very high i.e. infinite in such case, we use capitalized worth method. It is the present worth of project which lasts forever. It is mostly used in public sector project i.e. bridge, dam, irrigation, road etc. It is also called the capital cost method. It is obtained when AW is divided by interest rate. i.e.

$$CW = \frac{AW}{i}$$

Assume infinite project life recommend the best project from following project:

	A	B
Initial Investment	50,000	1,20,000
S.V	10,000	10,000
Annual Cost (A.C.)	9000	6000
n (time)	10	25
MARR	15%	15%

Ans $AW_A = -18,478$

Sol: I.I, S.V and annual are equal

$$P = A \frac{(1+i)^n - 1}{i(1+i)^n}$$

$$F = A\left[\frac{(1+i)^n - 1}{i}\right]$$

$$A = P \cdot \frac{i(1+i)^n}{(1+i)^n}$$

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now,

$$AW_A = -9000 + 10,000 \left[\frac{0.15}{(1.15)^{10}-1} \right] - 50,000 * \frac{0.15 * (1.15)^{10}}{(1.15)^{10}-1}$$

A/F → A/P

$$= -18,472$$

now,

$$CWA = \frac{AW_A}{i} = \frac{-18472}{0.15}$$

$$= -1,23,133$$

Again for project B,

$$AW_B = -6000 + 10000 \left[\frac{0.15}{(1.15)^{25}-1} \right] - 120000 * \frac{0.15 * (1.15)^{25}}{(1.15)^{25}-1}$$

~~-24,517~~

$$AW_B = -24516$$

$$CW_B = \frac{AW_B}{i} = \frac{-24516}{0.15}$$

$$= -1,63,446$$

Since, $CW_A < CW_B$ so, project A is selected //

(सभी -ve में हैं) //

CAPITALIZED Worth Method (CW):

"Same as AW"

$$CW = \frac{AW}{i}$$

Some times the project life is very high i.e. infinite in such case, we use capitalized worth method. It is the present worth of project which lasts forever. It is mostly used in public sector project i.e. bridge, dam, irrigation, road etc. It is also called the capital cost method. It is obtained when AW is divided by interest rate. i.e.

$$CW = \frac{AW}{i}$$

Assume infinite project life recommend the best project from following project:

	A	B
Initial Investment	50,000	1,20,000
S.V	10,000	10,000
Annual Cost (A.C.)	9000	6000
n (time)	10	25
MARR	15%	15%

Ans $AW_A = -18,4$

Sol^n I.I, S.V और annual को लगाएंगे

$$P = A \frac{(1+i)^n - 1}{i(1+i)^n}$$

$$F = A\left[\frac{(1+i)^n - 1}{i}\right]$$

$$A = \frac{P \cdot i(1+i)^n}{(1+i)^n}$$

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now,

$$AW_A = -9000 + 10,000 \overset{A/F}{\left[\frac{0.15}{(1.15)^{10}-1}\right]} -$$

$$50,000 * \frac{0.15 * (1.15)^{10}}{(1.15)^{10}-1} \rightarrow A/P$$

$$= -18,472$$

now,

$$CWA = \frac{AW_A}{i} = \frac{-18472}{0.15}$$

$$= -1,23,133$$

Again for project B,

$$AW_B = -6000 + 10000 \left[\frac{0.15}{(1.15)^{25}-1}\right] -$$

$$120000 * \frac{0.15 * (1.15)^{25}}{(1.15)^{25}-1}$$

~~-24,517~~

$$AW_B = -24516$$

$$CW_B = \frac{AW_B}{i} = \frac{-24516}{0.15}$$

$$= -1,63,446$$

Since, $CW_A < CW_B$ so, project A is selected //

(सभी -ve में हैं तो) //

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project

A project is one time one shot of activities to deliver unique product or service. It is temporary effort. It has time, cost and quality as constraints / limitation. It has following types:

① Dependent project:

A project is said to be dependent if selection / rejection of one project is affected by selection / rejection of another project. It can be classified as:

For the acceptance of one project, the another project must be accepted. Example: to construct dam we must have to accept of project of water tunnel.

(i) Contingent project:

Suppose we have 3 project; A, B and C, where A is contigent on the acceptance of both B and C, and C is contigent on the acceptance of B, then following condition can be developed.

combinations	A	B	C	Explanation
1	0	0	0	Do nothing
2	0	1	0	Accept B
3	0	1	1	B & C
4	1	1	1	A, B & C

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(ii) Mutually exclusive project:

Those project are mutually exclusive project, if the selection of one alternative reject the another alternative. Example:

Suppose we have 3 mutually exclusive project A, B and C. Then following combination can be made.

Combinations	A	B	C	Explanation
1	1	0	0	Accept A
2	0	1	0	Accept B
3	0	0	1	Accept C

(iii) Independent project:

The acceptance and rejection of one project is not dependent with another project.

H.W.

Q) Some engineering project are being considered as following cash flows. Estimation over four year as shown in table below. Determine what combination of project is best if the capital to invest is (a) unlimited (b) limited to Rs. 50,000 by using PW method and MARR = 10% per year.

projects	B_1	B_2	C_1	C_2	D
Initial Investment (I)	50,000	30,000	14,000	15,000	10,000
A.R.	20,000	12,000	4,000	5,000	6,000
B_1 & B_2	mutually exclusive				
C_1 & C_2	mutually exclusive & contingent on the acceptance of B_2				
D	contingent on the acceptance of C_1 & B_2				

Sol^n First, lets calculate the PW of all the project

For project B_1

$PW_{B_1} = 13,4000$

$PW_{B_2} = 8038$

$PW_{C_1} = -1320$

$PW_{C_2} = 850$

$PW_D = 9020$

$PW_{B_1} = -50,000 + 20,000\left(\frac{1.1^4 - 1}{0.1 * 1.1^4}\right)$

$= 13,4000$

⇒

Combination	B_1	B_2	C_1	C_2	D
1	0	0	0	0	0
2	1	0	0	0	0
3	0	1	0	0	0
4	0	1	1	0	0
5	0	1	0	1	0
6	0	1	1	0	1

Years

CF

Combination	0	1	2	3	4	$PW_{10\%}$
1	0	0	0	0	0	0
2	-50,000	20000	20000	20000	20000	13,400
3	-30,000	12,000	12,000	12,000	12,000	8,038
4	-44,000	16,000	16,000	16000	16000	6717
5	-45000	17000	17000	17000	17000	8890
6	-54000	22,000	22000	22000	22000	15740

Decision :

(i) Case 1 :

If the fund is unlimited then combination 6 is accepted.

(ii) Case 2 :

If the fund is limited to 50,000 then we select the combination 2.

[**note :** यदि same fund आपको अब PW देनी है decision लिखो]

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CH - 6

Risk Analysis

1. Sensitivity Analysis
2. Breakdown Analysis
3. Scenario Analysis (Decision Tree Analysis)

"We can not control the wind, but we can direct the sail".

Risk can be defined as hinderance of obstacles to achieve the objective. It plays the role both zero and one i.e. the cases zero and one are certain cases. So there is no risk.

Certainty —— Uncertainty
0, 1
↑
Risk

Risk is the intermediate case betn certainty and uncertainty in which we can assign the probability to the possible outcomes.

The safest place for ship is harvor but that is not what ships are for. The main objective of ship is to carry goods from one harvor to another so the obstacles which occur in achieving these objectives are risk.

Q) Perform Sensitivity analysis of the following project over the range of ±40% (±20%) if not given:

(a) Initial investment (I)
(b) Net annual revenue
(c) Salvage value
(d) Useful life

⇒ I = 11,500
Net annual revenue (A.R.) = 3000
S.V = 1000
Useful life (n) = 6 years
MARR = 10%

Soln

Here,

$$PW = -11500 + 3000\left(\frac{(1+i)^N - 1}{i(1+i)^N}\right) + \frac{1000}{(1+i)^N} \quad \text{— (1)}$$

(a) sensitivity analysis w.r.t Initial investment (I)

$$PW = -11,500(1+R\%) + 13630 \quad \text{— (a)}$$

taking ve 40%

$$= -11500(1+(-.4)) + 13630$$

$$= 6730$$

R%	PW
-40%	6730
-20%	4430
0%	2130
20%	-170
40%	-2470

better 1 ओर की range
मतलब
$f(x) = -0.4$ to 0.4
step 0.2

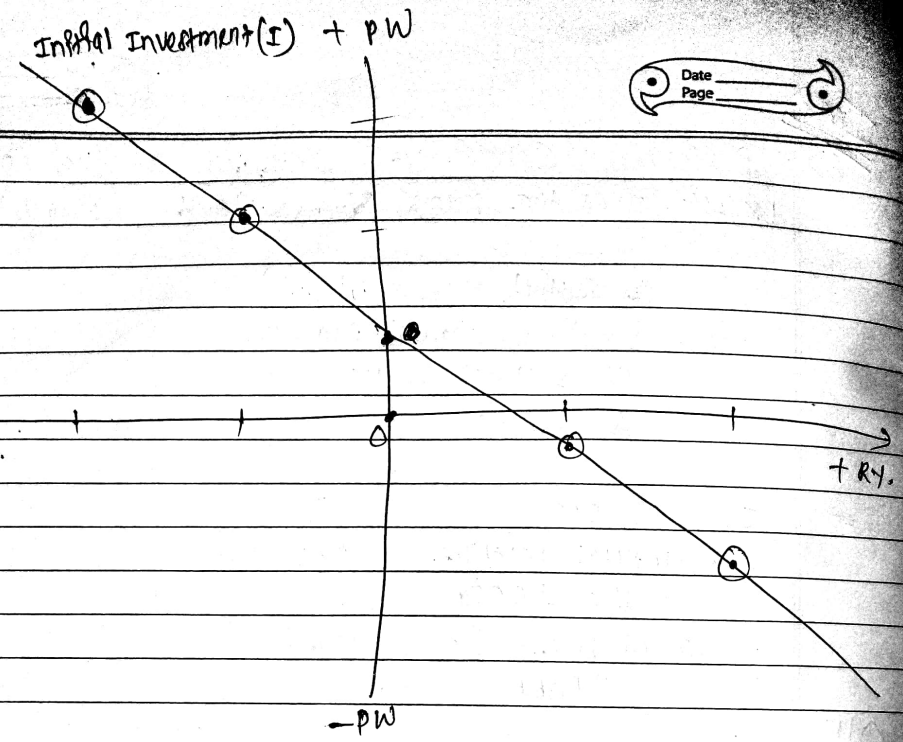

fig: Sensitivity analysis using Initial Investment (I)

(b) <u>Net annual Revenue</u>

144405 $$PW = -11500 + 3000\left[\frac{(1+i)^N - 1}{i(1+i)^N}\right](1+R\%) + \frac{1000}{(1+i)^N}$$

64405
54405
44405
34405
24405

$$= -11500 + 3000\left[\frac{(1+i)^N - 1}{i(1+i)^N}\right](1+R\%) + \frac{1000}{(1.1)^6}$$

$$= -10935 + 3000\left[\frac{(1+i)^N - 1}{i(1+i)^N}\right](1+R\%)$$

R%	PW
-40%	~~2130.7~~ -3095
-20%	2 -482.3
0%	2130.7
20%	4743.9
40%	7357

(c) ~~Salvage Value~~ Useful life

$$PW = -11500 + 3000\left[\frac{(1+i)^{N(1+R\%)} - 1}{i(1+i)^{N(1+R\%)}}\right] + \frac{1000}{(1+i)^{N(1+R)}}$$

(d) Salvage Value

$$PW = -11500 + 3000\left[\frac{(1+i)^{N} - 1}{i(1+i)^{N}}\right] + \frac{1000}{(1+i)^{N}}(1+R\%)$$

HW

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Q) Perform the sensitivity using PW, AW and FW method for

(a) Initial investment
(b) Net annual revenue
(c) Useful life
(d) Salvage value

and draw the graph (choose the suitable range that you prefer)

Given,

Initial investment	1,00,000
AR.	40,000
Annual expenses	5000
SV.	1000
life	6 years
MARR	12%

Q. 2) What are the major techniques to analysis the risk. Explain them in brief.

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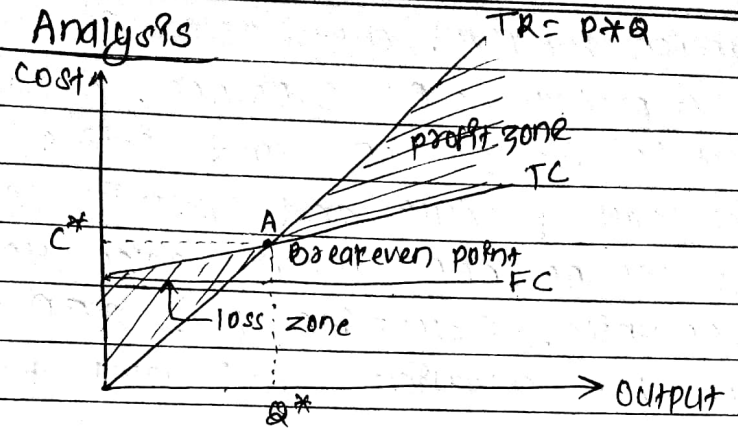
Break even Analysis



~~Consider the following two machines motors each of 100hp output capacity~~

It is the technique in which the break even quantity (that quantity output) at which there is neither loss or nor profit).

At breakeven point total revenue is equal to the total cost.

$$TR = TC$$
$$P*Q = TFC + TVC$$
$$P*Q = TFC + Q*V$$

$$\boxed{Q = \frac{TFC}{P-V}}$$

where, 'Q' is the breakeven quantity output.

TFC = total fixed cost
TVC = " variable cost
TR = Total revenue
TC = Total cost
P = SPPU (selling price per unit)
V = VCPU (variable cost per unit)

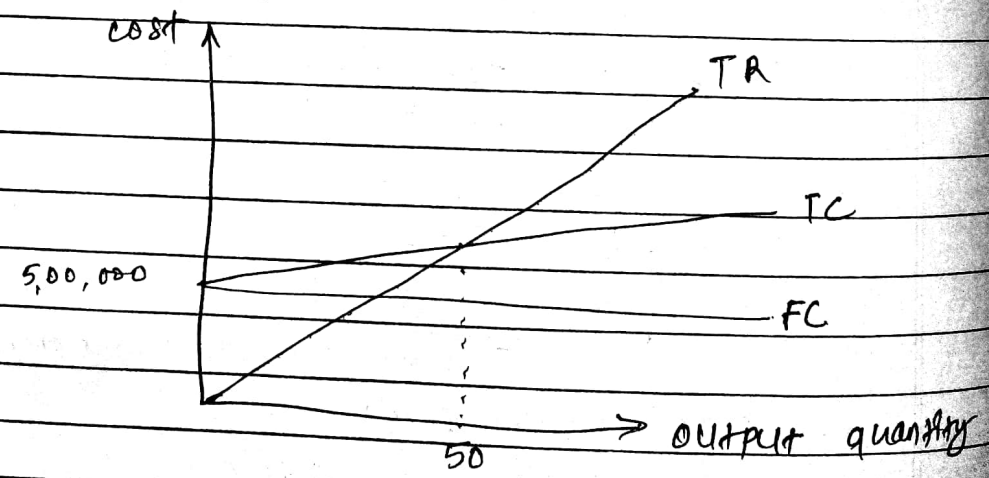
Q) Suppose the fixed cost associated with the production of a product is Rs 5,00,000. Assume that variable cost is Rs. 20,000 and selling price is Rs 30,000 for each product and max^m sales amount is Rs 30,00,000 when sales volume is 100 units. Determine the BEP (Break even point) for this situation and plot the BEP chart.

Sol: Given

$FC = 5,00,000$
$VC = 20,000$
$P = 30,00,000$

$$Q = \frac{5,00,000}{30,000 - 20,000}$$

$= 50$



Breakeven analysis for comparing two alternatives:

For this the annual operating expenses of both alternative is determined.

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consider the following two motors each of 100hp o/p capacity.

Item	motor A	motor B
purchase cost	125000	160000
efficiency	74%	92%
life (years)	10	10
maintenance cost Rs/year	5000	2500
Annual Tax & Insurance	1.5% of investment	
MARR	15%	

(a) how many hours per year would the motors have to be operated at full load for the annual cost to be equal, if electricity cost is Rs 5 KW per hour.

(b) If annual operation is more than 55 hours which motor should be selected.

Sol^n

$$\text{efficiency } (\eta) = \frac{O/P}{I/P}$$

$$\Rightarrow I/P = \frac{\text{output}}{\eta}$$

For motor A,

$$I/P_A = \frac{100 * 0.746}{0.74} = 100.81 \text{ KW}$$

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Let number of hour to be operated be 'x'

Total power expenses = 100.81 * x * 5 (per unit KW)
= 504.05 x

Annual tax and insurence cost = 125000 * 1.5%
= 1875 //

Annual worth of purchase cost,

$$AW_A = 125000 \left[\frac{0.15 (1+0.15)^{10}}{(1+0.15)^{10} - 1} \right]$$

= 24906 //

Total operating expenses of ~~oper~~ motor A,

= 504.05x + 5000 + 1875 + 24906
= 31781 + 504.05x

Similarly,

Total operating expenses of Motor B, → (36780 + 405.43x)

$$I/P_B = \frac{100 * 0.746}{0.92} = 81.08 \text{ KW} //$$

let the number of hour to be operated be 'x'

Total power expenses = 81.08 * x * 5
= 405.43 x

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Annual tax and insurence cost = 160000 * 1.5%
= 2400

Annual worth of purchase cost,

$$AW_B = 160000 \left[\frac{0.15\,(1+0.15)^{10}}{(1+0.15)^{10}-1} \right]$$

$$= 31879$$

Total operating expenses of motor B,

$$= 405.43x + 2500 + 2400 + 31879$$

$$= 36780 + 405.43x$$

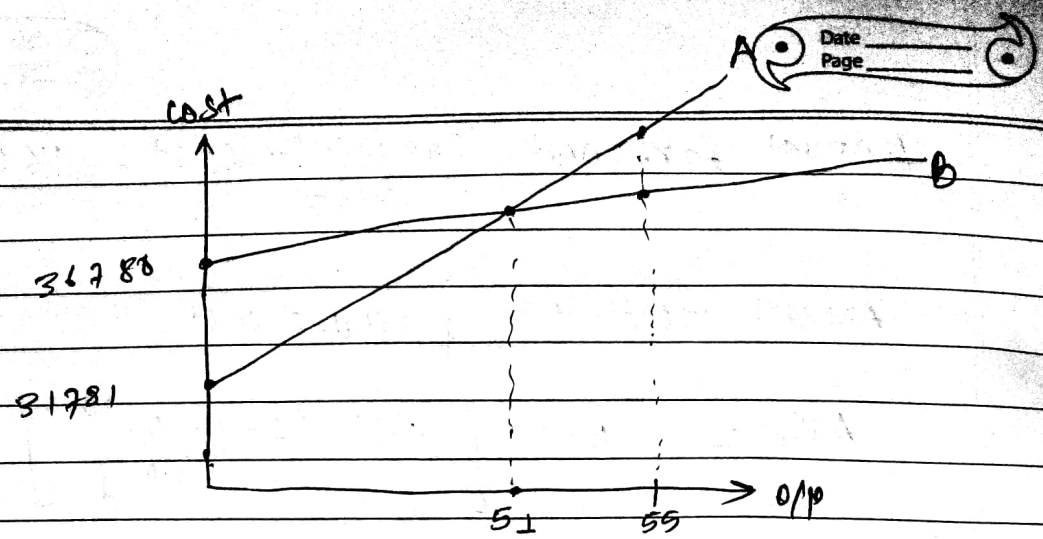
At breakever point,

Total operating expences of motor A = Total operating expenses of motor B

$$3781 + 504.05x = 36780 + 405.43x$$

$$98.62x = 4999$$

$$x = 51$$



Ans (b) After the breakeven point 51, at the 55 hours operation time we have to choose the motor B because the operating cost is lower than the motor A.

Note:→ cost বের করার পর যদি BEP পাওয়া যায় তবে A সিলেক্ট করব

Scenario Analysis

From the following information calculate the NPV for each scenario by assuming,

$I = 1,25000$

MARR = 15%

life = 5 years

Variable considered	Worse case (WC)	most likely (ML)	Best case (BC)
Unit demand / Year	1600	2000	2400
Unit price (Rs)	48	50	53
variable cost Rs/unit	17	15	12
F.C. Rs / year	11,000	10,000	8,000
Salvage value (Rs)	30,000	40,000	50,000

NPV of worse case scenario,

5 year का लागत per year है

$$NPV = -1,25,000 + \left[1600(48-17) - 11000\right] * (P/A, 15\%, 5)$$

$$+ 30,000 (P/F, 15\%, 5)$$

$$= -125,000 + 38600 \left[\frac{(1+0.15)^5 - 1}{0.15(1+0.15)^5}\right] + \frac{30000}{(1+0.15)^5}$$

$$= 19,311$$ //

→ यहाँ -ve का श्रमकर्ता अब लाभ कर रहा है

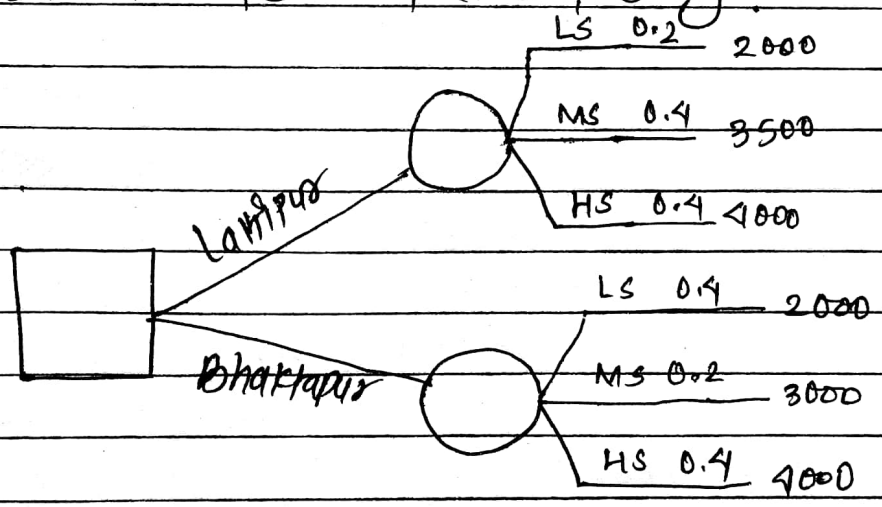
Decision Tree analysis

A business ~~[illegible]~~ Form is considering to expand its branch in either Bhaktapur or Lalitpur from primary survey following data has been obtained:

Business location	Lalitpur probability	Lalitpur Income (000)	Bhaktapur probability	Bhaktapur Income (000)
low success	0.2	2000	0.4	2000
medium success	0.4	3500	0.2	3000
high success	0.4	4000	0.4	4000

The cost of advertising for Lalitpur is RS 1,50,000 and Bhaktapur is RS 2,00,000. Which branch should the Form prefer, why?

Ans:



Expected income from Lalitpur,

$= 2000 * 0.2 + 3500 * 0.4 + 4000 * 0.4$

$= 3400000$

Net profit from Lalitpur $= 3400000 - 150000$

$= 3250000$

Similarly for Bhaktapur.

~~Net~~ expected income from Bhaktapur =
$2000 * 0.4 + 3000 * 0.2 + 4000 * 0.4$
$= 3000,000$ //

Net profit from Bhaktapur = $30,00,000 - 2,00,000$
$= 2800000$ //

Decision: The net profit from Lalitpur is greater than that of Bhaktapur, therefore business should be expanded to Lalitpur location.

CH-8

23-08-2017

Depreciation

→ Fixed type of assets

Depreciation can be defined as the decrement in value by wear and tear. The main purpose of depreciation is to determine book value and market value.

Causes of Depreciation

1) Accident
2) wear and tear
3) time
4) change in people expection
5) exhaust or depletion

Factor affecting depreciation

- initial cost
- life
- depreciation rate
- book value or salvage value
- legal provision of a nation

Methods

1) Straight line method
2) Declining balance method
3) Double rate declining balance method
4) straight line plus average interest method
5) sinking fund method
6) Sum of the year digit method
7) Modified accelerated cost recovery system (MACRS)

(1) Straight line Method:

$$SLM = \frac{I-S}{N}$$

where, I = Initial investment
S = salvage value
N = no. of year

Q) A Machine costing of Rs 11,000. is estimated to have life of 10 year and the S.V Rs 1000 at the end of life. Determine annual depreciation and the rate of depreciation by using SLM.

Sol^n

I = 11,000
SV = 1000
N = 10

$$SLM = \frac{11000-1000}{10} = 1000$$

Annual depreciation = 1000

$$\text{Rate of depreciation} = \frac{1000}{10000} \times 100 = 10\%$$

Year	Book value	Year	Book value
1		7	
2		8	
3		9	
4		10	
5			
6			

Year	Cost before dep^n	dep^n	cost after dep^n
1	11000	1000	10000
2	10000	1000	9000
3	9000	1000	8000
4	8000	1000	7000
5	7000	1000	6000
6	6000	1000	5000
7	5000	1000	4000
8	4000	1000	3000
9	3000	1000	2000
10	2000	1000	1000

d_k = annual dep^n deduction in the Kth year

$$= \frac{B-S}{N}$$

B = Original cost / initial investment

D_k^* = cumulative dep^n through year 'K'

$$= K\left(\frac{B-S}{N}\right)$$

BV_k = Book value at the end of year 'K'.

$$= B - D_k^*$$

St. line method

Q) A machine costing of Rs 4000 is estimated to have life 10 years and S.V. 0. Find
(1) depreciation amount for the 6 year
(2) accumulated depn through out 6th year.
(3) book value at the end of 6 year

Sol^n

(1) $SLM = \frac{4000 - 0}{10} = 400$ //
[প্রতিটি year এর জন্য 400 of Sale]

(2) depreciation amount for 6 year = 400×6
= 2400

(2) book value at the end of 6 year =
= 4000 - 2400
= 1600 //

Advantages of St. line method:

- It is simple to calculate and easy to understand.
- It makes easy for valuation.
- It makes the assumption that the assets must be used up during that life.

Disadvantages of St. line method:

- It is not proper to provide equal depn when assets is getting old.
- It ignores interest on capital invested in fixed assets.
- This method is not universally applied.

Declining Balance Method:

$$R = 1 - \sqrt[N]{\frac{S}{B}}$$

R = rate of depⁿ N = estimated life S = salvage value

B = book value

$$d_k = B(1-R)^{k-1} * R$$

$$d_k^* = B[1-(1-R)^k]$$

$$BV_k = B(1-R)^k$$

27-08-2017

Advantages

- High amount of depreciation for earlier amount of assets and as assets getting old depreciation goes on decreasing which is more scientific
- Suitable for assets having long useful life
- recognized by income tax department

Disadvantages

- Very difficult to decide rate of depreciation if salvage value is zero.
- applicable for only long life assets
- the book value of assets can not be zero year.
- Ignores the ~~capital~~ interest on capital.
- ~~cost~~

3. Double Rate Declining Balance Method:

$$\boxed{R = \frac{1}{N} * 100 * 2}$$

4. Sinking fund method

let,

I = Initial cost

S =

N =

i = compound interest rate

A = Annual equivalent amount

BV_k = Book value of asset at the end of kth year

d_k = Depreciation charge in k^{th} year.

Then,

$$A = (I-S)\,(A/F, i\%, N)$$

To find dep^n charge in the year k

$$d_k = (I-S)\,(A/F, i\%, N)\,(F/P, i\%, k-1)$$

$$BV_k = I - (I-S)\,(A/F, i\%, N)\,(F/A, i\%, k)$$

Q) Compute the depreciation charge and book value of each year by using sinking fund method with following information.

Initial invest = 1,00,000

S.V = 20,000

life of assets = 8 years

i = 12%

let calculate, A,

$A = (I - S)\ (A/F, 9\%, N)$ [Ans 6500]

$= \cancel{(0.12 - 20000)}$

$= (1,00,000 - 20,000)\left[\dfrac{0.12}{(1+0.12)^8 - 1}\right]$

$= 6504$ //

now, lets find the depⁿ charge and book value of each year,

Year	depreciation annual(A)	d_k	BV_k
0	0	0	1,00,000
1	6504	6504	93,496
2	6504 * (1.12) (1 + R compounding)	7284	86211
3	$6504 * (1.12)^2$	8156	78055
4	$6504 * (1.12)^3$	9134	68921
5	$6504 * (1.12)^4$	10231	58690
6	$6504 * (1.12)^5$	11458	47232
7	$6504 * (1.12)^6$	12833	34399
8	$6504 * (1.12)^7$	14373	20026

5. Sum of the Year digit method (SOYD)

Q) A machine having a cost of 36,000 and ~~[illegible]~~ Salvage value at the end of 5th year is Rs 6000. Calculate depⁿ charge per year under SOYD method.

Soln:

$N = 5$

$$SOYD = \frac{N(N+1)}{2} = 15$$

(कितने year बाकी है)

Year	Depⁿ		
0	0		
1	$\frac{5}{15}(36000-6000)$	= 10,000	//
2	$4/15\,(36000-6000)$	= 8000	//
3	$3/15\,(36000-6000)$	= 6000	//
4	$2/15\,(36000-6000)$	= 4000	//
5	$1/15\,(36000-6000)$	= 2000	//

(6) MACRS Method

[Modified accelerated cost recovery system]

→ 0.5 year tolerance छोड़ा ⇒ पहला + Last year में छोड़ा

Q) A tax payer wants to place in service of Rs. 10,000 assets that is assigned to 5 year class. Compute the MACRS ~~do~~ percentage and depⁿ amount for the assets.

Soln →

$SL = \frac{1}{N}$ (Book value) —— (*)

DB rate $= \frac{R}{N} = \frac{200}{5} = 40\% = 0.4$

DB rate $= 0.4 * B.V$ —— (*)

no salvage value so, put 100%.

Year	Dep^n method	Dep. rate
1	Straight line method $= \frac{1}{2} * SL = \frac{1}{2} * \frac{1}{5} * 100 = 10\%$ (to leave a value)	20%
	Declining Balance method $= \frac{1}{2} * 0.4 * 100 = 20\%$	
2	~~St. line method~~ Declining Balance method $= 0.4 * (100-20) = 32\%$	
	~~Declining Balance method~~ St. line method $= \frac{1}{4.5} * (100-20) = 17.7$	32%
3	Declining Balance method $= 0.4\ (100-20-32) =$	
	St. line method $= \frac{1}{3.5} * (100-20-32) =$	
4	Declining Balance method $= 0.4\ (100-20-32-\ ) =$	
	St. line method $= \frac{1}{2.5} * (100-20-32-\ ) =$	

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5 Declining Balance method = 0.4 (100 − 20 − 32 −

St. line method = $\frac{1}{1.5}$ (100 − 20 − 32 −

6 Declining Balance method =

St. line method =

28-08-2017

Sol^n

$\frac{1}{2}$ year DB = $\frac{1}{2}$ (0.4) * 100 = 20%. — 20%

1 $\frac{1}{2}$ year SL = $\frac{1}{2}$ * $\frac{1}{5}$ * 100 = 10%.

2 DB = 0.4 * (100 − 20%) = 32%. — 32%

SL = $\frac{1}{4.5}$ * (100 − 20%) = 17.78%.

3 DB = 0.4 (100 − 20 − 32) = 19.2 %. — 19.2%

SL = $\frac{1}{3.5}$ (100 − 52) = 13.7%.

4. DB = 0.4 (100 − 52 − 19.2) = 11.52 — 11.52 %.

SL = $\frac{1}{2.5}$ (100 − 71.20) = 11.52

5 DB = 0.4 * 17.28% = 6.9%. — 11.52 %.

SL = $\frac{1}{1.5}$ * 17.28 = 11.52

6 $\frac{1}{2}$ year DB = $\frac{1}{2}$ * 0.4 * 5.76 %. — 5.76%.

$\frac{1}{2}$ year SL = $\frac{1}{2}$ * $\frac{1}{0.5}$ * 5.76

MACRS :- fn Amortization, less discount,
- no salvage value

1. Straight line method : a %
2. Declining Balance method : b %

Higher

IRS configuration ⇒ 5 year class, → high possible
R = 200 % (given)
⇒ 7 year class

Now, lets calculate depreciation amount,

	Dep^n %	Dep^n Basis	Dep^n Amount
1	20 %	10000	2000
2	32 %	10000	
3	19.2	10000	
4	11.52	10000	
5	11.52	10000	
6	5.76	10000	

Q) A construction equipment has initial cost and annual saving per year are 40000 and 20,000 rs. with annual operation and maintenance cost Rs 7000. It will depreciate by MACRS and ~~[illegible]~~ will have no S.V. The useful life of equipment is 5 years. Estimate before and after tax cash flow. The company pays income tax @ 40%.

SL = 1/N (Book value) — (*)

Sol → DB Rate = $\frac{2}{N}$ = $\frac{200}{5}$ = 40 % = 0.4 — (*)

= 0.4 * B.V

Year	Depⁿ method	Depⁿ rate
1		20 %
2		32 %
3		19.2 %
4		11.52 %
5		11.52 %
6		5.76 %

Lets, make table to calculate depⁿ amount.

Year	Before Tax Cash flow (1)	MACRS rate (2)	Depreciation (3)	Net Taxable income (1-3) (4)	Tax amount (5) (4)*40%	Cash flow after tax (1-5)
0	-40,000	–	–	–	–	-40
		40000 at 20% →				
1	13000	20	8000	5000	200	12
2	13000	32	12,800	200	80	

3	13000	19.2	7680	5320		
4	13000	11.52	4608	8392		
5	13000	11.52	4608	8392		
6	13000	5.76	2304	10696		

Service Output Method or Unit of Production Method

- assets जाई काम ही आधार गरी अति dep^n निकाल्ने (useful आधार)

All the dep^n method discused above are based on the elasped time in year but we operate fixed assets on hour basis, in this case, unit of production method is used. This methods give equal dep^n charge for each unit of output or each unit of hour, regardless of the elasped of time.

$$R = \frac{I - S}{\text{Total working Hour / Total production unit}}$$

Q) A machine costing of Rs 50,000 is estimated to have 10,000 S.V. when replaced after 30,000 hour of used. Find its dep^n rate per hour of use and book value after 10,000 hour of operation.

Sol^n →

lets calculate the dep^n rate,

$$R = \frac{I - S}{\text{Total working hour}}$$

$$= \frac{50000 - 10000}{30000}$$

$$= 1.33 \text{ per hour}$$

Book value after 10,000 hour of operation,

$$= 50,000 - 10000 * 1.33$$

$$= 50000 - 1330$$

HW

Q) Critically examine the taxation system of Nepal.

WWW. MOF. GOV. NP

अर्थ मन्त्रालय

pdf of Sunday

30-08-2017

Date
Page

CH 10

6 Hrs

Basic Accounting procedure

- balance sheet
- theory (ratio, type)

Accounting:

Accounting is the process of analysing, recording the transaction and interpreting it to derive the meaningful conclusion.

Types of accounting:

- Single entry (एउटा पक्षमा मात्र लेख्ने गरिएको ... [illegible])
- Double entry → एकैचोटि 100% शुद्धता प्राप्त। [2013 मा लेखिएको]
- Cash basis → [illegible]
- Accural basis → [illegible] [illegible]

#

In single entry accounting system only one aspect of accounting i.e. either debit or credit is recorded.

#

It assumes that for every debit (dr.) there must be credit (cr.) and vice-versa. A business form it receives something, it must surrender something so double entry accounting system records both aspect i.e. dr and cr. of transaction. It is the modern concept of accounting.

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Cash basis

It record when cash is received i.e. ignores contingent liability.

Accural basis

It ~~record~~ ignores cash and records when liability is created.

Principle of Accounting:

General guideline for conducting business are principle of accounting.

They are:

1) Business entity assumption [व्यक्ति और संस्था अलग है]

Business and its owner are separate so the transation of business should be recorded in business's own account not in the owner's account.

2) Money measurement assumption

Each tran^n should be recorded in monetary term.

3) Cost principle [जो भी लेनदेन हो उसे किस कीमत पर record करना है]

Tran^n cost should be recorded actually when tran^n occur.

4) Going concept principle: [कारोबार सतत]

Keep accounting in such a way that business never ends.

Date
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Double entry principle

For every debit there must be credit.

6) Maturity : mature এর মানে হচ্ছে recover করা পরিণত।

Investment are returned only after maturity.

7) Accural principle

Records in accounting when liability creates.

Golden Rule Of Accounting

Every busines tranx^n has dual effect i.e. one side of tranx^n is debit and another side of transaction is credit. There are two approaches of debit & credit:

1) Traditional approach:

This approach is based on the types of account. There are three types of account

(a) Personal account

It includes person's account, firms account, companies A/C, institution A/C, loan A/C, capital A/C etc. The rule is:

Debit ~~the~~ is the receiver ~~and~~ ~~credit~~ Credit is the giver.

(b) Real account:

Real account are tangible and intangible.

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Tangible include: land a/c, door a/c, house a/c etc

Intangible includes: brands, goodwill, preferences etc

The rule is, what comes in is debited
what goes out is credited

(c) Nominal account:
All expenses and loss are debited
All incomes and gains are credited

2) Transactional approach:
This approach is based on accounting equation.

$$A = L + E$$

Where, A = assets (সম্পত্তি)
amount of payment → L = liability (দায়িত্ব)
E = equity (ব্যবসায়ীর মূলধন)

↑ A ⇒ Dr
↓ A ⇒ Cr

If assets is increased it is debited.
If assets is decreased it is credited.

If liability is increase it is credited.
If liability is decreases it is debited.
If equity is increase it is credited.
If equity is decrease it is debited.

31-08-2012

Double Entry book keeping System:

Book keeping is that branch knowledge which tells us how to keep a record of financial tranx^n. It is invented by LUCAPACIOLI.

Features of double entry sys.

- It is the most modern, progressive, scientific and best system of recording financial tranx^n it has following features:
  1. Two fold effect : एक debit एक credit
  2. Equal effect : debit = credit
  3. Guided by prescribed rule
  4. Arithmetic accuracy
  5. Full proof
  6. Universal

Advantages:

- complete record
- arithmetic accuracy
- position of profit and loss is known
- comparision
- financial position
- Legal importances
- easy to identify error
- It is used for making planning, vision, mission, strategy

Journal

It is the daily record of business. In accounting it means a preliminary books that provide a Chronological record of tranx^n with each tranx^n recorded with respective information in brackets.

Format:

Journal

Date	particular	L.F.	Dr Amount	Cr. Amount

1. Date
   : tranx^n भएको date
   Tranx^n date is written here.

2. Particular : के काम भयो
   Detail description of tranx^n

3. L.F : Ledger folio
   For index purpose.

4. Dr
   Debited amount is written here

5. Cr. Amount
   Credited amount

Uses

- It provides record in chronological order.
- Gives complete information about transn.
- Helpful for arithmetic accuracy.
- Without journal we can not prepare ledger.

Example of journal

(1) Started business with a cash of Rs. 5,00,000 on 15th Bhadra 2074.
→ Started and cash is debit

Date	particular	L.F	Dr Amount	Cr. Amount
2074	Cash a/c Dr.	1	5,00,000	~~5,00,000~~
Bhadra	To business			
15	(Capital) Cr.			5,00,000
	(Business is started)			

(2) Started business with cash Rs 1,00,000 furniture 40,000, computer 60,000.

Date	particular	L.F	Dr.	Cr. Amount
2074	cash a/c Dr.		100000	
Bhadra	furniture a/c Dr		40,000	
15	computer a/c Dr		60000	
	To capital a/c Cr.			2,00,000
	(business is started with			
	furniture and computer)			

Q) 2074 Bhadra 15, bought machinary worth of Rs 5,00,000 on cash

Date	particular	L.F	Dr. Amount	Cr. Amount
2074 Bhadra 15	machine a/c Dr.		5,00,000	
	To cash a/c Cr.			500,000
	(Machine is bought)			

Q) On 2074 Bhadra 15 Salary of Rs 5000 is paid in cash. (just related to only one side)

Date	particular	L.F	Dr Amount	Cr. Amount
	Salary a/c Dr.		5000	
2074 Bhadra 15	To Cash a/c Cr.			5000
	(salary paid on cash)			

Q) withdrawn (Dr.) Rs 1000 from bank

Date	particular	L.F.	Dr Amount	Cr. Amount
2074 Bhadra 15	Drawn a/c Dr.		1000	
	To cash a/c Cr.			1000
	(			

Q) withdraw goods worth 5000 and cash from bank Rs 10000.

Date	particular	L.F.	Dr.	Cr.
2074 Bhadra 15	Drawn a/c Dr.		15000	
	To Goods a/c cr.			5000
	To cash a/c cr.			10000

Ledger

Dr & Cr. हुँ

The business tranxn's are recorded in chronological order in journal but we can not find out information about transaction relating to a particular account. Similarly the position of assets and liabilities can not be found. To overcome such limitation ledger is used.

Ledger is the book which contain a classified and summarized form of permanent record of all tranxn. All the tranxn recorded in the book of journal are transferred into the ledger. So it is called the book final entry or book of secondary entry.

Objectives Of Ledger account:

- To present the financial position of business.
- to provide information about income and expenses
- to find out the position of purchase and sell of good.
- to examine the number of debit and credit.
- to supply financial information.

Dr

Date	particular	L.F	Amount	Date	particular	L.F	Amou

1. Date : tranx^n date included here.
2. particular :
3. LF.
4. Amount :

01-09-2017

Relationship betn journal and Ledger

1) Journal is a book of original entry and Ledger is the secondary entry.
2) Ledger is the account derived from journal.
3) Journal is chronological and Ledger is analytical.

Difference

	Journal	Ledger
1		
1)	Book of primary entry	1) Book of secondary entry
2)	chronological	2) Analytical
3)	Tranx^n info. is provided in journal.	3) transaction information is not provided.
4)	Journal does not shows the financial position of firm.	4) Ledger shows the financial position of the firm.
5)	Balancing no need.	5) There should be balancing

Generalise the following transactions.

April 1st ⇒ paid to Sarita cash Rs 12 000
April 5th ⇒ paid to Santosh Rs 39,000 on full Statement of Rs 40,000.
April 10th ⇒ paid to Rita Rs 10,000 on account and received discount at 10%.
15th ⇒ Paid to Hari Rs 90,500 by cheque and received discount Rs 5000

Date	particular	LF	Dr. Amount	Cr. Amount
April 1st	Sarita a/c Dr		12000	
	To cash a/c cr.			12000
	(paid to sarita by cash)			
April 5th	Santosh a/c Dr		40000	
	To cash a/c cr.			39000
	To discount a/c cr.			1000
	(cash paid to santosh with 10000 discount)			
	Rita a/c Dr		10000	
10th	To ~~discount~~ cash a/c cr			9000
	To discount a/c cr			1000
	(cash Rs paid to Rita with 10% discount)			
	Hari a/c Dr			
15th	To bank a/c			
	C			

Q) The following tranx^{n}s are given:

1. purchase goods for cash Rs 25,000
2. purchase goods from Ganesh Rs 15,000
3. Goods sold for cash Rs 30,000
4. Goods sold to Kumar Rs 10,000
5. Goods return by Kumar Rs 2000
6. Cash received from Kumar Rs 3000
7. cash paid to Ganesh Rs 4000
8. Goods return to Ganesh Rs 2000

Required:

a) Journal entries

b) Cash account, purchase a/c, sales a/c and Ganesh a/c.

Soln →

	Date	particular	LF	Dr Amount	Cr.
1		purchase a/c Dr To cash a/c Cr (goods are purchased)		25000	25000
2		purchase a/c Dr To Ganesh a/c Cr		15000	15000
3		Cash a/c Dr To sales a/c Cr ( )		30000	30000
4		Kumar a/c Dr To sales a/c Cr. (		10000	10000
5		Sales return a/c Dr. To Kumar a/c Cr. (		2000	2000

	Cash a/c Dr			
	To Kumar a/c Cr		3000	
6	(			3000
	Ganesh a/c Dr			
7	To Cash a/c Cr		4000	
	(			4000
	Ganesh a/c Dr			
8	To purchase return a/c Cr		2000	
	(			2000

Cash A/C

Dr | Cr

Date	particular	Amount	Date	Particular	Amount
			1	By purchase a/c	25,000
9	By Sales a/c	30000			
6	By Kumar a/c	3000			
			7	paid to Ganesh a/c	4000
				Balanding figure	4000
		33000			33000

Characteristics

- It is not an account but only the statement of balances.
- It is prepared on specific date so the info. provided by it are valid only upto that day.
- It includes all the ledger balances.
- It has two sides i.e. left side is called Dr, right side is called Cr.
- It is useful for making final account.
- It help to identify and remove the error.

Q) From the following balances of Mr. Ram Singh for the year ended 31st ~~December~~ January 2015.

Capital account	35,000	Salary	4000
Purchase	45,000	Bad dept recover	20,000
Drawing	9000	Outstanding expenses	25000
Sales Return	8000	Rent	3000
Building	40000		
Closing Stock	8000		
Plant and Machinery	7000		
Creditor (साहूकार)	18000		
Tax & Insurence	2500		
Bank over draft	2500		
Rent received	5000		
Opening stock	8000		
purchase Return	3000		
provision for bad dept	8000		
Reserved Fund	6000		
Discounted Recived	6000		
printing & Stationary	4000		
Loan	10,000		

Required:

- Trial balance for the year ended in 31th Dec 2016.

Soln → Mr. Ram Singh Trial balance
For year upto 31 Dec 2016

SN.	particular	Dr. Amount	Cr. Amount
1.	Capital		35,000
2.	purchase	45000	
3.	Drawing	9000	
4.	Sales Return	8000	
5.	Building	40,000	
6.	Close	8000	
7.		7000	
8.	creditor		8000
9.	Tax & insurance	2500	
10.	Bank over draft		2500
11.	Rent Received		5000
12.	opening stock	8000	
13.	purchase return		3000
14.	provision for bad dept		8000
15	Reserved Fund		6000
16	Discounted received (Rent)		6000
17	printing & stationary (expense)	4000	
18	loan		10,000
19	salary	4000	
20	Rent	3000	
21	Bad dept recover		20000
22	outstanding expenses		2500

Google: Company Act

Assignment 4

1. What are the types of companies explain the features of them.

2. Define sustainable Development, ecological limit & ecological foot print.

3. Write a short notes on
   * FIRR
   * EIRR

4. Explain the project funding mechanism with their types.

5. Explain the Detail components of life cycle cost.

private: liability unlimited ছিল।
public :- " limited ছিল (max 100)

2) " present development process should not compromise the need of future generation"

Development: → Constructive
→ Destructive

ecological limit: Earth
Footprint :- per area coverage.

* sustainable development

⇒ বাংলাদেশের সাধারণ কার্যক্রম
= কাজ, বিদ্যুৎ বন কার্যক্রম
⇒ 298 বছর সাধারণ কার্যক্রম
⇒ 39.6% → বর্তমান বনজঙ্গল

Carbon trading

30 मार्च

Q ⇒ funding : → public सरकारी
→ private
→ PPP (public, private partnership)

Q → Initial cost
→ operation and maintenance cost
→ Disposal cost

Engineering economics

Chen's park

लेखक सहित 2016 third edition.

Demand & supply

Q) The manager of a firm estimate that the total revenue from the sale of product is given by the eqn.

Total revenue (TR) = $300Q - \frac{Q^2}{2}$

Total cost (TC) = $500 + 60Q + Q^2$

(a) What is the profit maximization price and quantity of output.

→ For profit maximization

MC = MR

TR का derivative MR

$$\frac{d}{dQ}(TC) = \frac{d}{dQ}(TR)$$

$$60 + 2Q = 300 - Q$$

$$\therefore Q = 80$$

Now, total revenue $= 300 \times 80 - \frac{80^2}{2}$

$\therefore TR = 20,800$

We have,

$TR = P * Q$

$20800 = P * 80$

$\boxed{\therefore P = 260}$ //

(b) At what output rate is average cost is minm ? At this output rate what is the amount of economic profit.

→ Here,

$TC = 500 + 60 * 80 + (80)^2$

$= 500 + 4800 + 6400$

$= 11700$ //

$MC = \frac{d(TC)}{dQ} = MC = 60 + 2 * 80$

$= 60 + 160$

$= 220$ //

$MR = \frac{d(TR)}{dQ} = 300 - 80 = 220$

$\therefore AC$ (Average cost) $= \frac{TC}{Q} = \frac{11500}{80}$

$= 146.25$ //

Maxm profit = Total Revenue (TR) − Total cost (TC)

$= 20800 - 11700$

$= 9100$ //

TR > TC, so there is profit

Q) From the following data, project the sales trend for next five year.

Year	Sales (S)	period (T)
2012	240	1
2013	250	2
2014	240	3
2015	300	4
2016	340	5

Sol^n

Sales (S)	period	S*T
240	1	240
250	2	500
240	3	720
300	4	1200
340	5	1700
$\Sigma S = 1370$	$\Sigma T = 15$	$\Sigma ST = 4360$

$$\boxed{S = a + bT}$$

calculator process

(1) Mode

(2) ~~state~~ STAT (3)

2 ⇒ A+BX then enter data

⇒ press AC

⇒ shift 1

⇒ press 7

⇒ press

S (x)	Y (T)

$y = a + bx$

$y =$ Dependent variable

$x =$ Independent variable

$$\boxed{y = -5.64 + 0.03 \perp T}$$

AAS

Lets do it manually

$y = a + bx$

$$\boxed{S = a + bT}$$ least square method

(1) take sum

$\Sigma S = na + b\Sigma T$ — (1)

$1370 = 5a + 15b$ — (A)

now multiply by independent variable ΣT

$$\boxed{\Sigma ST = a\Sigma T + b\Sigma T^2}$$

$4360 = 15a + 55b$ — (B)

solving eqn. (A) and (B)

Read yourself

Date
Page

Unrecovered Investment Balance Diagram

Please Go to youtube.

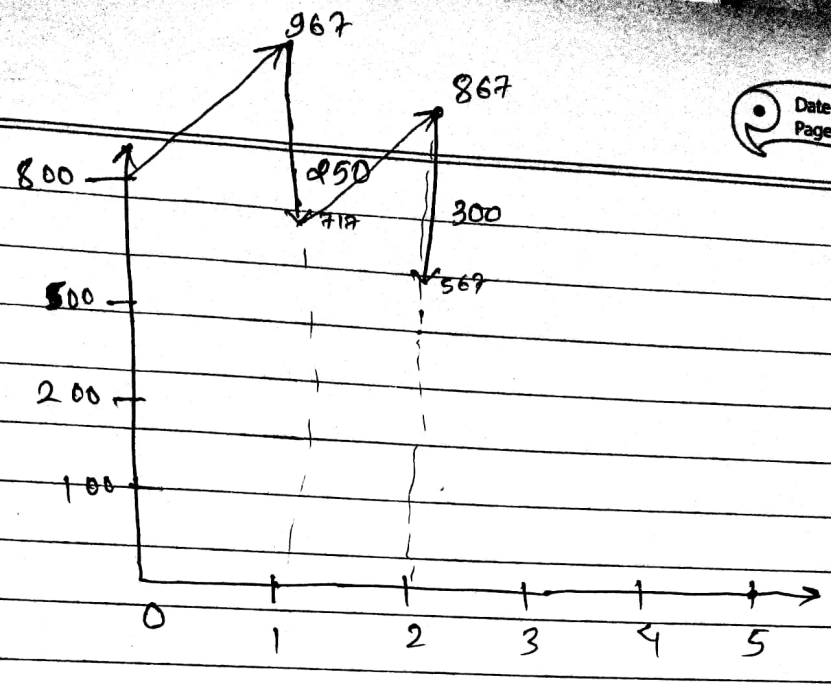
Q) Calculate the IRR from the following cash flow diagram and draw the investment balance diagram.

Year	CF
0	-800
1	250
2	300
3	400
4	-150
5	600

⇒ Ans ⇒ IRR = 20.95%. (do yourself

Unrecovered Investment

Year	CF	Begning	End	Revenue - expenses
0	-800	—	-800	-800
1	250	-800	-967	-717
2	300	-717	-867	-567
3	400	-567	-686	-286
4	-150	-286	-346	-496
5	600	-496	-600	0



1st year $800 * 1.2093 = 967$ (compounding ...

2nd year $717 * 1.2093 = 867$