RAO BAHADUR.Y. MAHABALESWARAPPA ENGINEERING COLLEGE
DEPARTMENT OF MANAGEMENT STUDIES [MBA]

FORMULA HANDBOOK

[FOR MBA 1ST SEMESTER STUDENTS]

FOR SUBJECTS
20MBA13 ACCOUNTING FOR MANAGERS
20MBA14 BUSINESS STATISTICS
20MBA12 MANAGERIAL ECONOMICS

ALL THE BEST

From HOD & Staff

ACCOUNTS FORMULA

- Calculation of COGS =

Opening stock + Purchases + Direct expenses – Closing Stock

- Trend Analysis = $\frac{\text{Current Year}}{\text{Base year}}$ * 100
- Absolute Analysis = Current Year - Base year
- Calculation of percentage = $\frac{\text{Absolute Change}}{\text{Base year}}$ * 100

- Cash Flow Statements

- Increase in current assets = Decrease in Cash Outflow (-)
- Decrease in current assets = Increase in Cash Inflow (+)
- Increase in current liabilities = Decrease in Cash Outflow (+)
- Decrease in current liabilities = Increase in Cash Inflow (-)
- Net cash flow = [Net cash flow from operating activity ± Net cash flow from investing activity ± Net cash flow from financing activity]

+

Cash & cash equivalents in beginning the year

=

Cash & cash equivalents in closing the year

MANAGEMENT ACCOUNTING

- Total cost = Fixed cost + Variable cost
- Contribution = Sales – Variable cost (OR)

Contribution $_{(\text{per unit})}$ = Selling Price $_{(\text{per unit})}$ – Variable cost $_{(\text{per unit})}$ (OR)

Contribution = Fixed cost ± Profit/Loss

Marginal Cost Equation

- Contribution = Sales – Variable cost
- Sales = Contribution + Variable cost
- Sales = Variable cost + Fixed cost ± Profit/loss
- Sales - Variable cost = Fixed cost ± Profit/loss

Profit/Volume Ratio (PV ratio)

- PV ratio = $\frac{\text{Sales} - \text{Variable cost}}{\text{Sales}} * 100$ or $\frac{\text{Contribution}}{Sales} *100$

  (OR) $\frac{\text{Fixed cost} + \text{Profit/loss}}{\text{Sales}} * 100$

- PV ratio = $\frac{\text{Change in profit (or) Change in contribution}}{Change\ in\ sales} * 100$

➢ Desired Profit (ussing in PV ratio)

- PV ratio = $\frac{\text{Contribution}}{\text{Sales}} *100$
- PV ratio = $\frac{\text{Fixed cost} + \text{Profit/Loss}}{\text{Sales}} *100$
- Sales = $\frac{\text{Fixed cost} + \text{Desired Profit}}{\text{PV ratio}} *100$

Break Even Analysis

- Break Even Sales = BEP (in units) *Selling Price per Unit
- BEP $_{\text{(in units)}}$ = $\frac{\text{Fixed cost}}{\text{Selling Price (per unit)} - \text{Variable cost (per unit)}}$

  (OR) $\frac{\text{Fixed cost}}{\text{Contribution (per unit)}}$

BEP (in budget)

- Break Even Sales = $\frac{\text{Fixed cost}}{\text{Sales – Variable cost}}$ * Sales

(OR) $\frac{\text{Fixed cost}}{\text{Contribution}}$ * Sales

(OR) $\frac{\text{Fixed cost}}{PV\ Ratio}$

BEP as percentage of estimated capacity

BEP (as percentage of capacity) = $\frac{\text{Fixed cost}}{\text{Total contribution}}$

MARGIN OF SAFETY

- Total sales – Break Even Point in sales
- MOS = $\frac{\text{Profit at selected activity}}{\text{PV ratio}}$
- MOS (in percentage) = $\frac{\text{Margin of safety}}{\text{Sales at selected activity}} * 100$

Calculation of Shut Down Point:-

Shut Down Point = $\frac{Total\ fixed\ cost - Shutdown\ cost}{Contribution\ per\ unit}$

Shut Down Point = $\frac{Fixed\ cost\ @\ present - Fixed\ cost\ @\ shut\ down}{P\ V\ Ratio}$

FLEXIBLE BUDGET

PARTICULARS		CAPACITY	CAPACITY
Prime cost			
Variable overheads			
Marginal cost	(A)		
Sales	(B)		
Contribution	(D)=(B-A)		
Fixed cost	(c)		
Profit	(E)= (D-C)		

Variances

Material Cost Variances

- MCV = (Std Qty * Std Price) – (Actual Qty * Actual Price)
- MPV = Actual Quantity * (Standard Price – Actual Price)
- MUV = Standard Price * (Standard Quantity – Actual Quantity)
- MMV =Standard Price * [Revised mix of actual input – Actual Proportion] *Standard Price
- MYV = Standard Rate * [Actual Yield – Standard Yield]

Labour Cost Variance: -

- Labour Cost Variance = (Standard Labour Cost) – (Actual Labour Cost)
- Labour Price Variance (or) Labour Wage rate Variance = Actual Hour * (Standard Rate – Actual Rate)
- Labour Efficiency Variance = Standard Rate * (Standard Hour – Actual Hour)

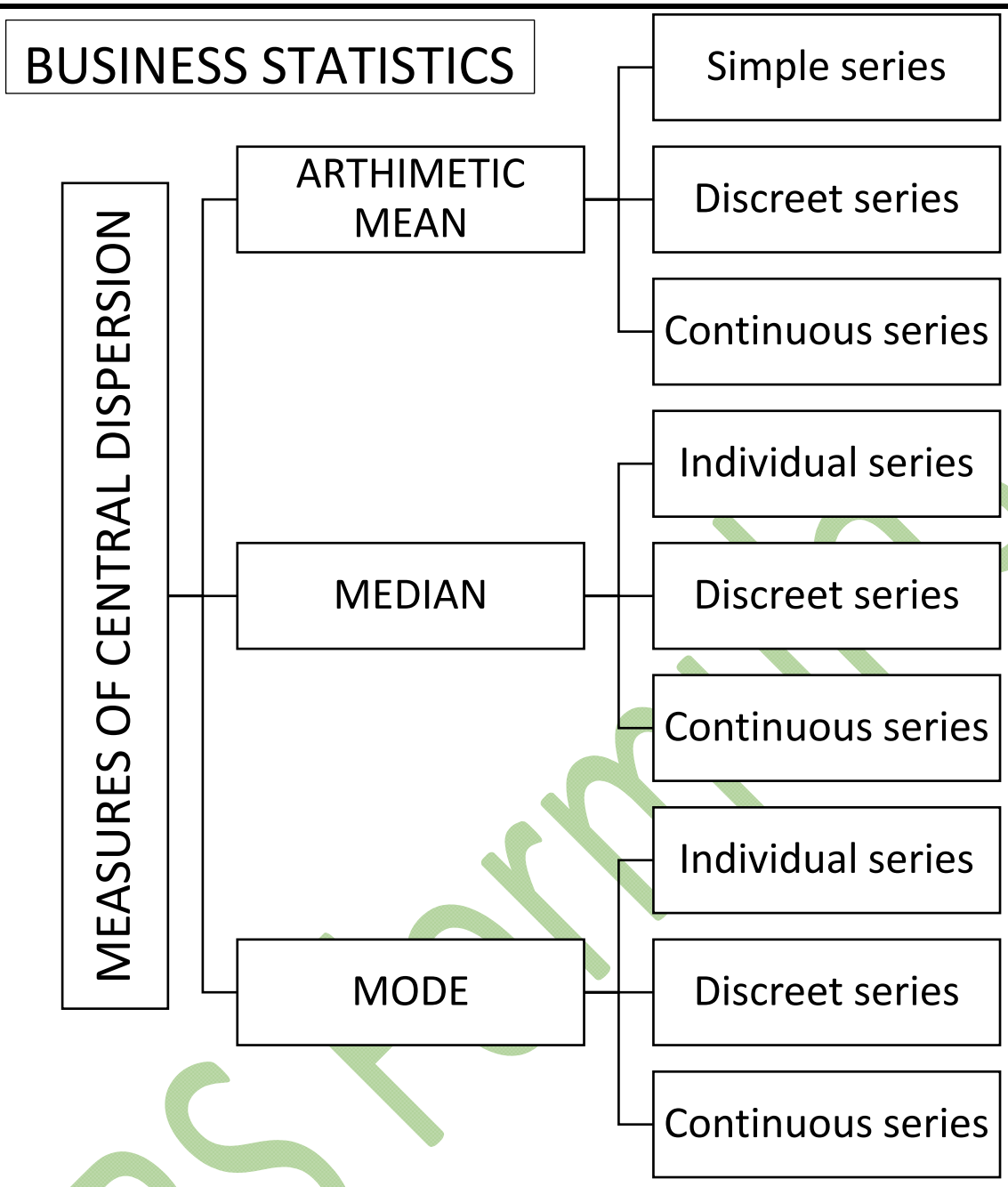
Overhead Cost Variance:-

- ✓ OCV=Absorbed Overhead– Actual Overhead
  (Standard Hours for Actual Output *Standard Absorption Rate) – Actual Overhead
- ✓ VCOV= (Standard Hours for Actual output *Standard Variable overhead Rate per Hour) – Actual Variable Overhead
- ✓ FOCV= (Actual Production* Standard Fixed Overhead Rate) –Actual Fixed Overheads Incurred

Revenue Variances

Sales Variance

- Total Sales Value Variance (TSVV)= Budgeted Sales–Actual Sales
- Sales Rate Variance (SRV)=Actual Quantity (Standard Rate-Actual Rate)
- Sales Volume Variance (SVV)= Standard Rate (Budgeted Quantity-Actual Quantity)
- Sales Mix Variance (SMV)=Revised Standard sales– Standard Sales
- Sales Quantity Variance (SQV)=Budgeted Sales–Revised standard Sales


BUSINESS STATISTICS
MEASURES OF CENTRAL DISPERSION
ARTHIMETIC MEAN
Simple series
Discreet series
Continuous series
MEDIAN
Individual series
Discreet series
Continuous series
MODE
Individual series
Discreet series
Continuous series

➢ ARTHIMETIC MEAN

- Simple series :- $\overline{X} = \sum x/n$

  (or) $\overline{X} = A + \sum d/N$

- Discreet series :- $\overline{X} = \frac{\sum fx}{\sum f}$
- Continuous series :- $\overline{X} = \frac{\sum fx}{\sum f}$

➢ MEDIAN

- Individual series :-
  - If N is "ODD"
    - Median = $\left[\frac{N+1}{2}\right]^{th}$ term
  - If N is "EVEN"
    - $\left[\frac{N}{2}\right]^{th}$ term
    - $\left[\frac{N}{2}+1\right]^{th}$ term
- Discreet series :- M = $\left[\frac{N+1}{2}\right]^{th}$ term
- Continuous series :- M = $L_1 + \frac{m-c}{f} * (L_2 - L_1)$

m = median number

i.e.., m = N/2

f = frequency of class

c = cumulative frequency of preceding class

L_2 = Upper limit

L_1 = Lower limit

➢ MODE

- Individual series :- Most repeated times
- Discreet series :- ---------
- Continuous series :-

  Z = $L_1 + \frac{fm-f1}{2fm-f1-f2} * (L_2-L_1)$

fm = frequency of modal class

f_1 = frequency of class preceding to the modal class

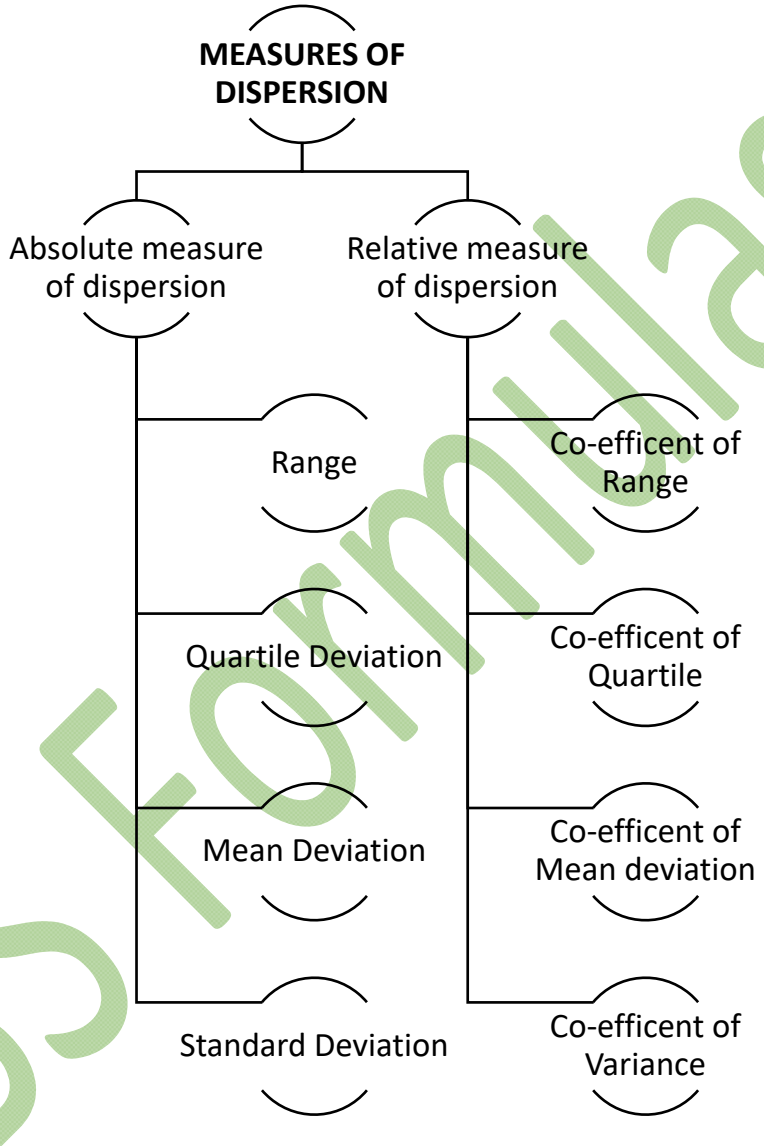
f_2 = frequency of class succeeding to the modal class

➢ Relation between Mean , Median & Mode

Mode = 3 Median - 2 Mean

$$\text{Mean} = \frac{3\ Median - Mode}{2}$$

MEASURES OF DISPERSION



➢ Absolute Measure Of Dispersion

- Range = Largest Value – Smallest Value
- Quartile Deviation =
  - Individual Series/Discreet Series
    - Q_1 (first quarter) = $\left[\frac{N+1}{4}\right]^{th}$ Value
    - Q_2 (second quarter) = $\frac{2(N+1)}{4}$ th Value
    - Q_3 (Third quarter) = $\frac{3(N+1)}{4}$ th Value
  - Continuous Series
    - $Q_k = L_1 + \frac{\frac{KN}{4} - C}{f} * (L_2 - L_1)$
- Standard Deviation

$$\sigma = \sqrt{(x-\overline{x})^2 + (x-\overline{x})^2 + \cdots + (x-\overline{x})^2 * \frac{1}{n}}$$

(or)

$$\sigma = \sqrt{\sum_{i=1}^{n} \frac{(x-\overline{x})^2}{N}}$$

  - Continuous series = $\sqrt{\frac{\sum f(x-\overline{x})^2}{\sum fx}}$

➢ Mean deviation

  - Individual series = $\frac{\sum |dx|}{N}$
  - Discreet series = $\frac{\sum f|dx|}{\sum f}$
  - Continuous series = $\frac{\sum f|dx|}{\sum f}$

$|dx|$ = deviation from mean or median (ignoring + or – sign)

- Co-efficient of Range

$$= \frac{Largest\ value - Smallest\ value}{Largest\ value + Smallest\ value}$$

- Semi-Inter quartile deviation

$$Q.D = \frac{Q_3 - Q_1}{2}$$

- Inter quartile deviation

$$Q_3 - Q_1$$

- Co-efficient of quartile deviation

$$= \frac{Q3 - Q1}{Q3 + Q1}$$

- Mean deviation

$$= \frac{\sum |dx|}{N}$$

- Coefficient of mean deviation

$$= \frac{mean\ deviation}{mean}$$

- Coefficient of variance = $\frac{\sigma}{\bar{x}} * 100$

- Coefficient of variance :- $\sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}}$

GEOMETRIC MEAN

- Individual series:-

$$GM = \text{Antilog}\left[\frac{\sum \log x}{n}\right]$$

- Discreet series and Continuous series:-

$$GM = \text{Antilog}\left[\frac{\sum f \log x}{\sum f}\right]$$

HARMONIC MEAN

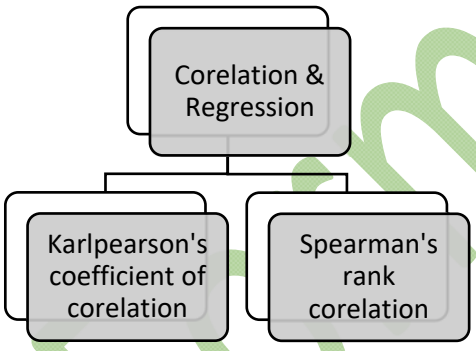
- Individual series:-

$$HM = \frac{1}{\frac{1}{N}\sum 1/n}$$

- Discreet series:-

$$HM = \frac{\sum f}{\frac{\sum f}{x}}$$

Corelation & Regression



- Karl Pearson's Co-efficient of correlation: -

- When deviation are taken from assumed mean

$$r = \frac{N\sum dxdy - \sum dxdy}{\sqrt{N\sum dx^2 - (\sum dx)^2}\ \sqrt{N\sum dy^2 - (\sum dy)^2}}$$

- Step-Deviation method

$$r = \frac{N\sum d_x^1\ d_y^1 - \sum d_x^1\ d_y^1}{\sqrt{N\sum d_{x^2}^1 - (\sum d^1x)^2}\ \sqrt{N\sum d_{y^2}^1 - (\sum d^1y)^2}}$$

- Actual data is considered

$$r = \frac{n\sum xy - \sum x\sum y}{\sqrt{n\sum x^2 - (\sum x)^2}\ \sqrt{n\sum y2 - (\sum y)^2}}$$

➢ Spear men's Rank Corelation

- When Ranks are given

$$r = 1 - \frac{6\sum d^2}{N^3 - N}$$

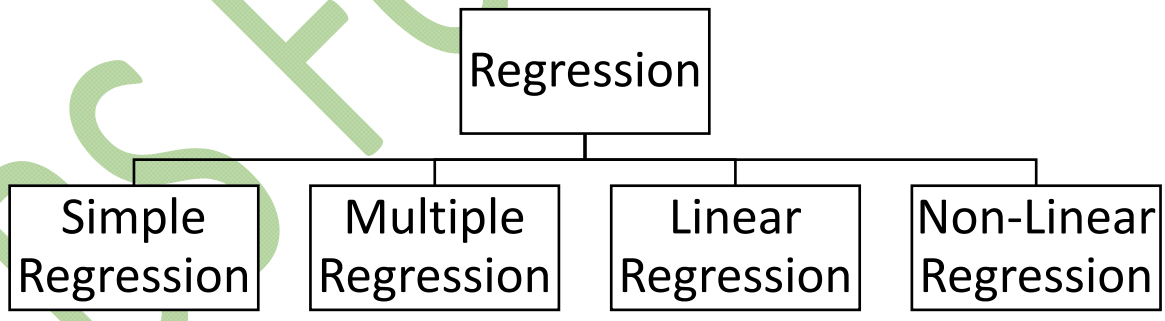
- When Ranks are not given

$$r = 1 - \frac{6\sum d^2}{N^3 - N}$$

- When Ranks are tied

$$r = 1 - 6\left[\frac{\sum d^2 + \frac{1}{12}(m_1^3 - m_1) + \frac{1}{12}(m_1^3 - m_1) + \cdots + \frac{1}{12}(m_n^3 - m_n)}{n^3 - n}\right]$$

CORELATION AND REGRESSION



Linear regression equation (least square method)

X on Y x = a + by [a – dependent ; b - independent]

$$\sum x = Na + b\sum y \quad \Rightarrow (1)$$

$$\sum xy = a\sum y + b\sum y^2 \quad \Rightarrow (2)$$

Y on X y = a + bx [a – dependent ; b - independent]

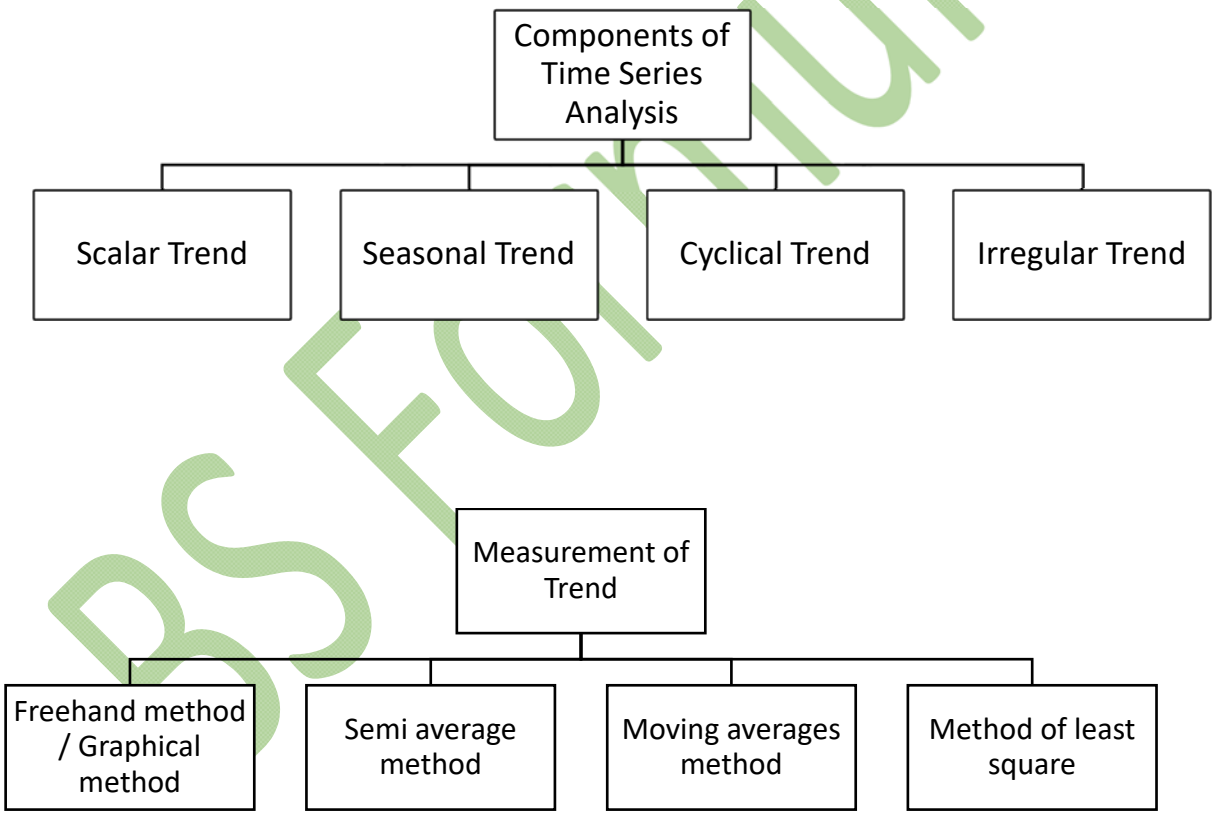
$$\sum y = Na + b\sum x \quad \Rightarrow (1)$$

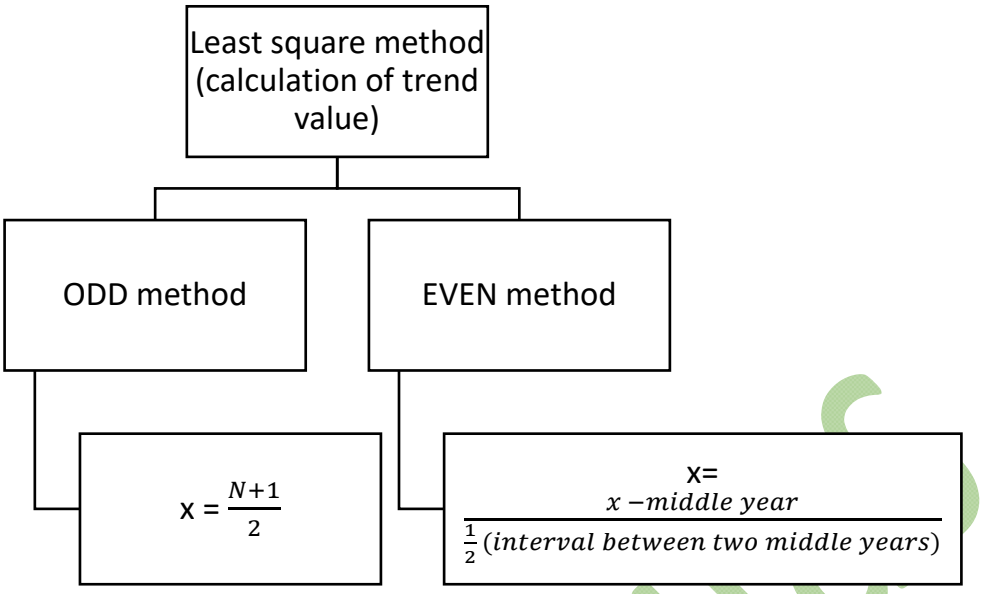
$$\sum xy = a\sum y + b\sum x^2 \quad \Rightarrow (2)$$

Multiple Regression:-

$$X = a_{123} + b_{123}Y_1 + c_{123}Y_2$$

Time Series Analysis





Ratio to trend method or Ratio to moving average method

$$\text{Constant factor} = \frac{400}{S}$$

PROBABILTY DISTRIBUTION

$n_r^p = \frac{n!}{n-r!}$ (Permutation)

$n_r^c = \frac{n!}{n-r!\, r!}$ (Combination)

General rule of probability :- m = ways to happen.

n = fails to happen.

$$P(A) = \frac{m}{m+n}$$

GRAPHICAL PROBABILTY :- $P = \frac{Number\ of\ favourable\ events}{Total\ number\ of\ equal\ likely\ cases}$

P + Q = 1 [P = 1 – Q ; Q = 1 – P]

P(AUB) = P(A) + P(B) - P(A∩B)

Mutually Exhasive events

P(AUBUC) = P(A) + P(B) + P(C)

– P(A∩B) – P(B∩C) – P(C∩A) + P(A∩B∩C)

0! = 1 ; 1! = 1

A∩B = 0

Mean = nP ; Standard deviation (SD) = $\sqrt{npq}$

Poison Distribution => $f(x) = \frac{e^{-m} m^x}{x!}$

Normal Distribution => $Z = \frac{X - u}{\sigma}$

Binomial Distribution => $f(r) = n_r^c * p^r * q^{n-r}$

Bayes Theorem => P $\left[\frac{E_k}{E}\right] = \frac{P\,(E_k)P\,(\frac{E}{E_k})}{\sum_{i=0}^{n} P(E_k)P(\frac{E}{E_k})}$

Mutually exclusive & Exhasive event =>

$$P[\frac{A_1}{B}] = \frac{P\,(A_1)P(\frac{B}{A_1})}{P(A_1)P\left(\frac{B}{A_1}\right)+P\,(A_2)P(\frac{B}{A_2})}$$

Hypotheses Testing

Null hypothesis = H_0

Alternative hypothesis = H_1

If Null hypothesis is true then, $\boldsymbol{H_0 : \mu = \mu_0}$

If Alternate hypothesis is true then, $\boldsymbol{H_1 : \mu \neq \mu_0}$

- **For one sample:-** $Z = \frac{X-\mu}{\frac{\sigma}{\sqrt{n}}}$ where $\boldsymbol{\mu}$ = Population mean

  σ = Standard deviation

  n = size of population ; x =sample mean

- **For two samples:-** $Z = \frac{(x_1-x_2)}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}}$

  Where S1 & S2 are two samples

  N1 & n2 are population sizes

- **Z test (sample size > 30)**

  i. One sample: $Z = \frac{\overline{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$

  where $\overline{x}$ = Population mean

  σ = Standard deviation

  n = size of population

  x =sample mean

-or- $Z = \frac{\overline{x} - \mu}{SE}$, where SE = Standard error of mean $SE = \frac{\sigma}{\sqrt{n}}$

ii. Two sample: $Z = \frac{(\overline{x}_1 - \overline{x}_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$ -or- $Z = \frac{(\overline{x}_1 - \overline{x}_2)}{SE}$;

$SE = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$

iii. For 2 standard deviations of 2 samples

$$Z = \frac{(S_1 - S_2)}{\sqrt{\frac{\sigma_1^2}{2n_1} + \frac{\sigma_2^2}{2n_2}}}$$

- **T – Distribution** (sample size $\leq$ 30)

  i. For one mean & one sample

  $t = \frac{\overline{x} - \mu}{s} * \sqrt{n}$, where $s = \sqrt{\frac{\sum(x - \overline{x})^2}{(n-1)}}$

if standard deviation is given without using (n-1) as denominator, then, $t = \frac{\overline{x} - \mu}{s/\sqrt{n-1}}$

ii. For 2 means of two samples

$$t = \frac{\overline{x}_1 - \overline{x}_2}{S} * \sqrt{\frac{n_1 n_1}{n_1 + n_2}}$$

$S = \sqrt{\frac{\sum(x_1 - \overline{x_2})^2}{n_2 + n_1 - 1}}$ Where $\overline{x}_1 = mean\ of\ first\ sample$

$\overline{x_2} = mean\ of\ two\ sample$

S = combined standard deviation

$n_1 = number\ of\ observations\ of\ first\ sample$

$n_2 = number\ of\ observations\ of\ two\ sample$

iii. Testing two sample mean, respective SD are unknown and equal

$$t = \frac{\overline{D} - 0}{\frac{\sigma_{diff}}{\sqrt{n}}} \; ; \sigma_{diff} = \sqrt{\frac{\sum D_i^2 - [\overline{(D)^2} * n]}{(n-1)}}$$

$\overline{D} = \frac{\sum D}{n}$ Where $\overline{D} = Differnce\ before\ \&\ after$

$\sigma_{diff} = SD$

$D_i^2 = Differnce\ Square$

- **F – Distribution**

$$f = \frac{larger\ sample\ variance}{smaller\ sample\ variance}$$

NON-PARAMETRIC TESTING

- **Rank some test**

Sample size less than 10

$$\mu_1 = n_1 n_2 + \frac{n_1 (n_1+1)}{2} - R_1$$

$$\mu_2 = n_1 n_2 + \frac{n_1 (n_1+1)}{2} - R_2$$

If the sample size < 10 then normal distribution Z test statistics

given as,

$$Z = \frac{\mu - n_1 n_2 / 2}{\sqrt{n_1 n_2 (n_1+n_2) / 12}}$$

Where $\frac{n_1 * n_2}{2}$ is mean

$\sqrt{n_1 n_2 (n_1+n_2) / 12}$ is std. deviation

- **KW test**

$$H = \frac{12}{n\ (n+1)} \sum_{1=1}^{k} \frac{R_i^2}{n_i} - 3(n+1)$$

Managerial Economics

✓ BEP (in units-Qty) = $\frac{Fixed\ cost}{Contribution\ per\ unit\ (or) P.V.Ratio}$

Contribution (per unit) = Fixed cost per unit – Variable cost per unit

✓ BEP (in sales-Rupees) = $\frac{Fixed\ cost}{PV\ ratio}$

PV ratio = $\frac{Sales - Variable\ cost}{Sales} * 100$

PV ratio = $\frac{Contibution}{Sales} * 100$

PV ratio = $\frac{Change\ in\ profit}{Change\ in\ sales} * 100$

✓ Safety Margin = $\frac{Sales - Break\ even\ quantity}{Sales} * 100$

-or- Safety Margin = Sales – Break even sales (or) BEP

✓ Contribution Ratio = P.V. Ratio

✓ Target Profit Sales = $\frac{Fixed\ cost - Target\ Profit}{Contribution\ margin}$

Contribution margin = Price – Variable Cost

✓ Fixed cost = Sales * PV Ratio – Profit

✓ Profit = PV Ratio * Sales – Fixed cost

✓ Target Profit Sales = $\frac{Fixed\ cost - Target\ Profit}{PV\ Ratio}$

✓ Sales = Fixed cost + Variable cost +Profit

✓ Sales = $\frac{Fixed\ cost + Target\ Profit}{PV\ Ratio}$

✓ MOS = $\frac{Profit}{P.V.Ratio}$

✓ Total Cost = Cost per unit * Total Quantity Produced -or-
Total cost = Total Fixed Cost + Total Variable Cost

✓ Total Fixed cost = Total Cost – Total Variable Cost -or- TFC = Average Fixed Cost * Quantity

✓ Total Variable Cost = Total cost – Total Fixed Cost

-or- Total Variable Cost = Average Variable cost * Quantity

-or- Addition Of Marginal Cost

✓ Average cost = $\frac{Total\ Cost}{Quantity}$ -or- Avg cost = Avg FC + Avg VC

✓ Average Fixed cost = $\frac{Total\ cost}{Quantity}$

-or- Average cost – Average Variable cost

✓ Average Variable cost = $\frac{Total\ Variable\ cost}{Quantity}$

-or- Average cost – Average Fixed cost

✓ Marginal Cost = $\text{Total Cost}_n - \text{Total Cost}_{n-1}$

-or- Marginal Cost = $\frac{Change\ in\ Total\ Cost}{Change\ in\ Total\ Quantity}$