Time value of money
(FORMULAS)

Date

Simple Interest –

1. $SI = \frac{P \times r \times t}{100}$

2. Amount $= P\left(1+\frac{rt}{100}\right)$, $P + \frac{Prt}{100}$, $P+SI$

P = principal Value
r = rate of Interest
t = time (in yrs)

Ex– The sum required to earn a monthly interest of ₹1200 at 18% p.a SI is :

Sol. $1200 = P \times \frac{18}{100} \times \frac{1}{12} = \boxed{80000} = P$ (Ans)

Compound Interest –

1. $CI = P[(1+i)^n - 1]$, $A-P$

2. Amount $= P(1+i)^n$

3. Dep $= A = P(1-i)^n$

P = principal Value
$n = t \times$ noccpy
$i = \frac{r}{\text{noccpy}}$

Ex– The CI on ₹40000 at 10% p.a for 1 year when the interest is payable quaterly is :- $i = \frac{10}{4}\%$, $n = 1 \times 4 = 4$

Sol $CI = 40000\left[\left(1+\frac{10}{4}\%\right)^4 - 1\right] = 4152.51$ (Ans)

Effective interest rate –

$ERR = [(1+i)^n - 1]$ Ex. The ERR corresponding to nominal rate of 7% convertible quaterly is $= E = \left[\left(1+\frac{7}{4}\%\right)^4 - 1\right] \times \frac{}{100} = 7.18\%$ (Ans)

FV – Kuch nhi likha → Regular
Immediately, Starting today, now → Due

ANNUITY

Future Value

SINGLE :

$FV = CF(1+i)^n$

CF = cash flow

REGULAR :

$FVAR = Ai \times FVAF(n,i)$

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

Ai = Annuity, FVAF = Future value annuity factor

DUE :

$FVAD = Ai \times FVAF(n,i) \times (1+i)$

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

Present Value

SINGLE :

$PV = \frac{CF}{(1+i)^n}$, CF = Cash flow

REGULAR :-

$PVAR = Ai \times PVAF(n,i)$

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

Ai = Annuity
PVAF = Present value annuity factor
PVAF = $(1+i)$ - - - - n GT

DUE :

$PVAD = \left[Ai \times PVAF\{[(n-1)],i\}\right] + Ai$

Date

Perpetuity –

1. Present value, $PVP = \frac{A_i}{i}$

2. Growing, $PVGP = \frac{A_i}{i-g}$

g = growth rate

$i < g \rightarrow$ not possible

Real rate of Return –

RRR = Nominal rate of Return – Rate of Inflation

Sinking Fund –

$$SF = a\frac{(1+i)^n - 1}{i}$$

Difference b/w CI & SI –

1. For 2 years $= P\left(\frac{R}{100}\right)^2$

2. For n years $= P\left[\left(1+\frac{R}{100}\right)^n - 1 - \frac{R \times n}{100}\right]$

Leasing

- Lessee
  - Purchase
  - Lease
  - (Cost v/s Present value of lease payment)
- Lessor
  - Sell
  - Lease out
  - (Sale price v/s Present value of lease receipt)

Date

1. No. of possible subset of any set $= 2^n$
2. No. of proper subset of any set $= 2^n - 1$
3. If $n(A) = n(B)$ then A, B
   n → cardinal No.
4. De Morgan's law $= (P \cap Q)' = P' \cup Q'$
   $(P \cup Q)' = P' \cap Q'$
5. Two sets formula $= n(A \cup B) = n(A) + n(B) - n(A \cap B)$
6. Three sets formula –
   $= n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$

Types of Relation

Reflexive
$(a,a)(b,b)(c,c)$
- is equal to
- is same as

Symmetric
$(a,b) = (b,a)$
- is reciprocal of

Transitive
$(a,b)(b,c) = (a,c)$
- is smaller then

Equivalence
includes all three
$(R + S + T)$

Sequences & Series

General term (n^{th} term of an AP) –

$$t_n = a \pm (n-1)d$$

Calci trick = $\boxed{a}$ $\boxed{+}$ or $\boxed{-}$ $\boxed{d}$ $\boxed{=}$ $\boxed{=}$ ..... $\boxed{=}$

t_2 t_3 t_n

Sum of first n terms –

$$S_n = \frac{n}{2}[a + t_n] \quad \text{OR} \quad \frac{n}{2}\left[a + a + (n-1)d\right] \quad \text{OR} \quad \frac{n}{2}\left[2a + (n-1)d\right]$$

use when t_n is given

use when t_n is not given

Calci trick = $\boxed{a}$ $\boxed{+/-}$ $\boxed{d}$ = = = = ... $\boxed{=}$ $\boxed{GT}$ $\boxed{+}$ $\boxed{a}$

t_n

Sum of first n natural or counting numbers –

$$S = \frac{n(n+1)}{2}$$

Sum of first n odd no's = $S = n^2$

Sum of squares of first n natural no's = $S = \frac{(n+1)(2n+1)n}{6}$

Sum of cube of first n natural no's = $S = \left\{\frac{n(n+1)}{2}\right\}^2$

General term (n^{th} term of an GP) –

$$t_n = a r^{(n-1)}$$

r = common ratio

Calci trick = $\boxed{r}$ X $\boxed{a}$ = = =

t_2 t_3 t_4

Sum of n terms of GP

$$S_n = \frac{a(r^n - 1)}{r-1}$$

Calci trick = $\boxed{r}$ $\boxed{X}$ $\boxed{a}$ $\boxed{=}$ $\boxed{=}$ ..... $\boxed{=}$ $\boxed{GT}$ $\boxed{+}$ $\boxed{a}$

t_2 t_3 t_n

Sum of ∞ GP (only used when $-1 < r < 1$)

$$S_\infty = \frac{a}{(1-r)}$$

i) AP (General term):-

$$t_n = a+(n-1)d$$

$t_n = a \pm d \underset{t_2}{=} \underset{t_3}{=} \underset{t_4}{=} \cdots$

ii) Sum of first n terms of an AP:-

$$S_n = \frac{n}{2}(a+t_n)$$

$$S_n = \frac{n}{2}(2a+(n-1)d)$$

$a \pm d \underset{t_2}{=} \underset{t_3}{=} = \underset{t_5}{=}$ GT $+a$

iii) Sum of first n natural terms:-

$$S = \frac{n(n+1)}{2}$$

iv) Sum of first n odd no.s:-

$$S = n^2$$

v) Sum of the squares of first n natural nos:-

$$S = \frac{n(n+1)(2n+1)}{6}$$

vi) Sum of cubes of first n natural nos:-

$$S = \left\{\frac{n(n+1)}{2}\right\}^2$$

i) GP (General term):

$$t_n = ar^{n-1}$$

$r \times a \underset{t_2}{=} \underset{t_3}{=} \underset{t_4}{=} \cdots \underset{t_n}{=}$

(ii) Common Ratio $= r$

$$r = \frac{t_2}{t_1} = \frac{t_3}{t_2} = \frac{t_4}{t_3}$$

(iii) Sum of first n terms

$$S_n = \frac{a(1-r^n)}{1-r}$$

$$S_n = \frac{a(r^n-1)}{r-1}$$

$r \times a = = = = GT + a$

(iv) If three terms are in GP

x, y, z

$$\frac{y}{x} = \frac{z}{y}, \quad y^2 = xz$$

(v) If three terms are in AP p, q, r

$$q - p = r - q$$

$$q = \frac{p+r}{2}$$

(vi) $S_\infty = \frac{a}{1-r} \{-1 < r < 1\}$

1) Quadratic Equation - $ax^2+bx+c=0$

2) Formula - $\dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

3) Sum of Roots - $\alpha+\beta = \dfrac{-b}{a}$

4) Product of Roots - $\alpha\beta = \dfrac{c}{a}$

5) Construction of a Quadratic Equation $= x^2-(\alpha+\beta)x+\alpha\beta=0$

$= x^2 -$ sum of roots (x) + Product of Roots

6) Discriminant -

- If $b^2-4ac<0$
  - roots are unreal or imaginary
- If $b^2-4ac \geq 0$
  - roots are real
    - $b^2-4ac=0$
      - roots are real & equal $(\alpha=\beta)$
    - $b^2-4ac>0$
      - roots are real & unequal $(\alpha \neq \beta)$
        - b^2-4ac is a perfect sq
          - roots are real, unequal & $\boxed{\text{rational}}$ also
        - b^2-4ac is not a perfect sq - roots are real, unequal & $\boxed{\text{irrational}}$

7) difference b/w root use equation $\}$ $(a+b)^2-(a-b)^2=4ab$

8) Identity

$(\alpha^2+\beta^2) = (\alpha+\beta)^2 - 2\alpha\beta$

CH-5 Permutations & combinations

OR → + Plus
AND → × Product

Permutations (Arrangement)
- direct (If all persons/objects are involved)
- After selection

$${}^nP_r = \frac{n!}{(n-r)!} \quad \left\{ \begin{matrix} n \geq r \\ n \rightarrow +ve \text{ integer} \end{matrix} \right\}$$

Particular case of theorem ($n=r$)

$${}^nP_n = \frac{n!}{(n-n)!} = \frac{n!}{0!} = n! \quad \{0! = 1\}$$

Special formula

$$(n+1)! - n! = n \cdot n!$$

ex- $6! - 5! = 5 \times 5!$

$720 - 120 = 5 \times 120$

$600 = 600$

Circular permutation (Part-II)
- No person has the same two neighbours
- different forms of necklaces/garlands.

$$\boxed{\frac{1}{2}(n-1)!}$$

(Part I) → $(n-1)!$

Steps to do sum of all n digit numbers:-

1. Find the number of numbers that can be formed (no. of possible no.s)
2. Find the repetition value of each digit

$$\text{Repetition of each digit} = \frac{\text{Value of step 1}}{\text{no. of different digits}}$$

3. Find the sum of digits
4. Sum of digits × Repetition
5. Multiply value of step by 1111, 111 etc in case of four digit no.s & three digit no.s respectively.

Formula - (Theorem)

$$\left[{}^{n-1}P_r\right] + \left[r \cdot {}^{n-1}P_{r-1}\right] = {}^nP_r \text{ - Total permutations}$$

- ${}^{n-1}P_r$ ↓ One particular thing always included
- $r \cdot {}^{n-1}P_{r-1}$ ↓ One particular thing always excluded

Combinations

- $^nC_r = \dfrac{^nP_r}{r!} = \dfrac{n!}{(n-r)! \times r!}$
- $^nC_0 = 1$ choose none of them
- $^nC_n = 1$ choose all of them

select 4 out of 5 = select 1 out of 5
select 3 out of 5 = select 2 out of 5

- Complementry theorem = $^nC_r = {^nC_{n-r}}$

Picking r thing to select = Picking (n-r) things to select

- no. of lines can be formed using given points = $^nC_2$
- Combination of n different thing taking n thing at a time

one or more $2^n - 1$

zero or more 2^n

(1) No. of straight lines with the given n points = $^nC_2$ (as we need to select 2 pts to make a line)

(2) no. of triangles with the given n points = $^nC_3$ (as we need to select 3 pts to make a triangle)

(3) No. of straight lines with the given n points where m points are collinear = $^nC_3 - {^mC_2} + 1$

(4) no. of triangle with the given n points where m points are collinear = $^nC_3 - {^mC_3}$

(5) no. of ||gm with the given one set of m parallel lines and another set of n || lines = $^nC_2 \times {^mC_2}$ Selecting 2 lines from each set of || lines

(6) No. of diagonals with n sides = $^nC_2 - n$

CHAPTER - 15 Probability

Concepts -

Total no. of possible events = p^q

where p = no. of events in one trial

q = no. of trials

Addition Theorems :-

1) For two mutually exclusive events = $P(A \cup B) = P(A) + P(B)$
2) For any n no. of mutually exclusively events = $P(A_1 \cup A_2 \cup A_3 \cup A_4 \dots \cup A_n) = P(A_1) + P(A_2) + P(A_3) + P(A_4) \dots P(A)_n$
3) For any two events (in general) = $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
4) For any three events A, B, C = $P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(A \cap C) + P(A \cap B \cap C)$

Conditional Probability -

$$P(A/B) = \frac{P(A \cap B)}{P(B)}$$

$$P(B/A) = \frac{P(B \cap A)}{P(A)}$$

Also,

$$P(A'/B) = \frac{P(A' \cap B)}{P(B)}$$

$$P(A/B') = \frac{P(A \cap B')}{P(B')}$$

$$P(B/A') = \frac{P(B \cap A')}{P(A')}$$

Compound theorem :-

For Independent → $P(B/A) = P(B)$

$P(A/B) = P(A)$

Joint Probability → $P(A \cap B) = P(A) \times P(B)$

Independents	v/s Mutually exclusive
when occurence of one event do not influence occurence of other.	• events that do not occur simultaneously • occurence of one implies non-occurence of other • one event influence other which implies they are dependent.

CH-14 Central Tendency and Dispersion

Arithmetic mean -

1. Discrete observations $\rightarrow \bar{x} = \frac{x_1 + x_2 + x_3 + x_4 \ldots + x_n}{n} = \frac{\Sigma x}{n}$

2. Frequency Distribution $\rightarrow \bar{x} = \frac{\Sigma fx}{n}$ $\left\{ \begin{array}{l} \text{grouped, } x = \text{individual} \\ \text{Ungrouped, } x = \text{mid-pt} \end{array} \right\}$

3. Assumed mean / step deviation $\rightarrow \bar{x} = A + \frac{\Sigma fd}{N} \times C$ $\left\{ \begin{array}{l} A = \text{Assumed mean, } C = \text{class length} \\ D = \frac{x-A}{C} \end{array} \right\}$

4. Combined AM $\rightarrow \bar{x}_c = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2}$

Median -

1. $Me = l_1 + \left[\frac{\frac{n}{2} - n_1}{n_u - n_1} \right] \times C$ $\left\{ \begin{array}{l} l_1 = \text{LCB of median class, } C = \text{class length} \\ N_u = \text{Cf of median class,} \\ N_1 = \text{pre-median cf of median class} \end{array} \right\}$

i) Find cf = cumulative freq.
ii) Calculate $n/2$ and median class
iii) Apply formula

How to find Partition Value?

1st Rank (Position) $\rightarrow [(n+1)p]^{th}$ term $\rightarrow n$ = no. of observations

2nd Value obtain

P = depends on type of PV

PV	Q_1	Q_2	Q_2	D_1	D_9	P_1	P_{39}	Me
value of P	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{2}{4}$	$\frac{1}{10}$	$\frac{9}{10}$	$\frac{1}{100}$	$\frac{39}{100}$	$\frac{1}{2}$

Mode -

1. Discrete $\rightarrow$ Highest / Max freq

2. Frequency Dis $\rightarrow Mo = l_1 \left\{ \frac{f_0 - f_{-1}}{2f_0 - f_{-1} - f_1} \right\} \times C$ $\left[\begin{array}{l} f_0 = \text{freq of modal class} \\ f_1 = \text{freq of post modal class} \\ f_{-1} = \text{freq of pre modal class} \end{array} \right]$

GM = for avg of ratios like Percentage

HM = for avg of ratios like rate of change of cost per unit, speed, hours per day, etc

AM = for all other averages

Relationship b/w mean / Mode / Median –

1) Symmetric Distribution → Mean = median = mode

2) Asymmetric / skewed distribution → Mean − mode = 3(mean − median)

OR Mode = 3 median − 2 mode

Skewness
1 – Positive (Mean > median > mode)
2 – Symmetric (mean = median = mode)
3 – Negative (mean < median < mode)

Geometric Mean – (only for +ve observations)

$(\text{product of observations})^{n\text{th root}}$

Ex ① GM of 36 & 9

$\sqrt{36 \times 9}$ (n = 2)

18

② GM of 8, 56, 4

$\sqrt[3]{8 \times 56 \times 4}$ (n = 3)

12.1648

Harmonic Mean –

1) Discrete observations = $H = \dfrac{n}{\Sigma(1/x)}$

2) simple / grouped frequency = $H = \dfrac{N}{\Sigma(f/x)}$

3) Combined HM = $\bar{x}_c = \dfrac{n_1 + n_2}{\dfrac{n_1}{H_1} + \dfrac{n_2}{H_2}}$

AM / HM / GM

If que mention
- Obs identical or same → AM = GM = HM
- Obs are unique different → AM > GM > HM

If ques silent → AM ≥ GM ≥ HM

For only TWO obs

$AM \times HM = (GM)^2$

DISPERSION

1. Range –

Discrete observation

$L - S$

$\left\{ \begin{array}{l} L = \text{Largest} \\ S = \text{Smallest} \end{array} \right\}$

Grouped freq. Distribution

$L - S$

$\left\{ \begin{array}{l} L = \text{UCB of last class interval} \\ S = \text{LCB of first class interval} \end{array} \right\}$

Coefficient of Range $= \dfrac{L-S}{L+S} \times 100$

<1> change of origin → no affect
<2> change of scale :
→ value – affected
→ Sign – no affect

2. Mean Deviation –

Frequency Distribution

$MD_A = \dfrac{1}{N} \sum f|x-A|$

Discrete

$MD_A = \dfrac{1}{N} \sum |x-A|$

$\left\{ \begin{array}{l} A = \text{appropriate measure of} \\ \text{central tendency} \\ (\text{mean, mode, median}) \end{array} \right\}$

Coefficient of MD $= \dfrac{\text{Mean Deviation of } A}{A} \times 100$

3. Standard Deviation –

Discrete observation

(i) $\sigma_x = SD_x = \sqrt{\dfrac{\sum (x-\bar{x})^2}{n}}$

(ii) $\sigma_x = SD_x = \sqrt{\dfrac{\sum x^2}{n} - \bar{x}^2}$

frequency distribution

(i) $\sigma_x = SD_x = \sqrt{\dfrac{\sum f(x-\bar{x})^2}{n}}$

(ii) $\sigma_x = SD_x = \sqrt{\dfrac{\sum fx^2}{N} - \bar{x}^2}$

For two numbers

$S = \dfrac{\text{Range}}{2}$

For first n natural numbers

$S = \sqrt{\dfrac{n^2-1}{12}}$

Coefficient of variation = $\frac{SD}{AM} \times 100$

Ex Variance of $x = 49$ & $2y + 3x = 10$. Find variance of $y = ?$

Ans $SD_x = \sqrt{49} = 7$

$SD_y = \frac{3}{2} SD_x$

$= \frac{3 \times 7}{2}$

$= 10.5$

$\text{var } y = (10.5)^2$

$= 110.25$

Combined SD =

$$SD_c = \sqrt{\frac{n_1 s_1^2 + n_2 s_2^2 + n_1 D_1^2 + n_2 d_2^2}{n_1 + n_2}}$$

n_1 = no. of obs first set

n_2 = no. of obs second set

s_1 = SD of 1st set

s_2 = SD of 2nd set

$d_1 = \bar{x}_1 - \bar{x}_c$

$d_2 = \bar{x}_2 - \bar{x}_c$

[x_c = comined mean]

Quartile Deviation = $QD_x = \frac{Q_3 - Q_1}{2}$

best measure for open end classification

Coefficient = $\frac{Q_3 - Q_1}{Q_3 + Q_1} \times 100$

CH-17

Correlation and Regression

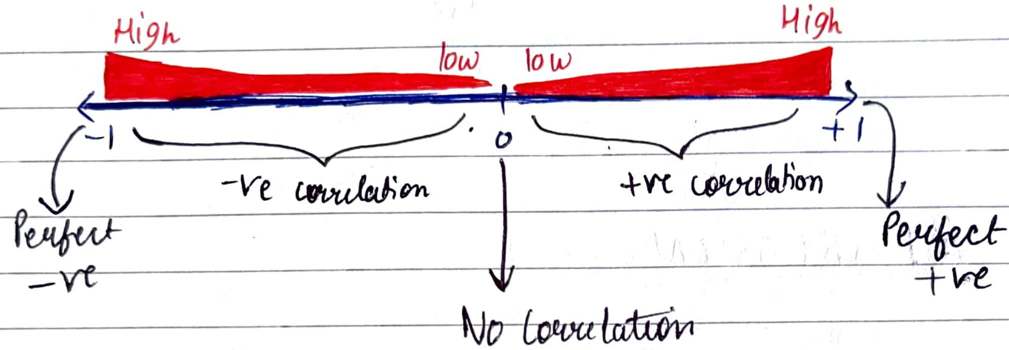
Bivariate Data-

No. of Marginal distribution in bivariate data = 2

No. of Conditional Distributions = $m+n$

r_{xy} (Karl's Pearson's Product moment Correlation coefficient)

$-1 \le r \le 1$



$R_{xy} = \dfrac{\text{Covariance}(x,y)}{SD_x \cdot SD_y}$

Variance of x (univariate) $\longrightarrow$ Co-variance of x, y (bivariate)

$$\frac{\Sigma(x-\bar{x})^2}{n} = \frac{\Sigma[(x-\bar{x})(x-\bar{x})]}{n} \longrightarrow \frac{\Sigma[(x-\bar{x})(y-\bar{y})]}{n}$$

OR

$$\frac{\Sigma x^2}{n} - \bar{x}^2 = \frac{\Sigma(x \cdot x)}{n} - \bar{x}\cdot\bar{x} \longrightarrow \frac{\Sigma xy}{n} - \bar{x}\cdot\bar{y}$$

$SD_x = \sqrt{\dfrac{\Sigma x^2}{n} - (\bar{x})^2}$

$SD_y = \sqrt{\dfrac{\Sigma y^2}{n} - (\bar{y})^2}$

Spearman's Rank correlation Coefficient

$$R_R = 1 - \frac{6\Sigma d^2}{n(n^2-1)}$$

d = difference in Ranks

In case of tie in Rank:

$$r_R = 1 - \left\{\frac{6[\Sigma d^2 + A]}{n(n^2-1)}\right\}$$

A = adjustment value = $\Sigma\left(\dfrac{t^3-t}{12}\right)$

t = tie length (no. of obs tied)

Co-efficient of concurrent deviation →

$$r_c = \pm\sqrt{\pm\left(\frac{2c-m}{m}\right)}$$

c = no. of concurrent data
m = no. of pairs compared (n-1)

$\boxed{\frac{2c-m}{m}}$

+ve → use +ve

-ve → use -ve

REGRESSION

Imperfect Correlation

Calculat Y when X is given	Calulat X when Y is given
↓	↓
Reg eq of $\boxed{Y \text{ on } X}$	Reg eq of $\boxed{X \text{ on } Y}$
↓	↓
minimize vertical Distances	minimize Horizontal Distances

Y on X

$$Y - \bar{Y} = b_{yx}(X - \bar{X})$$

b_{yx} ↓ slope of line Y on x

$$b_{yx} = \frac{\text{Covariance of } x, y}{\text{Variance of } x}$$

X on Y

$$X - \bar{X} = b_{xy}(Y - \bar{Y})$$

b_{xy} ↓ slope of line X on Y

$$b_{xy} = \frac{\text{Covariance of } x, y}{\text{Variance of } y}$$

If r is given in ques,

① $b_{yx} = r \times \frac{SD_y}{SD_x}$ ② $b_{xy} = r \times \frac{SD_x}{SD_y}$

r = correlation coefficient (karl's Pearson)

Change of Scale

① $b_{uv} = b_{xy} \times \dfrac{\text{change of scale of } x}{\text{change of scale of } y}$

② $b_{vu} = b_{yx} \times \dfrac{\text{change of scale of } y}{\text{change of scale of } x}$

} both effect of sign scale & effect of value scale

Portable Error (PE) → $0.6745 \times \dfrac{1-r^2}{\sqrt{n}}$ { r = correlation coefficient, n = no. of pairs of observation }

limits of correlation = $r \pm PE$

$r < PE$ → No correlation

$-1 < r < 1$ → PE can never be -ve

$r > 6PE$ → presence of correlation is certain

If x & y are non-linear but related $r = 0$

If x & y are not related at all $r = 0$

If $r = 0$, then there is no linear correlation but you cannot confirm that there is no correlation.

Review of Correlation & Regression :-

1) Coefficient of determination = r^2
2) Coefficient of Non-determination = $1 - r^2$

INDEX NUMBERS

Simple Aggregate method

Formula $= \frac{\Sigma P_n}{\Sigma P_0} \times 100$

Merits – easy to compute

= does not satisfy UNIT TEST

Simple Aggregate Relatives

Formula $= \frac{\Sigma \frac{P_n}{P_0}}{n}$

Merits = pure numbers

Weighted Aggregate Index

Laspeyres's Index ↓ (L)

$\frac{\Sigma p_n \times q_0}{\Sigma p_0 \times q_0} \times 100$

(a.k.a Weighted Avg of Relative method)

Passche's method ↓ (P)

$\frac{\Sigma p_n q_n}{\Sigma p_0 q_n} \times 100$

Marshall – Edgeworth Index ↓ (M)

$\frac{\Sigma p_n(q_0+q_n)}{\Sigma p_0(q_0+q_n)} \times 100$

Fisher's Ideal Method ↓ (F)

$\sqrt{L \times P}$

⇒ GM of L & P

Bowley's Index (B)

↓

$\frac{L+P}{2}$ = AM of L & P

Chain Index Number

$= \frac{\text{Link relative of current year} \times \text{Chain Index of previous year}}{100}$

Time Reversal Test → $P_{01} \times P_{10} = 1$

(only Remember)

Factor Reversal Test → $\underset{\text{Price test}}{P_{01}} \times \underset{\text{Quantity Index}}{Q_{01}} = \underset{\text{Value Index}}{V_{01}}$ (only Fisher satisfy)

$e = 2.71828$

Theoritical Distribution of Data

Types of probability function

Random Variable

- discrete (mass fun^n)
  - Binomial: ${}^nC_r\, p^r\, q^{(n-r)}$
    - mean $= n \times p$
    - Variance $= n \times p \times q$ (max value $\frac{n}{4}$)
    - Mode = Find $(n+1)p$
      - Integer $\boxed{\text{Bimodal}}$: $(n+1)p$, $(n+1)p-1$
      - Non-integer $\boxed{\text{Unimodal}}$ → largest integer of $(n+1)p$
  - Poisson: $\dfrac{e^{-m} \cdot m^x}{x!}$
    - mean $= u = m$
    - $\sigma^2 = m$
    - mode
      - Integer, Bimodal: m (1), $m-1$ (2)
      - Non-integer, Unimodal: m
- Continous (density fun^n)
  - Normal