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* Geometric mean :-

$$G.M = \sqrt[n]{(1+K) \times (1+K) \times (1+K)} - 1$$

K = rate of return
n = no. of years

(K = rate of Intrest)

$K = 10\%$
$= \frac{10}{100}$
$= 0.10$

$1 + K$
$= 1 + 0.10$
$= 1.10$

$K = 8\%$
$= \frac{8}{100}$
$= 0.08$

$1 + K = 1 + 0.08$
$= 1.08$

Year

2013
2014
2015
2016
2017

$$\sqrt[5]{(1+K) \times (1+K) \times (1+K) \times (1+K) \times (1+K)} - 1$$

$\sqrt{4}$ $\sqrt[10]{100}$ $= 100^{\frac{1}{10}}$

$= 2^2 = 4.$

$= 4^{\frac{1}{2}}$

$= 2^{2 \times \frac{1}{2}}$

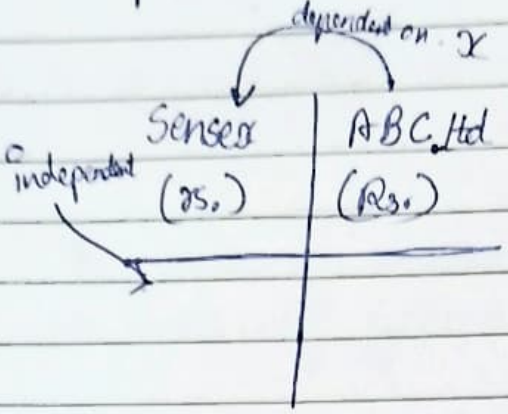
$= 2$

$= 2$

18/8 * Co-variance :-

x → Independent

y → dependent $y = a + bx$



Parameters :-

→ Co-variance → is a measure of relationship bet^n 2 random var
→ Correlation →
→ (Co-efficient)

* Co-variance formula :-

population: $Cov(x,y) = \frac{\Sigma(x_i - \bar{x})(y_j - \bar{y})}{n}$

sample: $cov(x,y) = \frac{\Sigma(x_i - \bar{x})(y_j - \bar{y})}{n-1}$

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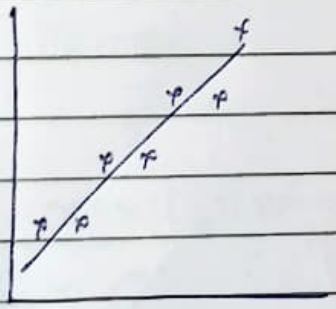
* Co-relation

x	y	
↑	↓	(+)
↓	↓	100

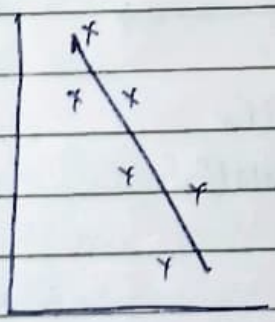
x	y
↑	↓
↓	↑

x	y
10	10
20	20
30	30
40	40



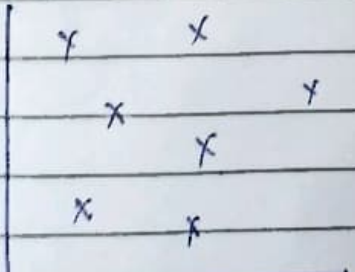
* positive correlation.
* upward slope.
* left to right upward
* direct relation.

price ↑
demand ↓



x	y
10	50
20	100
30	150
40	200

* negative correlation.
* downward slope
* left to right downward
* indirect relation.



* no correlation.

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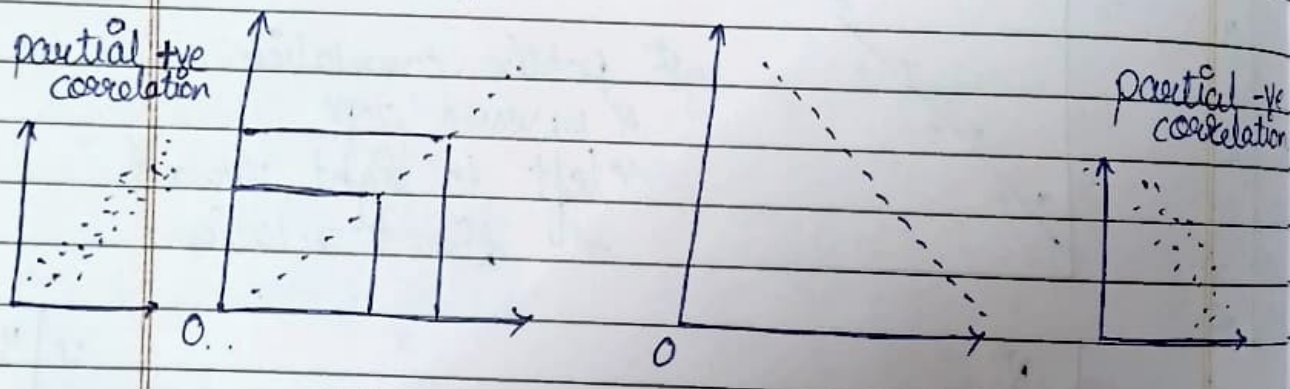
* Co-efficient :-

- There are three methods

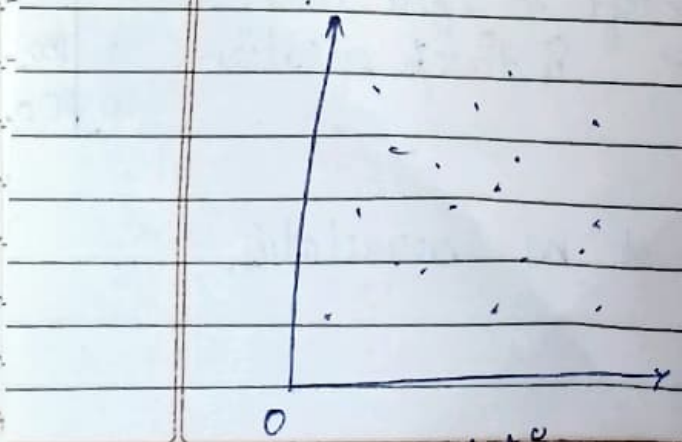
1) Scatter diagram
2) Spearsman rank correlation.
3) Karl Pearson Correlation-coefficient

[1] Scatter Diagram :-



positive correlation

negative correlation.



no relation.

[e] Spearman Rank Correlation :-

honesty, beauty → qualitative data

63, 65, 87, 24, 61, 57, 50, 61,

descending to ascending — position. $\frac{4+5}{2} = 4.5$ → $\frac{4^{th}\text{ rank} + 5^{th}\text{ rank}}{2}$

rank → 87, 65, 63, 61, 61, 57, 50, 24
1 2 3 4 5 6 7 8.

common one → $\frac{\text{addition}}{2}$

* rank correlation formula :-

$r = 1 - \frac{6\Sigma d^2}{n(n^2-1)}$ where, d = difference
n = no. of pairs

Que: two judges have given the ranks to 10 students for there Honesty. Find out rank correlation ~~codination~~ co-ordination.

~~1st judge~~ 1st judge – 3, 5, 8, 4, 7, 10, 2, 1, 6, 9

2nd judge – 6, 4, 9, 8, 1, 2, 3, 10, 5, 7

1 Judge · 2 Judge
9-6 = -3 (difference bet^n 2 rank)

d^2	1st Judge	2nd Judge	d.
9	3	6	-3
1	5	4	-1
1	8	9	-1
8	4	8	-4
12	7	1	6
16	10	2	8
1	2	3	-1
18	1	10	-9
1	6	5	1
4	9	7	2

$n = 10$

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

=

Interpretation of correlation coefficient :-

(1) Interpretation of $r = +1$

* $r = +1$ shows perfect positive correlation between two variables. For such variables an increase in the value of one variable is associated with a proportion increase in the value of the other variable.

(2) Interpretation of $r = -1$

* $r = -1$ shows perfect negative correlation between two variables. For such variables an increase in the value of one variable is associated with a proportion decrease in the value of the other variable.

(3) Interpretation of $r = 0$.

* $r = 0$ shows absence of the relationship between the variables, such variables are said to be unco-related. The variables are independent

(4) If the values of r is nearer to $+1$ or -1, the relationship between the variables is more close, and if the value of r is nearer to 0, the relationship is less close.

(5) The relationship between the variables is not proportional to the value of r that is i.e $r = 0.8$ does not indicate that the relation is two times close than r when $r = 0.4$. $r = 0.8$ indicates more closeness of the relationship than $r = 0.4$.

$r = +1$ (exact one)

in ↑ ↓ dec.
↓ dec. ↓ dec.

$r = -1$

in ↑ ↓ dec. same proportion

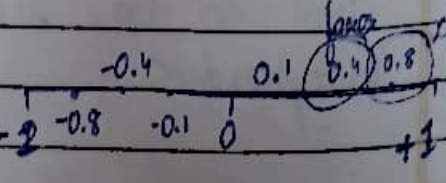
$r = 0$ no relation

far (0.4) nearer (0.8)

$r = +1$ or -1

$r = (0.8)$ (-0.8)

close to $+1$ close to -1



[3] Karl Pearson's Product :-

→ most popular method

$$r = \frac{\text{cov } x,y}{SD_x * SD_y} \qquad \frac{\text{cov } x,y}{\sigma x . \sigma y}$$

S.D = σ

cov. = σ

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2} . \sqrt{\Sigma y^2}}$$

Que: Find out correlation coefficient between length and weight.

length	weight
3	9
4	11
6	14
7	15
10	16

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Co-efficient of Determination = [correlation co-efficient]^2

$= (r)^2$

$r^2 - r^2 = 0$ (or) $r = \pm 1$

$0 \leq r^2 \leq 1$

$r = -0.4$

$r^2 = (-0.4 \times -0.4)$

$= 0.16$