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Batch: A-2
Tut 2 - written
Date: 9/2/23



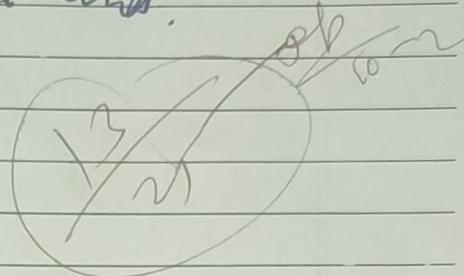
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Batch: A2 Roll No.: 16010421073
Experiment / assignment / tutorial No. 2
Grade: AA / AB / BB / BC / CC / CD / DD

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Tut 2 :- Correlating regression lines.

(Q.10) Mean (x) = 30.1 = \bar{x}
Mean (y) = 47.8 = \bar{y}
S.D (x) = $\sigma_x = 6.2$
S.D (y) = $\sigma_y = 9.5$
 $r = 0.72$



$$r = \frac{\text{COV}(x, y)}{\sigma_x \times \sigma_y}$$

$$0.72 \times 6.2 \times 9.5 = \text{COV}(x, y)$$

$$42.408 = \text{COV}(x, y)$$

$$\frac{\sum (x - \bar{x})(y - \bar{y})}{n} = 42.408$$

$$42.408 - (34 \times 47) + (43 \times 77)$$

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(Q. 2)

Student no	Accountancy	R_1	Statistics	R_2	$\sum D^2 = R_1 - R_2 $
1	45	3	35	1	4
2	70	7	90	6	1
3	65	6	70	4	4
4	30	1	40	2.5	2.25
5	90	8	95	7	1
6	40	2	40	2.5	0.25
7	50	4	60	3	1
8	57	5	80	5	0
					$\sum D^2 = 13.5$

$$R = 1 - \frac{6[\sum D^2 + cf]}{n(n^2 - 1)}$$

$$n = 8$$

$$m_1 = m_2 = 2$$

$$= 1 - \frac{6[13.5 + 0.5]}{8^3 - 8} \quad \text{so } cf = \frac{m_1(m_1^2 - 1)}{12}$$

$$= 1 - \frac{6(14)}{512 - 8}$$

$$= \frac{m_1^3 - m_1}{12}$$

$$= 1 - \frac{1}{6}$$

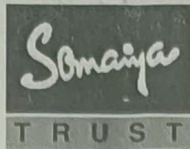
$$= \frac{8 - 2}{12}$$

$$= \frac{5}{6}$$

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

$$R = 0.833$$

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- (i) No the result will not change if we marks of two subjects of all students are increased by 5 because Rank of each student will be same and their square of difference R_1 & R_2 will be same. So there will be no change in Spearman's coefficient.
- Here we are using $R(X, Y) = R(X+a, Y+b)$. Change in origin which is valid for Spearman's coefficient of correlation.

- ii) No the result will not change in this case because $R(X, Y) = R\left(\frac{X}{a}, \frac{Y}{b}\right)$ change of scale property.

(4-30)	Subject 1	R_1	Subject 2	R_2	$D^2 = (R_1 - R_2)^2$
40	1	45	44	$(1-4)^2 = 9$	
46	2	46	25	$(2-5)^2 = 9$	
54	3	50	36	$(3-6)^2 = 9$	
60	4	43	3	$(4-3)^2 = 1$	
70	5	40	1	$(5-1)^2 = 16$	
80	6	75	11	$(6-11)^2 = 25$	
82	7	55	7	$(7-7)^2 = 0$	
85	8	72	10	$(8-10)^2 = 4$	
87	9	65	8	$(9-8)^2 = 1$	
90	10	42	2	$(10-2)^2 = 64$	
95	11	70	9	$(11-9)^2 = 4$	
					$\Sigma D^2 = 142$

$$n = 11$$

$$R = 1 - \frac{6 \sum D^2}{n(n^2 - 1)}$$

$$= 1 - \frac{6(142)}{11(11^2 - 1)}$$

$$= 0.354$$

$$R = 0.354$$

(Q.54) Equations of two lines of regression are

$$9x + 10y - 67 = 0 \quad \text{--- (1)}$$

$$5x + 2y - 23 = 0 \quad \text{--- (2)}$$

i) Mean values

$$\bar{X} = ?$$

$$\bar{Y} = ?$$

$$\therefore \bar{X} = 3$$

$$\bar{Y} = 4$$

Finding \bar{X} & \bar{Y} by
 equating eqⁿ (1) & (2).

$$x = \frac{23 - 2y}{5}$$

$$9\left(\frac{23 - 2y}{5}\right) + 10y - 67 = 0$$

$$207 - 18y + 50y - 335 = 0$$

$$32y = 128$$

$$y = 4$$

$$\text{so } x = 3$$

ii) Regression correlation coeff

Eq (1) (Rearrange)

$$y = -\frac{9x}{10} + \frac{67}{10}$$

$$\text{so } b_{yx} = -\frac{9}{10}$$

$$b_{xy} = \frac{1}{-\frac{9}{10}}$$

iii) Correlation coeff

$$r = \sqrt{b_{yx} \cdot b_{xy}}$$

$$r = 1$$