

Yashoda Girls' Arts & Commerce College, Nagpur



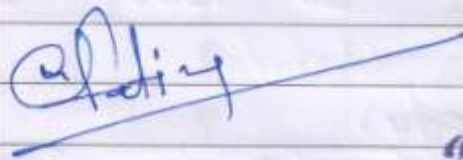
Department of Commerce

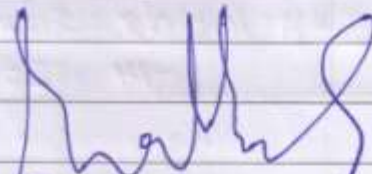
Assignment

Session: 2021 – 2022



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2021-2022





Principal
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Unit - I

* Correlation *

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Q. 1) Calculate co-efficient of correlation between the height and weight of 10 students and by the the of probable errors show whether or relationship is significant.

no. of Student	Height (in inches)	Weight (in lbs)
1	57	113
2	59	117
3	62	126
4	63	125
5	64	130
6	65	128
7	58	110
8	66	132
9	70	140
10	20	149

Height = x

Weight = y



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Solution:

Sl. no	x	dx	dx ²	y	dy (130)	dy ²	dx dy	
1	57	-8	64	113	-17	289	+136	
2	59	-6	36	117	-13	169	+78	
3	62	-3	9	126	-4	16	+12	
4	63	-2	4	125	-5	25	+10	
5	64	-1	1	130	0	0	0	
6	65	0	0	128	-2	4	0	
7	58	-7	49	110	-20	400	+140	
8	66	+1	1	132	+2	4	+2	
9	70	+5	25	140	+10	100	+50	
10	72	+7	49	149	+19	361	+133	
		$n = 10 \sum dx = -14$	$\sum dx^2 = 238$			$n = 10 \sum dy = -30$	$\sum dy^2 = 1368$	$\sum dx dy = 561$

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

$$= \frac{10 \times 561 - (-14 \times 30)}{\sqrt{10 \times 238 - (-14)^2} \sqrt{10 \times 1368 - (-30)^2}}$$

$$= \frac{560 - 420}{\sqrt{2380 - 196} \sqrt{13680 - 900}}$$

$$= \frac{5610}{\sqrt{2184} \times \sqrt{12780}}$$

$$= \frac{5190}{46.733 \times 113.049}$$

$$= \frac{5190}{5283.119}$$

~~$$= 0.98$$~~



* Rank co-Relation. *

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Q. 2) Calculate the rank co-efficient of Correlation of correlation of the following data.

$$x = 110 \quad 112 \quad 117 \quad 95 \quad 90$$

$$y = 50 \quad 32 \quad 45 \quad 40 \quad 30$$

Solution: Calculation of rank co-efficient of Correlation

x	R ₁	y	R ₂	(R ₁ - R ₂)	d ²
110	3	50	1	+2	4
112	2	32	4	-2	4
117	1	45	2	-1	1
95	4	40	3	+1	1
90	5	30	5	0	0
n = 5					$\Sigma d^2 = 10$

Co-efficient of correlation

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

$$= \frac{1 - 6 \times 10}{5 \times (25 - 1)}$$

$$= \frac{1 - 60}{5 \times 24}$$

$$= \frac{1 - 60}{120}$$

$$= -5$$

* Regression *

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Q.13) Information available as under

Subject	Mean	Variance
Statistic	48	64
Account	40	36

Correlation between the mark in statistics and account = 0.49

Find out the following equation

- 1) Regression equation
- 2) Find out the mark in statistics when the mark in account is = 70.
- 3) Find out the mark in account when the mark in statistics is = 75.

Solution :-

$$\begin{aligned} \sigma_x &= \sqrt{\text{Variance of } x} & \sigma_y &= \sqrt{\text{Variance of } y} \\ &= \sqrt{64} & &= \sqrt{36} \\ &= 8 & &= 6 \end{aligned}$$

Statistics = x

Account = y

x on y

$$B_{xy} = \frac{\sum Cx}{\sum Cy}$$

$$= \frac{0.49 \times 8}{6}$$

$$= \frac{0.49 \times 8}{6}$$

$$= \frac{3.92}{6}$$

$$B_{xy} = 0.653$$

y on x

$$B_{yx} = \frac{\sum Cy}{\sum Cx}$$

$$= \frac{0.49 \times 6}{8}$$

$$= \frac{0.49 \times 6}{8}$$

$$= \frac{2.94}{8}$$

$$B_{yx} = 0.367$$

x on y

$$x - Ax = B_{xy} (y - Ay)$$

$$x - 48 = 0.653 (y - 40)$$

$$x - 48 = 0.653 y - 26.12$$

$$x = 0.653 y - 26.12 + 48$$

$$x = 0.653 y + 21.88$$

y on x

$$y - Ay = B_{yx} (x - Ax)$$

$$y - 40 = 0.367 (x - 48)$$

$$y - 40 = 0.367 x - 17.616$$

$$y = 0.367 x - 17.616 + 40$$

$$y = 0.367 x + 22.384$$



Calculation the marks
of x , when $y = 70$

$$x = 0.653y + 21.88$$

$$x = 0.653 \times 70 + 21.88$$

$$x = 45.71 + 21.88$$

$$x = 67.59 \text{ or } 68$$

Calculation the mark
of y , when $x = 75$

$$y = 0.367x + 22.384$$

$$y = 0.367 \times 75 + 22.384$$

$$y = 27.525 + 22.384$$

$$y = 49.909 \text{ or } 50$$

4) Compute index number using Fisher's ideal formula and show that it satisfied time reversal test and factor reversal test and factor reversal test.

Year	2007		2008	
	Qty	Price	Qty	Price
A	12	10	15	12
B	15	7	20	5
C	24	5	20	9
D	5	16	5	14

Solution:

Comm	2007		2008		$P_0 Q_1$	$P_1 Q_1$	$P_0 Q_0$	$P_1 Q_0$
	P_0	Q_0	P_1	Q_1				
A	10	12	12	15	120	180	150	144
B	7	15	5	20	105	100	140	75
C	5	24	9	20	120	180	100	216
D	16	5	14	5	80	70	80	70
					$\Sigma P_0 Q_1$	$\Sigma P_1 Q_1$	$\Sigma P_0 Q_0$	$\Sigma P_1 Q_0$
					425	530	470	505



1) Fisher's ideal index method

$$P_{01} = \sqrt{\frac{\sum P_1 q_0}{\sum P_0 q_0} \times \frac{\sum P_1 q_1}{\sum P_0 q_1}} \times 100$$

$$P_{01} = \sqrt{\frac{505}{425} \times \frac{530}{470}} \times 100$$

$$P_{01} = \sqrt{1.188 \times 1.28} \times 100$$

$$P_{01} = \sqrt{1.340064} \times 100$$

$$= 1.1576113 \times 100$$

$$= 115.761$$

i) Time Reversal test (TRT) is satisfied when $P_{01} \times P_{10} = 1$

$$P_{01} q_{10} = \frac{\sum P_1 q_0}{\sum P_0 q_0} \times \frac{\sum P_1 q_1}{\sum P_0 q_1} \times \frac{\sum P_0 q_1}{\sum P_1 q_1} \times \frac{\sum P_0 q_0}{\sum P_1 q_0} = 1$$

$$P_{01} q_{10} = \sqrt{\frac{505}{425} \times \frac{530}{470} \times \frac{470}{530} \times \frac{425}{505}} = 1$$

$$P_{01} q_{10} = \sqrt{1}$$

$$P_{01} q_{10} = 1$$

ii) Factor Reversal Test (FRT)

When $P_01 \times Q_01$

$$P_01 = \sqrt{\frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times \frac{\sum P_1 Q_1}{\sum P_0 Q_1}}$$

$$Q_01 = \sqrt{\frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times \frac{\sum P_1 Q_1}{\sum P_0 Q_1}}$$

When $P_01 \times Q_01$

$$P_01 Q_01 = \sqrt{\frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times \frac{\sum P_1 Q_1}{\sum P_0 Q_1} \times \frac{\sum P_0 Q_1}{\sum P_0 Q_0} \times \frac{\sum P_1 Q_1}{\sum P_1 Q_0}}$$

$$P_01 Q_01 = \sqrt{\frac{505}{425} \times \frac{530}{470} \times \frac{470}{425} \times \frac{530}{505}}$$

$$FRT = \sqrt{\frac{530}{425} \times \frac{530}{425}}$$

$$FRT = \sqrt{\frac{530}{425}} = \frac{\sum P_1 Q_1}{\sum P_0 Q_0}$$

$$\therefore FRT = \frac{\sum P_1 Q_1}{\sum P_0 Q_0}$$



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* Time Series Analysis *

Q. 5) Compute the trend line and sales for the year 2011.

Year :- 2002 2003 2004 2005 2006 2007 2008 2009
 Sales :- 56 55 57 47 42 38 35 32

Solution:-

Year	Cost	Time deviation middle	$d \times M$	d^2	Calculation	Trend line
2002	56	-3.5	-196	12.25	$45.25 + (-3.93 \times -3.5)$	59.01
2003	55	-2.5	-137.5	6.25	$45.25 + (-3.93 \times -2.5)$	55.08
2004	57	-1.5	-85.5	2.25	$45.25 + (-3.93 \times -1.5)$	51.15
2005	47	-0.5	-23.5	0.25	$45.25 + (-3.93 \times -0.5)$	47.22
2006	42	+0.5	+21	0.25	$45.25 + (-3.93 \times 0.5)$	43.28
2007	38	+1.5	+57	2.25	$45.25 + (-3.93 \times 1.5)$	39.35
2008	35	+2.5	+87.5	6.25	$45.25 + (-3.93 \times 2.5)$	35.42
2009	32	+3.5	+112	12.25	$45.25 + (-3.93 \times 3.5)$	31.49
$N=9$	ΣM		ΣdM	Σd^2		
	= 362		= -165	= 42		

1) Calculation of middle year:

$$M.Y = \frac{n+1}{2} = \frac{8+1}{2} = \frac{9}{2} = 4.5^{\text{th}} \text{ year from}$$

2) Calculation of rate of growth:

$$R.O.G = \frac{\sum dm}{\sum d^2} = \frac{-165}{42} = 3.93$$

3) Average (Mean):

$$\text{Average} = \frac{\sum M}{n} = \frac{362}{8} = 45.25$$

4) Sales for the year - 2011:

= Average production + (Required year - middle year)

× rate of growth

$$= 45.25 + (2011 - 2005.5) \times 3.93$$

$$= 45.25 + 5.5 \times 3.93$$

$$= 45.25 + 21.62$$

$$= 66.87$$



Q. 6) By applying least square method, find out the production for the month of November in Particular year and with a trend value

Month: Jan Feb March April May June
 production: 120 135 138 125 141 147

July August
 140 132

Solution:

Year	production	Time Deviation mid Year	$d \times M$	Trend Ord	Trend line
Jan	120	-3.5	-420	$134.75 + (1.81 \times -3.5)$	128.41
Feb	135	-2.5	-33.7	$134.75 + (1.81 \times -2.5)$	130.22
March	138	-1.5	-20.7	$134.75 + (1.81 \times 1.5)$	132.03
April	125	-0.5	0.75	$134.75 + (1.81 \times 0.5)$	133.84
May	141	+0.5	0.25	$134.75 + (1.81 \times 0.5)$	135.65
June	147	+0.5	2.25	$134.75 + (1.81 \times 1.5)$	137.46
July	140	+2.5	6.29	$134.75 + (1.81 \times -2.5)$	139.27
Aug	132	+3.5	12.25	$134.75 + (1.81 \times 3.5)$	141.08
$N=7$	$\sum M$		$\sum d^2$		
	=1078		=42		

1) Calculation of middle year:

$$M.Y = \frac{n+1}{2} = \frac{8+1}{2} = \frac{9}{2} = 4.5^{\text{th}} \text{ year}$$

2) Calculation of rate of growth:

$$R.O.G = \frac{\sum dM}{\sum d^2} = \frac{76}{42} = 1.81$$

3) Average (Mean):

$$\text{Average} = \frac{\sum M}{n} = \frac{1078}{8} = 134.75$$

4) Sales for the year - 2011

= Average production + (Required year - Middle year) × Rate of growth

$$= 134.75 + (11 - 4.5) \times 1.81$$

$$= 134.75 + (6.5 \times 1.81)$$

$$= 134.75 + 11.765$$

$$= 146.51$$

~~25/05/2022~~



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