

CORRELATION AND REGRESSION ANALYSIS





2+6=2 Correlation & Regression Plotted points are forming 4. Scatter diagram showing 1. a straight like from Lower Left to upper Right 3 > x-azeis perfect positive correlation æ plotted points are forming 2. Y-azeis \odot a straight line from : 0 ୖୄୣୄୄ 3 upper Left to Lower Right - azeis perfect negative correlation 00000000 Plotted points are scattered Y-azeis 3. from Lower left to upper right but not in a straight line 3 Θ 6): positive correlation X-qzeis æ A Y-azis plotted points are scattered 4. from upper left to Lower **O** \odot not forming Right 9 $oldsymbol{O}$ straight line 0 X-azeis Ne ative correlation æ 5. r-azis Y-axis r-azeis 📀 NO 6 000000 \odot Pattes 000000 4 0 000000 000 • - a 2015 X-93els > x-azeis × æ There is no correlation. • Scatter diagrams can give an idea about type of correlation but it can't give exact degree of correlation. Scatter diagram can not find value of 'r' CA VINOD REDDY **Maths Notes** mod.reddy.ca@gmail.com

Comprehensive Revision

5. Find Spearman's rank correlation coefficient. X y Rank of y spearman's wetticient Rank Ч æ ofæ (without tie) 6 Z 22 İ $n(n^2-1)$ **q**3 I $n=7, 5d^2=$ Here 6 X 54 \bigcirc 5 2: 0.0357142857 helps us tofind Type as well Diff of Romk d = value of r as degree of correlation. 6. Find Spearman's rank correlation coefficient. X V Rank A R Rank æ spearman's weffi. (2) of y 7-SD 0.25 (with tie) $\Sigma d^2 + \Sigma \frac{t^3 - t}{t^3}$ 3.50 2.25 h (n2-1) 2.50 3.50 2,3,2,2 **t**= 12.25 02.5 = NO. of obsts involved in a tie 5<u>t3-t</u> 42.25 7.50 5d² - 92 1.50 + 4 = 5.50CA VINOD REDDY winod.reddy.ca@gmail.com **Maths Notes**







11.

r	Type of Correlation				
r = 1.00	Perfect positive correlation				
0.30 < r < 0.80	Moderate degree of positive correlation				
0.80 < r <1.00	strong degree of positive correlation				
r = 0	NO correlation				
r = -1.00	perfect negative correlation				
-1.00 < r < -0.80	strong degrée of negative correlation				
-0.80 < r < -0.30	Moderate degree of negative correlation				
0 < r < 0.30	weak degree of positive correlation				
-0.30 < r < 0	Small/weak degree of Negative correlation				
	Type of correlation.				
Value of	's' gives use >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>				
12. If $v = 3x+8$;	$u = 8y-19; r_{xy} = 0.80$ $\gamma = 32 + 8$				
$\mathbf{r}_{\mu\nu} = \chi_{\mu\nu}$	$= 0.80$ $\mu = 84 - 19$				
(
0					
Correlation coe	fficient is unaffected by change / shift of origin as well as by change in scale.				
13. If $u = -3x+5$	53; $v = -18y+99$; $r_{xy} = 0.70$				
$\mathbf{r} = \mathbf{Y}$	= 0.70				
• uv • • • • • • • • •					
U					
14. If $u = -18x^{-1}$	+55; $v = 16y+100; r_{xy} = 0.85$				
$\mathbf{r}_{uv} = -\gamma_{z}$	$r_{uv} = -\gamma_{XV} = -0.85$				
$220 \pm 1011 - d2$	P = 10V + C3V = 100P = 200 = 0.0201 = -9				
597 184 - 43	q 101 - 03 - 100 q ay0.6341 Buy = ?				
184	$\implies 184 = 93 - 32 \qquad 181 = 100 + 639 \qquad \chi_{111} = 0.6291$				
$u = \frac{93}{18} - \frac{3}{18} = \frac{1}{18} = \frac{1}$					
15. If $u = -8x+19$; $v = -16y-33$; $r_{xy} = -0.56$					
$\mathbf{r}_{\rm uv} = \chi_{\rm Ry} = -0.56$					
If y=	If y=-8x+33, V=128y+95, 8xy=-0.56				
then	then $\gamma_{uv} = 0.56$				
<u></u>					
C,	A VINOD REDDY Maths Notes				



Correlation & Regression Comprehensive Revision 18. **Regression Analysis** After studying correlation between 2 variables, the process of estimating the value of one variable on the basis of other is known as regression analysis x = Given v = Given $\mathbf{x} = \mathbf{P}$ $\mathbf{v} = \mathbf{P}$ Regression of yon re Regression of 2 on Eqn of Reg line of yonze y-y = byze (æ-ऋ byze = Req weffi. of your where r, b_{yx} , b_{xy} all are unit-free (y-y) = byze. (2-2) **Reg line of y on x is :** (2e-ze) = bzy · (y-y) **Reg line of x on y is :** 8.09 COV(2, y) cov(x,y)Reg coefficient of y on x is = b_{yx} = 52.54 Vari. of X CQ1 (21) **Reg coefficient of x on y is = b_{xy} =** QX γ. 5u vasiance of s se is Given & y is to be Think estimated y is Given & x is to be of Reg. of 2° on y Think estimated CA VINOD REDDY **Maths Notes** winod.reddy.ca@gmail.com

3+3=2 **Correlation & Regression** Comprehensive Revision 19. If $\bar{x} = 30$, $\bar{y} = 90$, $\sigma_v = 5$, $\sigma_v = 8$, r = 0.80Find a. Reg line of x on y IMP b. Reg line of y on x c. If x =25, y =? d. If y =85, x =? () Reg line of & only is: (x-x) = bxy (y-y) 3 x=25, y=? $x - 30 = 0.80 \times \frac{5}{2} \times (y - 90)$ y= 51.60 + 1.28(25) x - 30 = 0.50y - 45= 83.60 -15 +0.500 X (y-y) = byz (z-z) Regline of yonze is: (2) (4) y=85, x=? $y - 90 = 0.80 \times \frac{8}{5} \times (2 - 30)$ x = -15 + 0.20(82)y-90 = 1.28x - 38.40 = 27.50 51.60 + 1.28% 2 Therefore, b_{vx}. b_{xv} $\mathbf{b}_{yx} = \mathbf{r} \cdot \frac{\sigma_y}{\sigma}$ Square of correlation coefficient $= \mathbf{r} \cdot \frac{\mathbf{Q}_{y}}{\mathbf{Q}_{x}} \mathbf{x} \cdot \mathbf{r} \cdot \frac{\mathbf{Q}_{x}}{\mathbf{Q}_{y}}$ is equal to product of 2 regression coefficients. = **r**² $\mathbf{b}_{xy} = \mathbf{r} \cdot \frac{\mathbf{O}_x}{\mathbf{O}_y}$ Correlation coefficient 'r' is G.M. of $\mathbf{r} = \mathbf{b}_{vx} \cdot \mathbf{b}_{xv}$ 2 regression coefficients b_w. b_w $\mathbf{r}^2 = \mathbf{b}_{yy} \cdot \mathbf{b}_{yy}$ x² = byz. bzy CA VINOD REDDY **Maths Notes** mod.reddy.ca@gmail.com











41. Prepare a <u>bi-variate frequency table</u> for the following data

- relating to marks in stats (x) and maths (y).
- (12,18) (2,16) (12,3) (19,12) (5,8) (8,2) (13,14) (2,6) (13,19) (6,10) (2,12) (14,2) (18,5) (20,1)

		у	Marks i	n Maths (y	Maths (y)		l	
	x		0-10	10-2	20			
	Marks in State (x)	0-10	= 3	111	=3	6		
		10-20	=4		=4	8		
		Total	7		7	14		
•				-				
ind Ma	arginal Distribu	ition of x :	æ	0-10	10	-20		
			Freq	6		8		
ind M	arginal Distrib	ution of y :	y	0-10	10	- 20		
			Freq	7	7			
nd oo	nditional Distril	nution of y w	hon v is 10 9	.				
nu co	nunuonai Distrii			<i>.</i>	10	- 2 0		
			Erel	0-10	10	-20		
			Fig	3	4			
ind co	onditional Distri	bution of y w	/hen x is 0-10;					
			y	0-10	10 -	20		
			Freq	3	3			
"N	Marginal Distri Conditional Dis	bution' is th the ot tribution' is	e frequency her variable's the frequency	distributior s full range v distributio	n of one of valu	e variable Jes. Ne variable	(x or y) a (x or v) a	1Cro
_		the partic	cular s <mark>ub-pop</mark>	ulation of o	ther va	riable.		
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		1
		$\lambda = \frac{1}{2}$
) Il Ioli		
Compreh	anciva Pau	ision
Complen	CI 131 V C N C V	

2+13=2

			-	-			Co	omprehensive Revision
43 .	x y	0-10	10-20	20-30	30-40	40-50	Total	
	0-10	5	20	22	23	25	95	
	10-20	8	30	26	28	42	134	
	20-30	9	20	29	38	48	144	
	30-40	13	50	36	39	56	194	
	40-50	26	60	28	19	26	159	
	Total	61	180	141	147	197	726	
Fin	d Marginal I	Distributio	on of x :					
	æ	0-10	0 10	-20	20-30	30-40	40-	50
	7	95		34	144	19-4	15	59
Fin	d Marginal I	Distributio	on of y :_		0.0			
	Ч	0-10	0 10	-20	20-30	30-40	40-	50
	4	61	18	0	141	147	19	7
Fin	d conditional	Distributi	on of x wh	ien y is 3	0-40:			
	æ	0-10	0 10	-20	20-30	30-40	40-	So
	4	23	2	8	38	39	1	9
Fin	d conditiona	l Distribu	tion of y v	vhen x is	20-30:			
	Ч	0-10	0 10	-20	20-30	30-40	40-	SO
	7	9	2	0	29	38	48	
44	44. If 2 variables move in same direction i.e. an increase on the part variable introduces an increase on the part of other variable and Decrease on the part of one variable introduces decrease on the part of other variable also, then 2 variables are known to be $positive corelation$.							
45. If 2 variables move in opposite direction i.e. an increase on the part variable introduces an decrease on the part of other variable and Decrease on the part of one variable results in increase on the part of other variable,								
								••••••••••••••••••••••••••••••••••••••
					™!' '' '' ''	'' ''' '' '' '		
		UA VINUD H		maths N	iotes 👘	vinoa.reddy.c	a@gmail.	com

2+6=2 **Correlation & Regression** Comprehensive Revision 46. 2 variables are known to be. Non-correlated or un correlated if movement on the part of one variable does not produce any measureable movement on the part of other variable. (r, byz, bzy : All are unitfree **47.** 1. Correlation coefficient (r) is unit free. 2. Correlation coefficient remains same in value, not necessarily in sign after shift of origin and change in scale. 3. Correlation coefficient lies between -1 and 1, including both limiting values. $(-1 \leq \delta \leq 1)$ 4. Reg. wetti, is affected only by change in scale 48. For a group of 8 students, the sum of squares of diff. in ranks for maths & stats marks was found to be 50. What is the value of rank correlation coefficient? $\Sigma d^2 = 50$ h=8 $\frac{6 \times 50}{8(8^2 - 1)} = 1 - \frac{300}{504} = 0.4048$ 49. For a number of towns, correlation coefficient between people living below poverty line and increase of population is 0.50. If sum of squares of diff. in rank awarded to these factors are 82.50. Find number of towns. $x = 0.50 = 1 - \frac{6 \times 82.50}{h(n^2 - 1)}$ $\frac{495}{0.50} = 0.50 \qquad \therefore \ n(n^2 - 1) = \left(\frac{495}{0.50}\right) = 990$ $h(n^2-1) = 10(10^2-1)$ 50. While computing rank correlation coefficient between profit and investments for 10 years of a firm, the diff of rank of one observation was taken as 7 instead of 5 and rank correlation coefficient was 0.80. What is correct value of rank correlation coefficient? a. 0.95 b. 0.78 c. -0.80 d. None of these $\frac{0.80 \pm 1 - \frac{62d}{10(99)} + \frac{62d}{990} \pm 0.20}{\frac{62d}{990} \pm 0.20} = 0.20$ Wrong $\pm d^2 \pm 33$ CA VINOD REDDY Maths Notes #vinod.reddy.ca@gmail.com $\delta = 1 - \frac{6 \times 9}{100} = 0.94545$ correct zd2 = 33 - 49 +25 259



Trelation & Regression The provide paints in a scatter diagram lie from Upper left to lower right then Upper right to lower right to lower right to lower left then Negative correlation positive correlation 58. If plotted points in a scatter diagram are evenly distributed without depicting any pattern then There is No correlation . 59. If plotted points in a scatter diagram lie on a single line then correlation is a. Perfect Positive a. Perfect Positive b. Perfect Negative f. a or b d. None of these 60. The correlation between shoe-size and intelligence is a. a. a. Positive b. Negative Cerro d. None of these 61. Product moment correlation coefficient is considered for				
57. If plotted paints in a scatter diagram lie from Upper left to lower right then Upper right to lower left then Negative correlation positive correlation 58. If plotted points in a scatter diagram are evenly distributed without depicting any pattern then There IS No correlation . 59. If plotted points in a scatter diagram lie on a single line then correlation is a. Perfect Positive b. Perfect Negative f. a or b d. None of these 60. The correlation between shoe-size and intelligence is a. a. a. Positive b. Negative f. Zero d. None of these 61. Product moment correlation coefficient is considered for	rrelation & Regress	sion		Comprehensive Revision
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a. Strictly positive b. Strictly negative c. Always zero d. Either positive, negative or zero Similarly SD = Zero OR positive Variance = Zero OR positive Variance = Zero OR positive Image: Ima	63. The co-variance betw	ween 2 variables is :		
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Similarly SD = Zero OR positive Variance = Zero OR positive	c. Always zero		Either positive.	negative or zero
Variance = Zevo or positive $U(1) = U(1)	Similarly SD	الألبكة مع معتما		
	$\frac{1}{2}$	COU OR POSITIVE		
CA VINOD REDDY I Mathe Notee I @vinod roddy ca@dmail.com	variance = 2	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	<u>-</u> 	
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Correlation & Regression	Comprehensive Revision
86. Slope of regression equation of y or	1 x is :
a. b _{xy} b. b _{yx}	c. $1/b_{xy}$ d. $1/b_{yx}$
y-y= byze (æ-æ)	. byz. 2 - 1.y = byz. 2 - y
$y - \overline{y} = by_{\mathcal{R}} \cdot \partial \overline{\mathcal{R}} - by_{\mathcal{R}} \cdot \partial \overline{\mathcal{R}} - y$ $by_{\mathcal{R}} \cdot \overline{\mathcal{R}} - \overline{y} = by_{\mathcal{R}} \cdot \partial \overline{\mathcal{R}} - y$	\overline{z} $slope = -\frac{byze}{-1} = byze$
87. $(\mathbf{r})_{xy} = (\mathbf{r})_{yx}$	
a. correct b. wrong	c. can't say d. None of these
correlation coeffi. between æ	∉y = correlation coeffi. between y & 3€
88. b_{xx} is always same as b_{xy}	
a. correct b. wrong	
89. Covariance measures <u>JOWT</u>	variation between 2 variables.
a. Joint b. Common	c. Relative d. None of these
(vaziance of ze, ze	$=\frac{2\pi}{h}-\pi^2$
	[<u>Zx.y</u> <u></u>
co-vaziance of ze,y	$= \begin{bmatrix} n \\ n \end{bmatrix}$
90. Karl Pearson's Product Moment	covaziance (x,y)
Correlation Coefficient	52.54
$2 \frac{2}{2} \frac{2}{2} - \frac{2}{2} \frac{2}{3} \frac{1}{3}$	$\sum (x - \overline{x}) (y - \overline{y})$
$\sqrt{\frac{\Sigma x^2}{h}} - \overline{x}^2 \times \sqrt{\frac{\Sigma y^2}{h}} - \overline{y}^2$	$\sqrt{\Sigma(x-\overline{x})^2} \times \sqrt{\Sigma(y-\overline{y})^2}$
Spearman's Rank =	$\left[6 \le d^2 \right]$ without the
$= \left[- \frac{6 \left(\sum d^2 + \sum \frac{t^3 - t}{12} \right)}{\log \left(b^2 - 1 \right)} \right]$	$h(n^2-1)$ with the





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⁴ I AM STRONG ³ BECAUSE I KNOW MY WEAKNESS - CA VINOD REDDY -

Food For Thought



Student Life is the SEED of your life. PLANT it Wisely

मेहनत इतनी खामोशी से करो के सफलता शोर मचा दे

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Yesterday You Said Tomorrou