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CALCULATION OF REGRESSION EQUA	A ON
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Salesmen	Test Score X	$(X-\bar{X})$	x ²	Sales Y	$(Y - \overline{Y})$	y ²	9
1 2 3 4 5 6 7 8 9	40 70 50 60 80 50 90 40 60	-20 +10 -10 0 +20 -10 +30 -20 0	400 100 100 0 400 100 900 400 0	2.5 6.0 4.0 5.0 4.0 2.5 5.5 3.0 4.5 3.0	-1.5 +2.0 0 1.0 0 -1.5 +1.5 -1.0 +0.5 -1.0	2.25 4.00 0 1.00 0 2.25 2.25 1.00 0.25 1.00	+20 +20 0 +15 +45 +20
N=10	$\Sigma X = 600$	$\Sigma x = 0$	$\Sigma x^2 = 2,400$	$\Sigma Y = 40$	$\Sigma y = 0$	$\Sigma y^2 = 14$	Σxy = (

$$\overline{X} = \frac{\Sigma Y}{N} = \frac{600}{10} = 60; \ \overline{Y} = \frac{\Sigma Y}{N} = \frac{40}{10} = 4$$

$$b_{yx} = \frac{\Sigma xy}{\Sigma x^2} = \frac{130}{2,400} = 0.054$$

The regression equation of sales and test scores is given as:

$$Y - 4 = 0.054 (X - 60)$$

 $Y_0 = 0.76 + 0.054 X$

When X is 100, Y would be

$$Y = 0.76 + 0.054 (100) = 6.16.$$

Thus the most probable weekly sales volume if salesman makes a score of 100 is 6.16 thousand rupees.

Deviations taken from Assumed Means

When actual means of X and Y variables are in fractions, the calculations can be simplified by the deviations from the assumed mean. The value of b, i.e., the regression coefficient, will be cal as follows:

Regression equation of X on $X: (X - \overline{X}) = b_{xy}(Y - \overline{Y})$ where $b_{xy} = \frac{N\Sigma d_x d_y - \Sigma d_x \Sigma d_y}{N\Sigma d_y^2 - (\Sigma d_y)^2}$

$$b_{xy} = \frac{N \sum d_x d_y - \sum d_x \sum d_y}{N \sum d_y^2 - (\sum d_y)^2}$$

Regression equation of Y on X: $(Y - \overline{Y}) = b_{yx}(X - \overline{X})$ where $b_{yx} = \frac{N\Sigma d_x d_y - \Sigma d_x \Sigma d_y}{N\Sigma d_x^2 - (\Sigma d_x)^2}$

$$b_{yx} = \frac{N \sum d_x u_y}{N \sum d_x^2 - (\sum d_x)^2}$$

Once the values of b_{xy} and b_{yx} are determined in the above manner, the regression equations obtained very easily.

Illustration. 4. A company wants to assess the impact of R & D expenditure on its annual profit. The following presents the information for the last eight years:

ents the information	tor m	e tast eight ;		- 'a w a	2007	2006	2005	2004	2009
Years	8	2010	2009	2008	2007	2000	2002	2001	2014
R & D expenditur	·e			報	1.0	Ä	5	3	2
(Rs, 1000)		9	7	5	10	4	ē,	E3	-
Annual Profit						2.0	34	25	20
(Rs. 1000)	1	45	42	41	60	30		Rs. 100.00	n ac 2 1
				-1	atil Car 2009	O for an allow	eated sum of	K2. 100.00	U as 1

Estimate the regression equation and predict the annual profit for 2009 for an allocated sum of Rs. 100,000 as expenditure.

Solution. Let R & D expenditure be denoted by X and annual profit by Y

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