Q Calculating Karl Pearson's Coefficient Correlation by Assumed Mean {Second Method}

This method can also be used when we have actual means.

Means in this case are not actual which means they are in decimals.

Formula :

$$r = \frac{N \cdot \Sigma dxdy - \Sigma dx \cdot \Sigma dy}{\sqrt{N \cdot \Sigma dx^2 - (\Sigma dx)^2} \times \sqrt{N \cdot \Sigma dy^2 - (\Sigma dy)^2}}$$

X	$(X-A)$ dx	dx^2	Y	$(Y-A)$ dy	dy^2	$dxdy$
10	−6	36	30	−12	144	72
12	−4	16	35	−7	49	28
18	2	4	45	3	9	6
16	0	0	44	2	4	0
15	−1	1	42	0	0	0
19	3	9	40	6	36	18
18	2	4	47	5	25	10
17	1	1	46	4	16	4
$\Sigma X = 125$		Σdx^2	$\Sigma Y =$	Σdy	Σdy^2	$\Sigma dxdy = 138$
	$\Sigma dx =$	71	337	$= 1$	$= 203$	
$N = 8$	−3					

$$\bar{X} = \frac{\Sigma X}{N} = \frac{125}{8} = 15.62 \qquad \bar{Y} = \frac{\Sigma Y}{N} = \frac{337}{8}$$

{Mean of X} {Mean of Y} = 42.12

Since both the means are in decimals we can't use them for this numerical.

Step 1: Obtain ΣX and ΣY to calculate $\bar{X}$ and $\bar{Y}$ {Check if they're actual means or not}.

Note: When we calculate 'x' = $X - \bar{X}$, it is called deviation from Mean. Here we'll calculate $dx = X - A$, which is deviation from Assumed Mean.

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Step 2: Locate the assumed mean in column X and column Y. We can take any numbers from the respective series as assumed mean. But in order to simplify things we will take the values that are closer or somewhat nearer to the actual means {which we calculated in the beginning}.

So we take 16 from column X as the assumed mean {which is closer to the actual mean 15.62}.

Similarly, we'll take 42 from column Y as the assumed mean {which is closer to the actual mean 42.12}

Step 3: Calculate dx $(X-A)$ to obtain Σdx.

Step 4: Calculate dy $(Y-A)$ to obtain Σdy.

Step 5: Subsequently calculate dx^2 and dy^2 to obtain the values of Σdx^2 and Σdy^2.

Step 6: Calculate the product of dx and dy to obtain the value of $\Sigma dxdy$.

Step 7: Put all the values in the formula:

$$r = \frac{8 \times 138 - (-3)(1)}{\sqrt{8 \times 71 - (-3)^2}\sqrt{8 \times 283 - (1)^2}}$$

$$= \frac{1104 + 3}{\sqrt{568 - 9} \times \sqrt{2264 - 1}}$$

$$= \frac{1107}{\sqrt{559} \times \sqrt{2263}}$$

$$= \frac{1107}{23.643 \times 47.57}$$

$$= \frac{1107}{1124.72}$$

$r = 0.984$

Positive High Correlation between X and Y.