Correlation (Business Statistics)
Dr.M.K.Singh

Spearman's Rank difference Method

This method of finding the correlation coefficient between two variables was developed by the British Psychologist Charles Edward Spearman in 1904.This method is applied to measure the association between two variables when only ordinal or rank data are available.In other words,this method is applied in a situation in which quantitative measure of certain qualitative factors such as judgement, leadership, honesty, intelligence, etc.In such cases quantitative measure cannot be fixed but they can be ranked.the ranking is decided by using a set of ordinal numbers.Mathematically, Spearman's rank correlation coefficient is defined as:

$$\rho = 1 - \frac{6\sum d_i^2}{n(n^2-1)}$$

$\rho = 1 - 6\sum d^2/N(N^2-1)$

Where ρ ==rank correlation coefficient
R_1=rank of observations with respect to first variable
R_2=rank of observations with respect to second variable
$d = R_1 - R_2$
N= number of pairs of observations.

Example1.

X	Y	R_x	R_y	d	d^2
10	15	6	3	3	9
12	10	5	5	0	0
8	6	7	7	0	0
15	25	4	1	3	9
20	16	3	2	1	1
25	12	2	4	-2	4
40	8	1	6	-5	25
				0	$\sum d^2=48$

Exercise 2.

X	Y	R_x	R_y	d	d^2
36	50	7	6	1	1
56	35	3	9	-6	36
20	70	9	3	6	36
65	25	1	10	-9	81
42	58	6	5	1	1
33	75	8	2	6	36
44	60	5	4	1	1
53	45	4	7	-3	9
15	89	10	1	9	81
60	38	2	8	-6	36
					318

$$\rho = 1 - \frac{6\sum d_i^2}{n(n^2-1)}$$

In case of tied rank

$$\rho = \frac{\sum_i (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_i (x_i - \bar{x})^2 \sum_i (y_i - \bar{y})^2}}$$