



CORRELATION PART-5

What are the steps involved in computing rank correlation co-efficient when equal ranks or tie in ranks occur?

In some cases it may be found necessary to assign equal rank to two or more individuals or entries. In such a case, it is customary to give each individual or entry an average rank.

THE FORMULA IS:

$$R = 1 - \frac{6 \left\{ \sum D^2 + \frac{1}{12} (m_1^3 - m_1) + \frac{1}{12} (m_2^3 - m_2) + \dots \right\}}{N^3 - N}$$

QUESTION: An examination of eight applicants for a clerical post was taken by a firm. From the marks obtained by the applicants in the Accountancy and Statistics papers, compute rank co-efficient of correlation.

Applicant	A	B	C	D	E	F	G	H
Marks in Accountancy	15	20	28	12	40	60	20	80
Marks in Statistics	40	30	50	30	20	10	30	60


Applicants	Marks in Accountancy X	Rank Assigned R1	Marks in Statistics Y	Rank Assigned R2	$(R1 - R2)^2$ D_i^2
A	15	2	40	6	16.00
B	20	3.5	30	4	0.25
C	28	5	50	7	4.00
D	12	1	30	4	9.00
E	40	6	20	2	16.00
F	60	7	10	1	36.00
G	20	3.5	30	4	0.25
H	80	8	60	8	0.00
					$\sum D_i^2 = 81.5$

$$R = 1 - \frac{6 \left\{ \sum D^2 + \frac{1}{12} (m_1^3 - m_1) + \frac{1}{12} (m_2^3 - m_2) + \dots \right\}}{N^3 - N}$$

Here $N=8$. The item 20 is repeated 2 times in series X and hence $m_1 = 2$.
 In series Y, the item 30 occurs 3 times and hence $m_2 = 3$.
 Substituting these values in the above formula:

$$\begin{aligned} R &= 1 - \frac{6 \left\{ 81 \cdot 5 + \frac{1}{12} (2^3 - 2) + \frac{1}{12} (3^3 - 3) \right\}}{8^3 - 8} \\ &= 1 - \frac{6(81 \cdot 5 + 0 \cdot 5 + 2)}{504} = 1 - \frac{6 \times 84}{504} = 0 \end{aligned}$$

There is no correlation between the marks obtained in the two subjects.



This is a case of tied ranks as more than one student share the same mark both for Economics and Statistics.


For Eco. the student receiving 80 marks gets rank 1 one getting 62 marks receives rank 2, the student with 60 receives rank 3, student with 56 marks gets rank 4 and since there are two students, each getting 50 marks, each would be receiving a common rank, the average of the next two ranks 5 and 6 i.e. $(5+6) / 2 = 5.50$ and lastly the last rank..

7 goes to the student getting the lowest Eco marks.

In a similar manner, we award ranks to the students with stats marks.

Computation of Rank Correlation Between Eco Marks and Stats Marks with Tied Marks

Eco Mark (x_i)	Stats Mark (y_i)	Rank for Eco (x_i)	Rank for Stats (y_i)	$d_i = x_i - y_i$	d_i^2
80	90	1	1	0	0
56	75	4	2.50	1.50	2.25
50	75	5.50	2.50	3	9
48	65	7	5	2	4
50	65	5.50	5	0.50	0.25
62	50	2	7	-5	25
60	65	3	5	-2	4
Total	—	—	—	0	44.50



For Economics mark there is one tie of length 2 and for statistics mark, there are two ties of lengths 2 and 3 respectively.

$$M_1 = 2$$

$$M_2 = 2$$

$$M_3 = 3$$

Answer=0.15