

Statistical Connections

Spearman Rank Correlation

A counterpart for the Pearson correlation coefficient for qualitative ordinal data is the *Spearman rank correlation coefficient*, or simply Spearman's rho. This is used to measure the strength of association between two categorical variables on the ordinal scale. Spearman's rho is given by

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

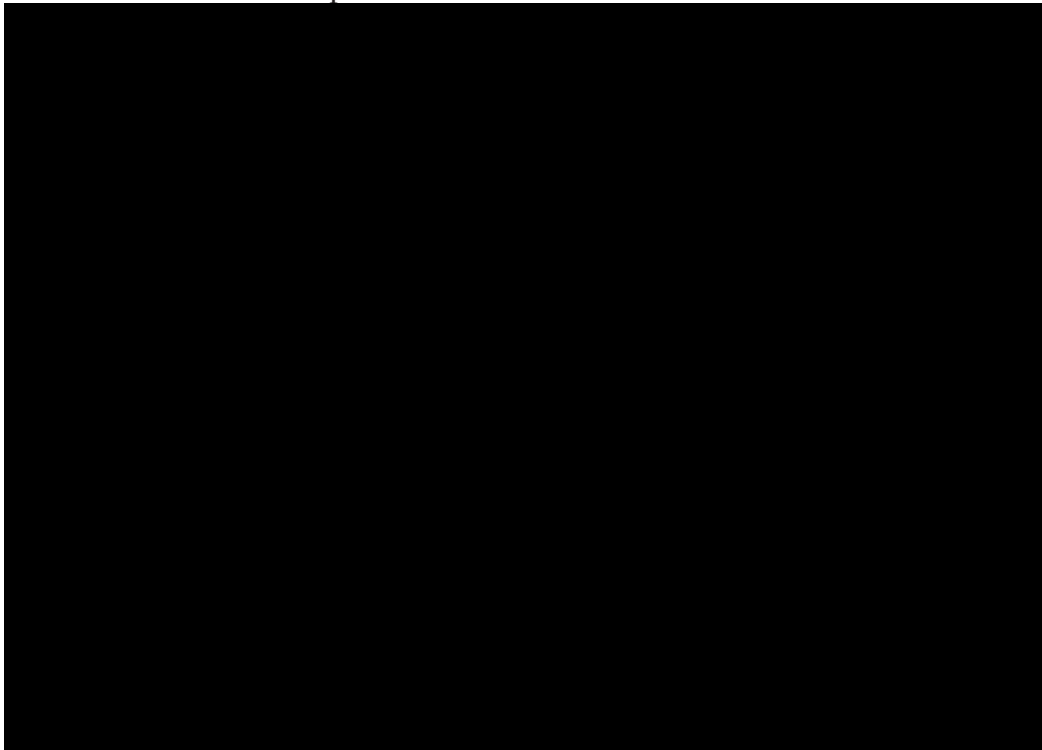
where n is the number of persons or objects being ranked,

x_i is the rank of person i with respect to the first variable,

y_i is the rank of person i with respect to the second variable, and

the difference of ranks d_i is given by $d_i = x_i - y_i$.

Look at the example below.



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First, compute the differences and their squares.

x_i	y_i	$d_i = x_i - y_i$	d_i^2
1	5	-4	16
2	1	1	1
3	3	0	0
4	6	-2	4
5	7	-2	4
6	2	4	16
7	9	-2	4
8	10	-2	4
9	8	1	1
10	4	6	36
<i>Sum</i>			86

Substituting $n = 10$ and $\sum d_i^2 = 86$, the Spearman rank correlation coefficient is

$$r_s = 1 - \frac{6\sum d_i^2}{n(n^2 - 1)} = 1 - \frac{6(86)}{10(10^2 - 1)} = 0.48.$$

