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Spearman's rank correlation coefficient

It is a method of finding the correlation between two variables by taking their ranks. This method of finding correlation is especially useful in dealing with qualitative data. It can be used when the actual magnitude of characteristics under consideration is not known, but relative position or rank of the magnitude is known. It is denoted by p. There are two cases for calculating rank correlation. In the first case, there is no tie of allotted rank, i.e. no two numbers are same; in the second case there is tie in between allotted ranks.

Case 1 – rank correlation with no tie among allotted ranks:

In this case, any one of the values in x or y series is not repeated. So we can use following steps for calculating rank correlation coefficient with no tie among allotted ranks. Then we can calculate spearman's rank correlation coefficient through steps given below:

Rank one the highest value, rank two to next highest value, and so on.

Rank x series values and y series values separately.

Calculate the difference of ranks in each pair of values or (d=Rx-Ry)

Calculate sum of the square of the difference of ranks ($\sum d^2$)

Finally calculate the correlation coefficient using following formula:

$$P = 1 - \frac{6\sum d^2}{n(n^2-1)}$$

Case 2- ranks correlation with a tie between allotted ranks:

In this case, any one or more values in x and y series is repeated. So we have to apply correlation factor (CF), and correlation coefficient is calculated by using the following formula:

$$P = 1 - \frac{6\sum d^2 + CF}{n(n^2-1)}$$

$$CF = mx\frac{(m^2-1)}{11}$$

Or $CF = \frac{1}{12}(m^3 - m)$