Correlation

Spearman Rank-Difference Method. Here is a shortcut for computing the Spearman correlation coefficient between ordinal variables. The two variables here are social rank and skill rank.

Spearman correlation, $r_s = 1 - \frac{6\sum D^2}{N(N^2-1)}$, where ΣD^2 is the sum of the squared difference between ranks, and N is the number of pairs of ranks.

Example 1

Table 1. ***Spearman*** r_s *Work Table for Two Variables with Ordinal Scales*

Subject	***Social Rank***	***Skills Rank***	***D***	D^2
1	2	1	1	1
2	4	3	1	1
3	1	2	-1	1
4	8	8	0	0
5	3	6	-3	9
6	6	4	-2	4
7	9	10	-1	1
8	5	5	0	0
9	10	9	1	1
10	7	7	0	0
				ΣD^2**, Sum = 18**

$$r_s = 1 - \frac{6\sum D^2}{N(N^2-1)} = 1 - \frac{6(18)}{10(100-1)} = 1 - \frac{108}{990} = 1 - 0.11 = 0.89$$

SPSS Output: Spearman rho for Example 1

		Skills Rank
Scoail Rank	Correlation Coefficient	0.891(**)
	Sig. (2-tailed)	0.001
	N	10

** Correlation is significant at the 0.01 level (2-tailed).

Example 2:

Spearman Rank-Difference Method. Here is another example for computing the Spearman correlation coefficient between an ordinal variable and an interval variable. We may rank the scores in reverse order (reverse ranking). To reverse rank the scores, we first rank the data for each: the highest score receives a rank of 1, the next highest a rank of 2, and so on.The two

variables here are X and Y. When the values are the same for a variable (tied), we assign the average rank for the tied values; e.g. Subjects 4 and 6 tied for X with values = 1, so ranks 9 and 10 are averaged and a new rank of 9.5 is assigned.

Table 2. *Spearman Correlation for A variable with an Ordinal and an Interval Scales*

Subject	***X***	***Y***	***X Rank***	***Y Rank***	***D***	***D^2***
1	2	49	7.5	6	1.5	2.25
2	5	56	1.5	3	-1.5	2.25
3	1	40	9.5	9	0.5	0.25
4	3	53	5.5	4.5	1	1
5	4	53	3.5	4.5	-1	1
6	1	37	9.5	10	-0.5	0.25
7	5	62	1.5	1	0.5	0.25
8	3	47	5.5	7	-1.5	2.25
9	4	58	3.5	2	1.5	2.25
10	2	45	7.5	8	-0.5	0.25
						ΣD^2, Sum = 12

$$r_s = 1 - \frac{6\sum D^2}{N(N^2-1)} = 1 - \frac{6(12)}{10(100-1)} = 1 - \frac{72}{990} = 1 - 0.073 = 0.927 \text{ or } 0.93$$

SPSS Output: *Spearman rho for Example 2*

		Y
X	Correlation Coefficient	0.926(**)
	Sig. (2-tailed)	0.000
	N	10

** Correlation is significant at the 0.01 level (2-tailed).

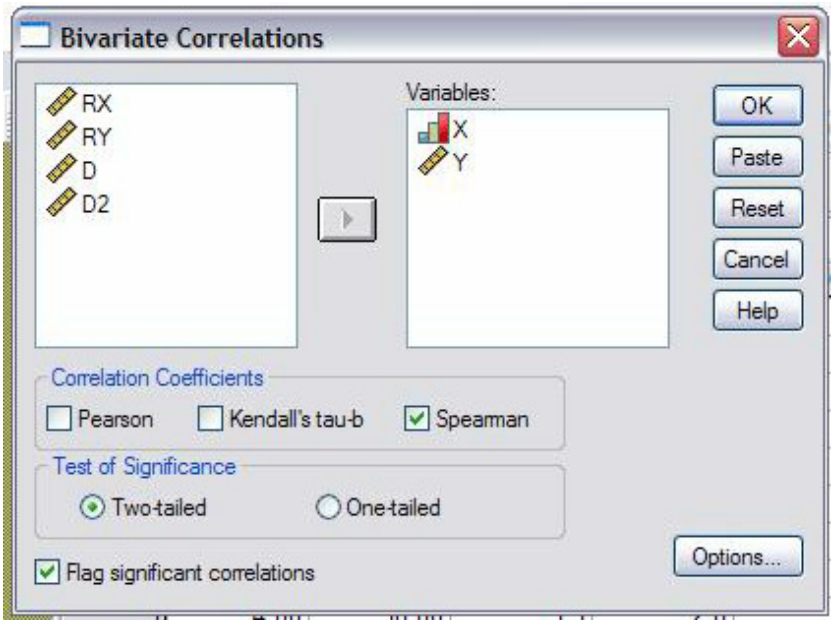

Figure 1. SPSS Spearman rho procedure
Analyze -> **Correlate** -> Select *Variables* and *Spearman*