Kendall's Tau and Partial Tau

When two variables are at least ordinal, the tau correlation may be obtained as a measure of the relationship between the two variables. The values of the two variables are ranked. The method involves ordering the values using one of the variables. If the values of the other variable are in the same order, the correlation would be 1.0. If the order is exactly the opposite for this second variable, the correlation would be -1.0 just as if we had used the Pearson Product-Moment correlation method. Each pair of ranks for the second variable are compared. If the order (from low to high) is correct for a pair it is assigned a value of +1. If the pair is in reverse order, it is assigned a value of -1. These values are summed. If there are N values then we can obtain the number of pairs of scores for one variable as the number of combinations of N things taken 2 at a time which is N(N-1). The tau statistic is the ratio of the sum of 1's and -1's to the total number of pairs. Adjustments are made in the case of tied scores. For samples larger than 10, tau is approximately normally distributed.

Whenever two variables are correlated, the relationship observed may, in part, be due to their common relationship to a third variable. We may be interested in knowing what the relationship is if we partial out this third variable. The Partial Tau provides this. Since the distribution of the partial tau is not known, no test of significance is included.

The file labeled TAUDATA.LAZ has been used to illustrate this procedure in the figure below:

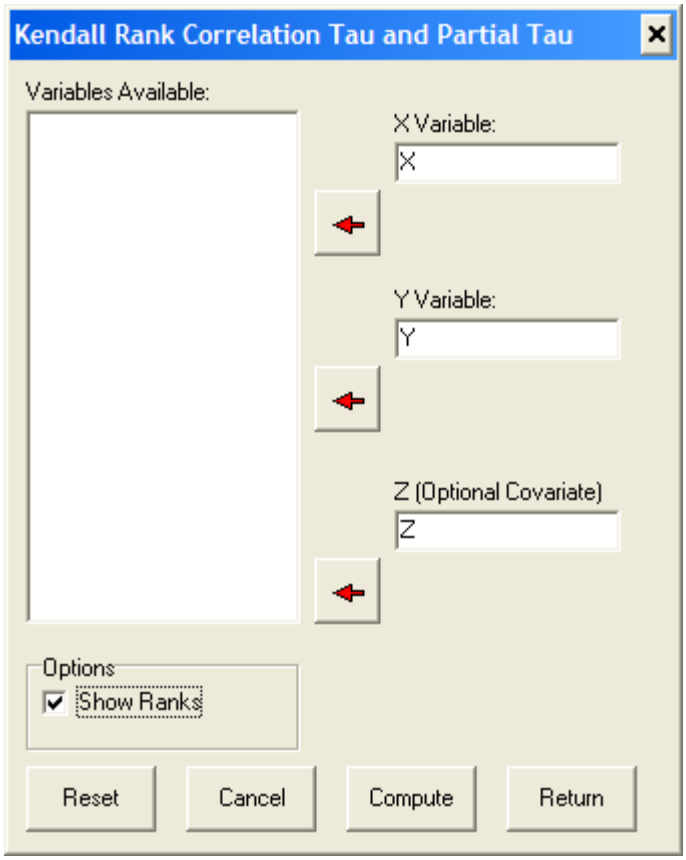

Figure 1. Kendall's Tau Form

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Ranks

                RANKS
                     X            Y            Z
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1	3.000	2.000	1.500
2	4.000	6.000	1.500
3	2.000	5.000	3.500
4	1.000	1.000	3.500
5	8.000	10.000	5.000
6	11.000	9.000	6.000
7	10.000	8.000	7.000
8	6.000	3.000	8.000
9	7.000	4.000	9.000
10	12.000	12.000	10.500
11	5.000	7.000	10.500
12	9.000	11.000	12.000

Kendall Tau for File: C:\Documents and Settings\Owner\My Documents\Projects\CLanguage\data\TAUDATA.TEX

Kendall Tau for variables X and Y
Tau = 0.6667 z = 3.017 probability > |z| = 0.001

Kendall Tau for variables X and Z
Tau = 0.3877 z = 1.755 probability > |z| = 0.040

Kendall Tau for variables Y and Z
Tau = 0.3567 z = 1.614 probability > |z| = 0.053

Partial Tau = 0.6136

NOTE: Probabilities are for large N (>10)