—SOFTWARE ANNOUNCEMENTS—

New Software

PERM: A Double-Precision FORTRAN Routine for Obtaining Parallel Analysis Eigenvalues from Permuted Data

Parallel analysis (Horn, 1965) has been recommended as an accurate method of choosing the number of components to retain in principal components analysis, particularly for psychological item data. The researcher compares the eigenvalues from obtained data with the corresponding eigenvalues from one or more sets of random data with the same number of variables and observations, retaining only those components with observed eigenvalues greater than the corresponding eigenvalues from random data. Most implementations of parallel analysis are based on normally distributed data (e.g., Lautenschlager, 1989; Longman, Cota, Holden, & Fekken, 1989); however, individual items often have either skewed or discrete distributions. PERM is a FORTRAN computer program which overcomes this limitation by basing the comparison eigenvalues on permutations of the obtained data, thus eliminating the assumption of multivariate normality. It can perform principal components analysis of either correlation or covariance matrices, for any number of subjects or variables, and can provide any user-selected number of replications, providing both mean and specified upper-percentile eigenvalues. The program will read the data file, calculate eigenvalues for the observed correlation or covariance matrix, then calculate eigenvalues for the permuted data matrix (permuting the original data within variables). This procedure maintains the data distribution found in the sample, without assumptions about the population distribution, which is generally unknown. The number of possible permutations from even a small data set is enormous, so use of a random sample of permutations must be made. Researchers have commonly used 3 to 5 replications to obtain estimates of mean eigenvalues, and we have found that 40 replications provide good estimates of 95th percentile eigenvalues (Longman, Cota, Holden, & Fekken, 1991).

PERM is written in VS FORTRAN, with calls only to standard double-precision routines from IMSL Version 10 (International Mathematical and Statistical Libraries, 1987), although subroutines from other sources could be substituted if necessary. PERM also could be implemented on microcomputers, using either IMSL or other appropriate routines for microcomputers, but analysis of large data sets may be quite slow compared with analysis on a mainframe.

PERM, its documentation, and a trial data set are available free of charge either via Bitnet (holdenr@qucdn.queensu.ca) or as text files by mailing a formatted 5.25-in. diskette with a self-addressed stamped return mailer to Ronald R. Holden, Department of Psychology, Queen's University, Kingston, Ontario, Canada K7L 3N6.

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Dunnett-Like Multiple Comparisons Among Product-Moment Correlations

Although textbooks on experimental design in the behavioral, social, biological, and engineering sciences contain discussions of multiple comparisons, the focus is almost always on comparisons among means, and comparisons defined on other statistics, such as correlations or variances, are seldom mentioned. Perhaps because of this gap in standard textbooks, the major statistical computer packages (e.g., SAS, BMDP, SPSS, SYSTAT) usually do not include subprograms for simultaneous comparisons constructed on statistics other than the mean. A program is available for conducting "Dunnett-like" pairwise comparisons on a set of K independent sample correlations.

Levy (1973, 1975) introduced a technique for extending the Dunnett method of planned, nonorthogonal, pairwise comparisons on sample means to similar analyses on sample product-moment correlations and other statistics. In employing Dunnett's procedure in its standard form, each of the means of $K-1$ experimental groups is