ANOVR: Analysis of variance with repeated measures

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Description

ANOVR will analyze designs with up to four between-subjects factors and up to four within-subjects factors, thus permitting up to eight experimental factors. Input is like that of BMD08V, except ANOVR permits proportional as well as equal ns. All observations on the repeated-measures factors must be present for each subject used.

Output includes a check on the data as read, the summary table, and all possible means: cell means, means of two-factor slices and/or surfaces, main means, and so on. Homogeneity of independent cell variances is tested by Bartlett's test.

Designs with Subjects Crossed with Factors: Repeated-Measures Designs (Winer, 1971, Chapter 4). ANOVR computes the variance-covariance (VCV) matrix on all repeated measures. The VCVs are often a source of psychological interpretations as well as of information indicating that the conventional assumptions of $F = MS_T/MS_{ST}$ are grossly violated. The Box-Geisser-Greenhouse index, λ , is computed on the VCV and is used to adjust the degrees of freedom so as to yield a robust F test (Winer, 1971, p. 523). The VCV is then rescaled to yield the correlations between the repeated measures.

Mixed Designs: Subjects Nested under Some Factors but Crossed with Other Factors (Winer, 1971, Chapter 7). In the simplest such design (Winer, 1971, p. 518) with a levels of the between factor and b levels of the repeated-measures factor, there would be a different b by b VCV matrices, one for each independent group. These are

computed and printed or punched as requested; thus the variance is available for every cell. From each such matrix, a MS_{SB} term is computed that would be the appropriate MSe for testing MS_B computed on this group alone. Bartlett's test is used to test the homogeneity of these values (Winer, 1971, p. 522).

The a different VCV matrices are pooled and are tested for homogeneity by the Box technique (Winer, 1971, p. 595). The test for compound symmetry and the Machley test that $\lambda = 1.0$ are conducted on the pooled VCV matrix.

For multifactor designs, mean squares needed for tests of means of one factor at a given level of another factor (Winer, 1971, p. 545) are computed. These features are not available in SPSS, SAS, BMD, or BMDP programs.

Language

The program is written in FORTRAN IV and compiles in WATFIV or FORTRAN (G or H) on an IBM 370-168. Machine-specific features have been avoided.

Computation Time and Space

Most examples from Winer (1971) run in 3 sec. With the maximum number of options, the program occupies about 80K, plus some space for dynamic storage of the data array, $\bar{Y}$ s, and VCVs. However, the program is available in reduced-option versions for smaller computers.

Availability

A copy of the program and documentation may be obtained by sending a standard tape to Paul A. Games, 420 Carpenter Building, University Park, Pennsylvania 16802.

REFERENCE

WINER, B. J. *Statistical principles in experimental design* (2nd ed.). New York: McGraw-Hill, 1971.

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