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Tool for One-way and Two-way CATANOVA and ORDANOVA for Analysis of Variation in a Cross-balanced Design and Power of a Test

Monday, 16 September 2024 13:30 (20 minutes)

A tool for analysis of variation of qualitative (nominal) or semi-quantitative (ordinal) data obtained according to a cross-balanced design is developed based on one-way and two-way CATANOVA and ORDANOVA. The tool calculates the frequencies and relative frequencies of the variables, and creates the empirical distributions for the data. Then the tool evaluates the total data variation and its decomposition into contributing components as effects of the main factors influencing the data, i.e., sources of variation (such as examination conditions and expertise of technicians) and their interaction. The significance of a factor's influence is tested as a hypothesis on homogeneity of the corresponding variation component with respect to the total variation. Powers of the tests and associated risks of incorrect decisions are calculated considering the number of categories and levels of the factors, i.e., the size of the statistical sample of nominal or ordinal data collected in the study, and the effect of the size for the test. The code for calculations using a macro-enabled Excel spreadsheet and including Monte Carlo draws from a multinomial distribution is described. Examples from the published studies of interlaboratory comparisons of weld imperfections (a case of nominal data) and intensity of drinking water odor (a case of ordinal data) are demonstrated.

Type of presentation

Talk

Classification

Both methodology and application

Keywords

One and Two-way, CATANOVA, ORDANOVA

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Session Classification: Handling categorical and ordinal data

Track Classification: Stochastic Modelling