

Calibration between log-ratios of parts of compositional data

Sandra Donevska, Eva Fišerová and Karel Hron

Palacký University Olomouc, Czech Republic

Abstract

Compositional data are multivariate observations carrying only relative information, popularly represented as proportions or percentages. Consequently, only ratios between parts of compositional data are informative [1, 4]. They are characterized by the simplex sample space with the Aitchison geometry that has Euclidean vector space structure. Thus, since compositional data have different nature from the standard multivariate observations that rely on the Euclidean geometry in real space, they need to be expressed in real space using proper log-ratio transformation before standard statistical analysis is applied.

In the contribution we will perform calibration between parts of compositional data. One possible way to solve this problem is to apply orthogonal regression to all log-ratios of pairs of compositional parts. We will focus on some properties and interpretation on matrices of predicted averages and residual variances as results for all the mentioned combinations of log-ratios. The corresponding statistical inference will be performed using a linear regression model with type-II constraints [2, 3].

Keywords

Compositional data, Log-ratio transformation, Orthogonal regression, Linear model with type-II constraints.

References

- [1] Aitchison, J. (1986). *The Statistical Analysis of Compositional Data*. Chapman and Hall, London.
- [2] Donevska, S., E. Fišerová and K. Hron (2011). On the equivalence between orthogonal regression and linear model with type-II constraints. *Acta Univ. Palacki. Olomuc., Fac. rer. nat. Math.* 50, 19–27.
- [3] Fišerová, E. and K. Hron (2010). Total least squares solution for compositional data using linear models. *J. Appl. Stat.* 37, 1137–1152.
- [4] Pawlowsky-Glahn, V. and A. Buccianti (2011). *Compositional Data Analysis: Theory and Applications*. Wiley, Chichester.