

Compositional Regression and Its Interpretation

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Abstract

Regression analysis is an important tool for analysing the relationships between the response variable and known explanatory variables. When the response variables or explanatory variables are compositional, special treatment in regression is necessary. Proper statistical methodology for this kind of observations is a logratio methodology that enables to express the data isometrically in the real Euclidean space where it is possible to apply standard statistical tools (Aitchison, 1986; Pawlowsky-Glahn et al., 2015). The contribution is focused on three main regression tasks, where compositional data are involved: either regression with compositional response variable, or regression with compositional explanatory variables, or regression between parts of a composition. The main methodological approach for dealing with compositional regression is based on orthonormal logratio coordinates. Although regression models in orthonormal logratio coordinates are theoretically well justified, both the normalizing constants to reach orthonormality and the natural logarithm itself result in quite a complex interpretation of the regression parameters. The aim of the contribution is to present new orthogonal logratio coordinates (Müller et al., 2017) in order to achieve better interpretability of regression parameters while preserving all important features of regression models for compositional data. Theoretical results will be applied to a real-world example from psychometry.

References

- Aitchison, J. (1986). *The statistical analysis of compositional data*. London: Chapman and Hall.
- Müller, I., Hron, K., Fišerová, E., Šmahaj, J., Cakirpaloglu, P., Vančáková, J. (2017) Interpretation of Compositional Regression with Application to Time Budget Analysis. *Submitted*.
- Pawlowsky-Glahn, V., Egozcue, J.J., Tolosana-Delgado, R. (2015). *Modeling and analysis of compositional data*. Chichester: Wiley.