Rank-Based Procedures for Repeated Measure Designs

J.W. McKean[1]

[1] Western Michigan University

Keywords: GEE, Iterated-reweighted least squares, R-estimates, Working correlation.

Abstract

Repeated measure designs are among the most popular designs. A subject's responses for such designs are generally correlated, so multivariate procedures are often used for the analysis. However, if one knows the correlation structure then more powerful univariate procedures can be used. Liang and Zeger (1986) proposed an iterative-reweighted least squares (IRLS) procedure that utilizes a "working" correlation model which need not be the correct structure. This has led to the wide spread use of these designs. We present a rank-based procedure for such designs. In general, it can be thought of as an IRLS robust procedure, i.e., the estimates solve a system of general estimating equations (GEEs). Depending on the weight structure used, either highly efficient or high breakdown analyses can be obtained and, further, diagnostic procedures are easily formulated to help differentiate between the two fits. The geometry of the procedure is similar to that of LS in that the rank-based norm is substituted for the Euclidean norm, so interpretation is readily straightforward. Often a linear model is appropriate for such designs and in this case the rank-based estimates which solve the GEEs are asymptotically equivalent to R estimates. Examples and some simulation results are presented.

References

K.Y. Liang and S.L. Zeger (1986). Logitudinal data analysis using generalized linear models, *Biometrika*, 73, 12-22.