

Analysis of growth curve data by using cubic smoothing splines

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Abstract

Longitudinal data arises frequently in various fields of applied sciences where individuals are measured according to some ordered variable, e.g. time. A common approach used to model such data is based on the mixed models for repeated measures. This model provides an eminently flexible approach to modeling of a wide range of mean and covariance structures. However, such models are forced to rigidly defined class of mathematical formulas which may not be well supported by the data within the whole sequence of observations. A possible non-parametric alternative is a cubic smoothing spline which is very flexible and has useful smoothing properties. It is shown that the solution of the penalized log-likelihood equations is the cubic smoothing spline and this solution can be further written under the mixed model framework [Verbyla et al. (1999)]. In the present paper we show that under some special class of covariance structures these solutions can be written in closed forms. It is further investigated how these formulas can be utilized under balanced complete (growth curve) data.

Keywords

Covariance structures, Cubic smoothing splines, Growth curves, Longitudinal data, Mixed models.

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