

0.1 Measures of Influence

The impact of an observation on a regression fitting can be determined by the difference between the estimated regression coefficient of a model with all observations and the estimated coefficient when the particular observation is deleted. The measure DFBETA is the studentized value of this difference.

Influence arises at two stages of the LME model. Firstly when V is estimated by \hat{V} , and subsequent estimations of the fixed and random regression coefficients β and u , given \hat{V} .

0.1.1 DFFITS

DFFITS is a statistical measure designed to show how influential an observation is in a statistical model. It is closely related to the studentized residual.

$$DFFITS = \frac{\hat{y}_i - \widehat{y_{i(k)}}}{s_{(k)}\sqrt{h_{ii}}}$$

0.1.2 PRESS

The prediction residual sum of squares (PRESS) is a value associated with this calculation. When fitting linear models, PRESS can be used as a criterion for model selection, with smaller values indicating better model fits.

$$PRESS = \sum (y - y^{(k)})^2 \quad (1)$$

- $e_{-Q} = y_Q - x_Q\hat{\beta}^{-Q}$
- $PRESS_{(U)} = y_i - x_i\hat{\beta}_{(U)}$

0.1.3 DFBETA

$$DFBETA_a = \hat{\beta} - \hat{\beta}_{(a)} \quad (2)$$

$$= B(Y - Y_a) \quad (3)$$

0.1.4 Influence Statistics for LME models

Influence statistics can be coarsely grouped by the aspect of estimation that is their primary target:

- overall measures compare changes in objective functions: (restricted) likelihood distance (Cook and Weisberg 1982, Ch. 5.2)
- influence on parameter estimates: Cook's (Cook 1977, 1979), MDFFITS (Belsley, Kuh, and Welsch 1980, p. 32)
- influence on precision of estimates: CovRatio and CovTrace
- influence on fitted and predicted values: PRESS residual, PRESS statistic (Allen 1974), DFFITS (Belsley, Kuh, and Welsch 1980, p. 15)
- outlier properties: internally and externally studentized residuals, leverage

0.1.5 Variance Ratio

- For fixed effect parameters β .

0.1.6 Cook-Weisberg statistic

- For fixed effect parameters β .

0.1.7 Andrews-Pregibon statistic

- For fixed effect parameters β .

The Andrews-Pregibon statistic AP_i is a measure of influence based on the volume of the confidence ellipsoid. The larger this statistic is for observation i , the stronger the influence that observation will have on the model fit.