0.1 Case Deletion Diagnostics for LME models

Haslett & Dillane (19XX) remark that linear mixed effects models didn't experience a corresponding growth in the use of deletion diagnostics, adding that McCullough and Searle (2001) makes no mention of diagnostics whatsoever.

Christensen (19XX) describes three propositions that are required for efficient case-deletion in LME models. The first proposition decribes how to efficiently update V when the ith element is deleted.

$$V_{[i]}^{-1} = \Lambda_{[i]} - \frac{\lambda\lambda\prime}{\nu ii} \tag{1}$$

The second of Christensen's propostions is the following set of equations, which are variants of the Sherman Wood bury updating formula.

$$\begin{aligned}
X'_{[i]}V_{[i]}^{-1}X_{[i]} &= X'V^{-1}X - \frac{\hat{x}_i\hat{x}'_i}{s_i} && (2)\\
(X'_{[i]}V_{[i]}^{-1}X_{[i]})^{-1} &= (X'V^{-1}X)^{-1} + \frac{(X'V^{-1}X)^{-1}\hat{x}_i\hat{x}'_i(X'V^{-1}X)^{-1}}{s_i - \bar{h}_i} && (3)\\
X'_{[i]}V_{[i]}^{-1}Y_{[i]} &= X\prime V^{-1}Y - \frac{\hat{x}_i\hat{y}'_i}{s_i} && (4)
\end{aligned}$$

In LME models, fitted by either ML or REML, an important overall influence measure is the likelihood distance (?). The procedure requires the calculation of the full data estimates $\hat{\psi}$ and estimates based on the reduced data set $\hat{\psi}_{(U)}$. The likelihood distance is given by determining

$$\begin{aligned}
LD_{(U)} &= 2\{l(\hat{\psi}) - l(\hat{\psi}_{(U)})\} && (5)\\
RLD_{(U)} &= 2\{l_R(\hat{\psi}) - l_R(\hat{\psi}_{(U)})\} && (6)
\end{aligned}$$

Haslett & Dillane (199X) offers an procedure to assess the influences for the variance components within the linear model, complementing the existing methods for the fixed components.

The essential problem is that there is no useful updating procedures for $\hat{V}$, or for $\hat{V}^{-1}$. Haslett & Dillane (199X) propose an alternative , and computationally inexpensive approach, making use of the '`delete=replace`' identity.

Haslett (1999) considers the effect of 'leave k out' calculations on the parameters β and σ^2, using several key results from Haslett and Hayes (1998) on partioned matrices.

0.2 Haslett's Analysis

For fixed effect linear models with correlated error structure Haslett (1999) showed that the effects on the fixed effects estimate of deleting each observation in turn could be cheaply computed from the fixed effects model predicted residuals.

Bibliography

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