

## Nobre Singer : Mixed Model Residuals

Usually one assumes

- $b_i \sim N_q(0, G) i = 1, \dots, m$
- $e_i \sim N_{n_i}(0, \sigma_i)$
- $b_i$  and  $e_i$  independent
- $G$  and  $\sigma_i$  are  $(q \times q)$  and  $(n_i \times n_i)$  positive definite matrices with elements expressed as functions of a vector of covariance parameters  $\theta$  not functionally related to  $\beta$
- If  $\sigma_i = I_{n_i} \sigma^2$ : homoskedastic conditional independence model

$$\begin{bmatrix} \mathbf{b} \\ \mathbf{e} \end{bmatrix} \sim \mathcal{N}_{qm+n}$$

$$\mathbf{Q} = \mathbf{V}^{-1} - \mathbf{V}^{-1} \mathbf{X} (\mathbf{X}^T \mathbf{V}^{-1} \mathbf{X})^{-1}$$

Sensitivity and residual analysis of the underlying assumptions constitute important tools for evaluating the fit of any model to given data.

## Generalized Leverage