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Likelihood-based inference for the ratios of regression coefficients in linear models

Received: 22 October 2004 / Revised: 23 June 2005 / Published online: 17 June 2006
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Abstract We consider the standard linear multiple regression model in which the parameter of interest is the ratio of two regression coefficients. Our setup includes a broad range of applications. We show that the $1 - \alpha$ confidence interval for the interest parameter based on the profile, conditional profile, modified profile or adjusted profile likelihood can potentially become the entire real line, while appropriately chosen integrated likelihoods do not suffer from this drawback. We further explore the asymptotic length of confidence intervals in order to compare integrated likelihood-based proposals. The analysis is facilitated by an orthogonal parameterization.

Keywords Adjusted profile likelihood · Adjustments to profile likelihood · Conditional profile likelihood · Expected length of confidence interval · Integrated likelihood · Orthogonal transformation · Profile likelihood