problems such as those involving sequential experiments and those in which only indirect data (from relatives) are available in predicting an individual's breeding value.

Robinson notes (Section 4.2) that the BLUP estimates may be viewed as approximate Bayes estimates with improper uniform priors on β and θ. However, the results using proper prior distributions (even only mildly informative ones) that reflect pre-experiment knowledge can be substantially different from those obtained using flat priors; for instance, see Example 2 in Kass and Steffey (1989). For further details of Bayesian analyses with informative priors for β and θ in the linear model (1), see Gianola and Fernando (1986), Broemeling (1985) and the references contained therein.

The difficulty in finding ways to incorporate prior information has led many applied statisticians to question the practical value of Bayesian methods. Establishing sensible methodologies has been a goal of continuing research by statistical scientists, cognitive psychologists and econometricians. While translating uncertainty into probability distributions can be challenging, the potential scientific rewards for doing so can be substantial. Some authors have advocated generating probability distributions from statements made by substantive experts as a mechanism for incorporating prior information. For example, Kadane, Dickey, Winkler, Smith and Peters (1980) present a method for specifying a conjugate prior for (β, σ^2) in the normal linear regression model. That procedure is based on collecting responses from substantive experts (nonstatisticians) to questions about the predictive distribution of the response vector given values of the predictor variables. Such a procedure may be adaptable to the mixed effects models considered here.

Along with Kadane (1990) we would emphasize the need for more work on elicitation and would add that the need is especially great when elicitation is taken, in its broadest sense, to refer to the general process of constructing probability distributions from available background information.

We look forward to future modeling efforts that tap all sources of relevant information in order to improve inferences in the statistical problems encountered in animal breeding and many other fields of science.

Comment

Robin Thompson

Dr. Robinson's paper is valuable as it shows the links of BLUP, suggested for animal breeding applications, with methods used in other areas. An alternative way of thinking about the models used is in terms of an expectation and a variance for y that leads to a natural interpretation for prediction in terms of regressing future observations on present observations. I wonder why Dr. Robinson did not use such a formulation. With regard to making inferences on random estimates, can Dr. Robinson say if it is sensible to use the suggestion of most likely unobservables to construct confidence intervals for random estimates? I would also like to know which likelihood to use when testing fixed effects.

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