



FIG. 2. Plots of example data.

where

$$g^* = \left[\frac{(n+1)(s-k)}{(n+1)(s-k)+2} \right] \left[\frac{n-k-2}{n} \right].$$

In conclusion, we agree with Professor Rao that his empirical Bayes predictor of future observations in growth curve models performs better than its least squares counterpart. We have also described several other empirical Bayes prediction methods. With the three example data sets, we have found our calibrated empirical Bayes predictor to yield smaller CVAE and to be more stable than its calibrated least squares counterpart.

ACKNOWLEDGMENTS

This work was supported by National Institutes of Health Grant GM29745. We also thank the Statistics

Center, Massachusetts Institute of Technology, for the use of their computing resources.

ADDITIONAL REFERENCES

- AMEMIYA, Y. (1985). What should be done when an estimated between-group covariance matrix is not nonnegative definite? *Amer. Statist.* **39** 112-117.
- GOLDSTEIN, H. (1986). Multilevel mixed linear model analysis using iterative generalized least squares. *Biometrika* **73** 43-56.
- LAIRD, N., LANGE, N. and STRAM, D. (1987). Maximum likelihood computations with repeated measures: Application of the EM algorithm. *J. Amer. Statist. Assoc.* **82** 97-105.
- LANGE, N. and LAIRD, N. M. (1986). Random-effects and growth-curve modeling for balanced and complete longitudinal data. Technical Report, Dept. Mathematics, Massachusetts Institute of Technology, Cambridge, Mass.
- LONGFORD, N. (1987). A fast scoring algorithm for maximum likelihood estimation in unbalanced mixed models with nested random effects. Technical Report 87-77, Educational Testing Service, Princeton, N. J.
- REINSEL, G. (1985). Mean squared error properties of empirical Bayes estimators in a multivariate random-effects generalized linear model. *J. Amer. Statist. Assoc.* **80** 642-650.

Comment: On Exchangeability Judgments in Predictive Modeling and the Role of Data in Statistical Research

David Draper

Professor Rao has shared with us some thought-provoking ideas on prediction in growth curve mod-

David Draper is a member of the Statistical Research and Consulting Group, Department of Economics and Statistics, RAND Corporation, 1700 Main Street, Santa Monica, California 90406.

eling. The paper has four basic attributes, two of which seem positive and two negative. On the positive side,

- the basic problem is predictive in nature, thereby emphasizing inference on observable quantities (future values of outcome variables of interest) rather than on unobservable quantities (parameters); and