

Bootstrapping Data with Multiple Levels of Variation

A.H. Welsh¹, C.A. Field², Zhen Pang¹

¹*Centre for Mathematics and its Applications, The Australian National University,
ACT, Australia*

²*Department of Mathematics and Statistics, Dalhousie University, Nova Scotia,
Canada*

We consider the problem of bootstrapping data with multiple levels of variation. We discuss the random effect model and the transformation model for such data and consider general estimators including the Gaussian maximum likelihood estimator for the mean and variance parameters of the model. We show that these estimators have different distributions under the two models unless all the random variables have Gaussian distributions. This means that, in general, inference, including bootstrap inference, depends on which model holds and we have to use procedures which are appropriate to the underlying model. We investigate the asymptotic properties of bootstrap procedures designed for the two models and discuss conditions under which the bootstrap gives asymptotically valid results.