

UNIVERSITY OF SYDNEY

SCHOOL OF MATHEMATICS AND STATISTICS

Statistics Seminar

Friday, 8th August, 2008. 2.00pm, Carslaw 173

Small Sample Confidence Regions in Exponential Families

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Abstract

This paper describes multivariate approximate conditional confidence regions for canonical exponential families. These confidence regions have actual coverage probabilities that are closer to their nominal levels than are the actual coverage probabilities of traditional normal-theory regions, and have boundaries that are smoother than those obtained by inverting traditional exact tests. Our method is based on constructing one-dimensional conditional tests, combining *p*-values, and inverting. More specifically, consider a statistical model with three parameters, of which two are of interest and one is not of interest. We generate a confidence region for the two parameters of interest by first generating a confidence interval for one of the parameters, conditional on sufficient statistics associated with the other interest parameter and the nuisance parameter. For values of this bounded parameter inside the confidence interval, we determine a confidence interval for the remaining interest parameter conditional on the sufficient statistic associated with the nuisance parameter. This procedure determines the boundaries of a confidence region. This method is illustrated through applications to logistic and positive Poisson regression examples, in which parameters of interest are alternative representations of a single underlying physical quantity; in our examples, they represent the effectiveness of a study drug relative to a standard drug in a crossover trial, measured under two different orderings, and the intensity of infection among a certain demographic group, measured in two different day care centres.

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