Likelihood asymptotics

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Syllabus

Likelihood inference (first-order asymptotics): Statistical models. Likelihood: observed quantities. Examples. Invariance properties. Expected likelihood quantities and exact sampling properties. Reparameterizations. Likelihood inference procedures. Consistency of the maximum likelihood estimator. Asymptotic distribution of the maximum likelihood estimator. Asymptotic distribution of the log-likelihood ratio: simple null hypothesis, likelihood confidence regions, comparisons among asymptotically equivalent forms, non-null asymptotic distributions, composite null hypothesis (nuisance parameters), profile likelihood, asymptotically equivalent forms and one-sided versions, testing constraints on the components of the parameter. Non-regular models.

Numerical and graphical aspects in R: log likelihood, plot of the log likelihood, MLE and observed information, Wald confidence intervals, deviance confidence regions, simulation, numerical optimization methods, parameter of interest and profile likelihood. Examples.

Higher order asymptotics: Laplace expansions. Approximation of marginal likelihood. Edgeworth and saddlepoint expansion for density functions. Improvements over classical asymptotic theory. The p^* formula. Tail probabilities and modified directed likelihood. Bartlett adjustment. Modified profile likelihood and its approximations. Bias reduction. Tail area approximations for Bayesian inference. R software.

Asymptotic theory for estimating equations and pseudolikelihoods[1]: Misspecification. Estimating equations. Quasi likelihood. Composite likelihood.

[1] Only if there is still some time...

References

Barndorff-Nielsen, O.E. and Cox, D.R. (1994). *Inference and Asymptotics*. Chapman and Hall, London.

Brazzale, A. R., Davison, A. C. and Reid, N. (2007). *Applied Asymptotics: Case Studies in Small Sample Statistics*. Cambridge University Press, Cambridge.

Cox, D.R. and Hinkley, D.V. (1974). *Theoretical Statistics*. Chapman and Hall, London.

Davison, A.C. (2003). *Statistical Models*. Cambridge University Press, Cambridge.

Pace, L. and Salvan, A. (1997). *Principles of Statistical Inference from a neo-Fisherian Perspective*. World Scientific, Singapore.

Severini, T.A. (2000). *Likelihood Methods in Statistics*. Oxford University Press, Oxford.

van der Vaart, A.W. (1998). *Asymptotic Statistics*. Cambridge University Press, Cambridge.

Young, G.A. and Smith, R.L. (2005). *Essentials of Statistical Inference*. Cambridge University Press, Cambridge.

Lectures and topics

date		**topic**
18/06/15	10.00–13.00	Likelihood inference (first-order asymptotics)
18/06/15	14.30–17.00	Numerica and graphical aspects in R
19/06/15	10.00–13.00	Higher-order likelihood theory
19/06/15	14.30–17.00	Higher-order likelihood theory/Asymptotic theory for estimating equations and pseudolikelihoods