McMASTER UNIVERSITY

GRADUATE PROGRAM IN STATISTICS

STATISTICS SEMINAR

Speaker: Tao Li, Department of Mathematics and Statistics, McMaster University

Title: *"Ordered Ranked Set Samples and Applications to Statistical Inference"*

Day: Tuesday March 29, 2005

Time: 3:30 - 4:30 PM

Place: HH/217 – Deloitte Colloquium Room (refreshments in HH/216 at 3:00 PM)

SUMMARY

Different from simple random samples, ranked set samples (RSS) are independent but non-identical. Moreover, if the ranking is perfect, each ranked set sample is actually distributed as regular order statistics from a simple random sample. In my research, the idea of order statistics from independent but non-identical random variables is used to propose ordered ranked set sampling (ORSS) and derive the density function of ORSS and some properties of moments of ORSS. Then we apply ORSS to three kinds of statistical inferences. We determine the best linear unbiased estimations based on ORSS and show that they are more efficient than best linear unbiased estimations based on RSS for two-parameter exponential, normal and logistic distributions. Although this is not the case for the one-parameter exponential distribution the relative efficiency is very close to 1. Then the nonparametric confidence intervals for quantiles and tolerance intervals based on ORSS are derived and their

properties are discussed. Finally, the Fisher information and maximum likelihood estimation based on ORSS are developed. We choose normal, logistic and one-parameter exponential as examples and conclude that in these three cases, although the MLEs based on ORSS are not as efficient as the MLEs based on RSS, the relative efficiencies are pretty high.

REEFERENCES

Chen, Z., Bai, Z. & Sinha, B. K. (2003) "Ranked Set Sampling--Theory and Application." *Lecture Notes in Statistics*, No. 176, Springer-Verlag, New York.

Chen, Z. (2000) "On Ranked Sample Quantiles and Their Applications." *Journal of Statistical Planning and Inference* **83**, pp. 125-135.

Stokes, L. (1995) "Parametric Ranked Set Sampling." *Annals of the Institute of Statistical Mathematics* **47**, pp. 465-482.

ABOUT THE SPEAKER. **Tao Li** is a Ph.D. student in statistics in the Department of Mathematics and Statistics at McMaster University. She is soon to complete her studies on the theory and applications of order statistics under the guidance of Professor N. Balakrishnan. Li graduated with a B.Sc. in mathematics in 1996 and a M.Sc. in ring theory in 1999 from Capital Normal University, Beijing, China. She then entered the financial mathematics program at McMaster University and graduated with a M.Sc. in 2002. (Picture by Rong Zhang, 2004)

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