STAT 7360

Advance Topics in Statistics
Theory of and application of ranked set sampling

Fall 2012

Instructor: Dr. Mohammad Jafari Jozani
Office: 325 Machray Hall,
Phone: 204-272-1563
E-mail: $M\_jafari\_jozani@umanitoba.ca$
Office hours: Mondays 9:00 a.m. to 10:30 a.m. or by appointment.

Course Description

Ranked set sampling (RSS) is a sampling procedure which can be used in situations where a small number of sampling units can be ordered fairly accurately with respect to a variable of interest without actual measurements on them and this can also be achieved at low cost. This means some form of ranking of units is possible. This is a useful property since quite often, exact measurements of these units can be very tedious and/or expensive. For example, for fisheries studies (such as age structure or the length distribution of an age or sex class of fish, especially in the case of short-lived species) or environmental risks such as radiation (soil contamination and disease clusters) or pollution (water contamination and root disease of crops), exact measurements would require substantial scientific processing of materials or sampling units and a high cost as a result, while the variable of interest from a small number of experimental (sampling) units may easily be ranked. The RSS is based on this premise and it provides an interesting alternative to simple random sampling in these situations. The process of RSS is considered by many to be a more efficient method of data collection. In addition, in some ways, the sample so collected may be considered more representative of the population.

In this course, we introduce the concept of RSS. We show how RSS performs better than simple random sampling for estimating the means. We will focus on both parametric and nonparameteric inference based on RSS (e.g, estimation of the location and scale parameters; confidence intervals for quantiles; testing hypothesis, etc.). Also, we study the problem of using RSS in finite populations as a suitable survey sampling design (e.g, calculating the inclusion probabilities; developing ratio estimators, unbiased and almost unbiased ratio estimators, studying the performance of the usual estimators under RSS, etc.). Several other interesting topics will be covered in the course.

Mark Breakdown

Homeworks	5%
Final Examination (120 minutes, time and placed to be announced)	55%
Project	40%

Grade cut-offs

The following are the minimum percentage grades required to receive each of the various letter grades: A+ (90%), A (80%), B+ (75%), B (70%), C+ (65%), C (60%), D (50%).

Homeworks

Homeworks are due at the start of class (time will be announced). Homeworks submitted late will be severely penalized. Homeworks submitted after the solutions are posted or after the graded assignments are return to students will not be marked and receive a grade of 0. Obviously, exceptions can be made to the above policy if special/exceptional circumstances warrant them (e.g., serious illness).

Test

There will be a final Exam as well as a research project which we will discuss in the class. The final examination is closed book. A non-programmable calculator is necessary (graphing calculators are not permitted). However, other electronic devices, such as cell phones and MP3, are strictly prohibited.

Recommended Text Books and References

I will have my own notes which are mostly based on my papers on ranked set sampling as well as some other articles published in the statistical journals. However, I recommend to use the following textbook for further reading.

Ranked Set Sampling: Theory and Applications
by: Zehua Chen, Zhidong Bai and Bimal K. Sinha
Lecture notes in Statistics 176
Springer-Verlag New York, Inc. ISBN 0-387-40263-2
2004.

Academic Dishonesty

It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. Links to resources that that describe academic dishonesty (including plagiarism, cheating, inappropriate collaboration and examination impersonation) can be found at:
`http://www.umanitoba.ca/faculties/science/student/webdisciplinedocuments.html`
or through the Faculty of Science home page at:
`http://www.umanitoba.ca/faculties/science`
Typical penalties imposed within the Faculty of Science for academic dishonesty are also described.

2012-2013 REGISTRATION ADVISORY

Important Note from the Dean of Science:

It is your responsibility to ensure that you are entitled to be registered in this course. This means that you have:

- the appropriate prerequisites, as noted in the calendar description, or have permission from the instructor to waive these prerequisites;
- not previously taken, or are concurrently registered in, this course and another that has been identified as not to be held with in the course description. For example, STAT 1000 cannot be held for credit with STAT 2220.

The registration system may have allowed you to register in this course, but it is your responsibility to check. If you are not entitled to be in this course, you will be withdrawn, or the course may not be used in your degree program. There will be no fee adjustment. This is not appealable. Please be sure to read the course description for this and every course in which you are registered.