STAT6115: Additional Survey Sampling and Estimation

Module Outline 2018/2019

Semester 1

Contents

This module outline should be read in conjunction with the Blackboard website for the module and the Degree Handbook for your degree programme. Degree Handbooks are available here: https://www.southampton.ac.uk/studentservices/academic-life/faculty-handbooks.page

1. Essential information

Staff:

Lecturer: Prof. Li-Chun Zhang
Room: 58/4005
Telephone: (0)23 8059 2533
Email(s): L.Zhang@soton.ac.uk

Teaching Assistant: Ms. Martina Patone
Email(s): M.Patone@soton.ac.uk

Administrator: Socstats@soton.ac.uk
+44(0)23 8059 7782   Building 2, Room 2040

Times and Dates:

The module will take place between December 3 and 7 2018.

Assignments and Assessments

100% exam of 120 minutes

2. Course content

a) Aims of the Module

This module aims to:

To introduce students to a range of estimation methods for use in surveys. The main part of the module covers design-based approaches including ratio, regression and other calibration estimators, and how these weighting approaches may be used to compensate for nonresponse. There will also be an overview of methods for variance estimation. The module will provide students with the skills to use imputation to compensate for nonresponse in appropriate situations.

b) Learning Outcomes

On successful completion of this course, you will be able to:

- choose and implement the appropriate method for estimating from surveys, including understanding the properties of different types of estimator.
- choose an appropriate method to compensate for nonresponse in a survey or missing data more generally. Weighting and imputation approaches will be described.
- choose and implement an appropriate procedure for estimating the variance of a probability sample.

- describe the properties of model-based estimators, and deduce estimators from their model specifications.

c) Key Skills

You will develop skills in:

Statistical computing in R.

d) Recommended Reading

Cochran, W.G. (1977). Sampling Techniques. (3rd Edition). New York: Wiley.

Sarndal, C.-E., Swensson, B. and Wretman, J. (1992). Model Assisted Survey Sampling. New York: Springer-Verlag.

Deville,J.-C. and Sarndal,C.-E. (1992). Calibration Estimators in Survey Sampling. *Journal of the American Statistical Association*, **87**, 376-382.

Valliant, R., Dorfman, A.H. and Royall, R.M. (2000). Finite Population Sampling and Inference. New York: John Wiley.

Chambers, R.L. and Clark, R.G. (2012). An Introduction to Model-Based Survey Sampling with Application. Oxford University Press.

e) Blackboard

When registered for the module, you should be enrolled automatically on the module's Blackboard course and you can log on at: http://blackboard.soton.ac.uk/. If you do not have access to the site please let the module coordinator know.

The site contains all the relevant course materials. Hard copies of the slides and handouts for computer workshops will also be provided.

You should check in regularly to ensure you see all announcements and course materials. You will also need to submit your coursework to Turnitin through Blackboard (see section 3d below).

f) Timetable

Monday 3 December 2018

10:00 – 11:30	Introduction; Post-stratification (I)
11:30 – 11:45	Coffee & tea
11:45 – 13:00	Exercises
13:00 – 14:00	Lunch
14:00 – 15:00	Post-stratification (II)

15:00 – 15:15	Coffee & tea
15:15 – 16:30	Exercises & computer workshop

Tuesday 4 December 2018

09:30 – 11:00	Ratio and Regression Estimation (I)
11:00 – 11:15	Coffee & tea
11:15 – 12:30	Ratio and Regression Estimation (II)
12:30 – 13:30	Lunch
13:30 – 15:00	Exercises & computer workshop
15:00 – 15:15	Coffee & tea
15:15 – 16:30	Generalised Regression Estimation (I)

Wednesday 5 December 2018

09:30 – 11:00	Generalised Regression Estimation (II)
11:00 – 11:15	Coffee & tea
11:15 – 12:30	Exercises & computer workshop
12:30 – 13:30	Lunch
13:30 – 15:00	Generalised Regression Estimation (III)
15:00 – 15:15	Coffee & tea
15:15 – 16:30	Exercises & computer workshop

Thursday 6 December 2018

09:30 – 11:00	Reweighting for Nonresponse (I)
11:00 – 11:15	Coffee & tea
11:15 – 12:30	Exercises & computer workshop
12:30 – 13:30	Lunch
13:30 – 15:00	Reweighting for Nonresponse (II)
15:00 – 15:15	Coffee & tea
15:15 – 16:30	Exercises & computer workshop

Friday 7 December 2018

09:30 – 11:00	Recap, Q&A
11:00 – 11:15	Coffee & tea
11:15 – 12:30	Self-study (Lecturer will be available for additional queries)

This timetable is subject to change depending on class progress.

3. Assessment and Feedback

a) Assessment methods

The intended learning outcomes for the module will be assessed as follows:

100% exam. The duration of the written exam is 120 minutes. All questions are compulsory, each with several subtasks. The distributed marks will be given alongside each subtask.

Permitted materials: Lecture Notes and university approved calculator. The Lecture Notes can be annotated.

b) Resit arrangements

Students who require to resit this module would sit a new exam in the supplementary examination period. You will be notified about the corresponding date by the School Office.

c) Past exam papers

This is the first time this module is run. There are no past exam papers.

d) Feedback

Formative and summative feedback are provided in the following ways:

- Informal verbal feedback will be given during lectures and tutorials for individual and group work. (You'll need to contribute regularly to group discussions to make the best use of this.)
- Informal written and verbal feedback are often provided by email or during office hours when we respond to queries about assessments, for example.
- Exam results are published only as a grade. Although individual feedback on examinations is not normally given, feedback on the strengths and weaknesses of the performance of the whole group which took an examination may be available via Blackboard.
- Students are entitled to view their examination scripts on request, your Student Office can advise on the process to be followed. You are only permitted to view an examination script to enable you to see how you can improve your future performance and no mark or other annotation on the script is negotiable or open to alteration. The absence of annotation on a script does not mean that it has not been marked.
- Feedback works two ways – we want to hear from you about any concerns

you have and suggestions about how to improve modules. We do this through informal mid semester feedback, which can sometimes be used to make immediate improvements in module delivery, and through a formal questionnaire at the end of the module, which will benefit students taking it in subsequent years. In addition to these, informal feedback from you on how we are doing and what we could do better is welcome anytime.

- For further information about how your work is marked and moderated, university quality assurance processes etc., please visit the marking and feedback section in the University's quality handbook: https://www.southampton.ac.uk/quality/assessment/framework/marking_and_feedback.page?

For the feedback to be effective, it is important that you work with the feedback given and identify how you can improve your work in the future. Should you need further information about your work, get in touch with whoever marked the work.

4. Grade Descriptors and Marking Criteria

Social Statistics and Demography follow the standard the University grade descriptors available here: http://www.southampton.ac.uk/quality/assessment/framework/principles_and_definitions.page#assessment_descriptors when marking assessed work. The marking criteria and/or marking rubric for each individual piece of assessment on this module will be made available on Blackboard and with the instructions for each assessment. Note that the rating given for each criterion is descriptive and does not necessarily relate in a direct numerical way to the mark achieved.

5. Academic Integrity and Referencing

The University places the highest importance on the maintenance of academic integrity and expects that all students will familiarise themselves with the Regulations Governing Academic Integrity available at: http://www.calendar.soton.ac.uk/sectionIV/academic-integrity-regs.html

Procedures will be invoked to investigate suspected breaches of academic integrity when concerns are raised during the marking process or in connection with suspected cheating in examinations. We are aware that students may have experienced differing standards at other institutions (including those overseas) but it is essential that you take steps to ensure your full understanding of the standards expected at Southampton as significant penalties can be imposed if these standards are breached.

Unfortunately, Academic integrity breaches sometimes occur. The regulations distinguish between two types of breaches of academic integrity:

minor (first-time offences, "committed through inexperience or lack of understanding and ... limited in scope or their effect"), and major. The minor breaches are dealt with by individual markers, through the regular feedback process. However, everything that is not a minor breach, including all repeated cases, is a major one.

The major breaches are dealt with either by the Faculty Academic Integrity Officer or by an Academic Integrity panel, depending on the severity of the alleged breach. The outcomes from this process can vary with the maximum penalty that can be given the termination of the programme – **so please treat Academic Integrity seriously**.

6. Support and Troubleshooting

If you find yourself experiencing any study skills difficulties contact the Academic Skills Hub, level 2 in the Hartley Library, Monday - Friday: 10:00 – 12:00 & 14:00 – 16:00. http://library.soton.ac.uk/sash

You can also access specialized study support from Enabling Services: https://www.southampton.ac.uk/edusupport/study_support/index.pageIf you experience any specific difficulties with the content of the module, please contact the module coordinator.

If you are not satisfied with the response contact your Personal Academic Tutor or the Programme Coordinator Paul Smith (P.A.Smith@soton.ac.uk) or Angela Luna-Hernandez (A.Luna.Hernandez@soton.ac.uk).

If you have a major difficulty during the course, such as a health problem that prevents you from attending lectures or seriously interferes with your work, you should make sure to discuss this with your Personal Academic Tutor.

7. Prerequisites

Please make sure that you familiarise yourself with the basic survey sampling theory and results in Sampling Techniques (Cochran, 1977), as well as the relevant algebra and linear algebra skills that are necessary in order to complete the course. Revisit the MOffStat/MDataGov Introductory Module and STAT6093/STAT6116 if necessary. You will struggle otherwise, which can create problems also for the others.

Since computer workshops will be used to enhance your learning outcomes, basic familiarity with R and RStudio will be essential. R is a free software environment for statistical computing and graphics. It compiles and runs on a

wide variety of UNIX platforms, Windows and MacOS. RStudio makes R easier to use. It includes an editor, debugging & visualisation tools.
To download R and numerous packages developed for R, please visit https://www.r-project.org/

To download RStudio, please visit   https://www.rstudio.com/products/rstudio/download/

You should be familiar with the basic operations such as:

- open and store a file containing R codes
- how to get online help about R
- simple commands for assignment, routing, loop, etc.
- input/output functions scan, read.table, cat, print, etc.
- graphic functions plot, hist, etc.
- program and execute an R function

There are many free R tutorials available online, such as
https://www.statmethods.net/r-tutorial/index.html