

MACQUARIE UNIVERSITY, SYDNEY
Division of Economic and Financial Studies
STAT823: Statistical Graphics
Unit Outline: Second Semester 2008
Convenor: Associate Professor Peter Petocz



Please read this unit outline carefully. It contains important information about the unit. If anything in it is unclear, please consult your lecturer.

ABOUT THIS UNIT

STAT823 is a four credit point unit offered by the Department of Statistics as part of the Master of Applied Statistics program and enrolment can be in internal or distance mode. We present the principles of effective graphical presentation, set them in a historical context and apply them to a variety of statistical data sets. Emphasis is given to use of modern multivariate graphical techniques such as trellis/lattice graphs and mosaic plots to show a variety of displays of data and model fits, and to display model consistency with data. To present graphics, we introduce and use S-Plus and R software, as well as other standard packages. Participants choose an area for further investigation related to their interests. This unit may be taken at any stage of the Master of Applied Statistics program: as an introduction early in the program, or as an overview towards the end of the program.

TEACHING STAFF

The lecturer for the unit is Associate Professor Peter Petocz
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UNIT WEB PAGE

The web page for this unit can be found at: www.stat.mq.edu.au/pg/stat_units/stat/stat823 (you can get there conveniently from the Department of Statistics website www.stat.mq.edu.au by selecting Postgraduate, then Statistics PG Units and then STAT823).

There is a Blackboard/WebCT page for the unit that will contain all the required course materials and allows communication between participants and lecturer. We will be using this extensively during the course. You can access this from the address <http://learn.mq.edu.au> (or from the STAT823 web page). You will be asked for your Student ID number and myMQ Portal password. If you have any problem accessing this website, you should go to the Online Teaching Facility support web page at <http://online.mq.edu.au/docs/tecinf.html>.

CLASSES

You will have one 3-hour lecture/practical class on Tuesday 6-9 pm in E4B 202. If possible, you should attend these classes; but if you are enrolled externally there will be a range of options for participation, including materials on Blackboard/WebCT and connection via Wimba.

LEARNING OUTCOMES

This course will help prepare students for professional work as a statistician, particularly for the graphical communication of statistical ideas and results to non-statistical (and statistical) users. Students will develop critical thinking skills about how information can be best presented visually, and they will learn how to communicate quantitative information effectively. At the end of the course students will:

1. be familiar with important historical and contemporary examples of graphics, and be able to use them as models in their own work
2. be aware of the elements of graphical design, and use them to critically appraise presented graphics in articles and web pages and suggest appropriate ways of improving them
3. be familiar with a range of modern multivariate graphical techniques and know when it is appropriate to use them
4. learn to use the computer (statistical packages and languages) to generate appropriate graphics
5. use statistical graphics to investigate and analyse data, check statistical model assumptions and effectively present the results of statistical investigations to a range of audiences

All academic programs at Macquarie seek to develop students' generic skills. One aim of this unit is that you will develop to a level appropriate for a university graduate your skills in cooperative teamwork; written and verbal communication; information technology; problem solving and critical thinking. The unit will also encourage you to engage with broader aspects of being a university graduate, particularly in the areas of ethics, sustainability and creativity.

REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

There is no specified textbook for this unit and a variety of readings will be available from the Blackboard site or from the internet. The following books are good general references that will be referred to during the semester:

- Tufte, E. (2001). *The Visual Display of Quantitative Information* (second edition). Graphics Press, Cheshire Conn. (first edition 1983).
- Cleveland, W. (1993). *Visualizing Data*. Hobart Press, New Jersey.
- Chen, C., Hardle, W. and Unwin, E. (eds.) (2008). *Handbook of Data Visualization*. [HDV] Springer-Verlag, Berlin. (*Several chapters of this recent professional-level summary of research in the field will be placed in e-reserve for your reading.*)

ASSESSMENT AND ITS RELATION TO LEARNING OUTCOMES

The assessment has three components:

- Portfolio 25%. An individual portfolio of at least five items relating to statistical graphics, each item using a maximum of two pages, on topics or questions presented in classes (and on the website). You will be asked to submit these online, and they will be graded on a scale of 1-5 each. You can submit more than five items if you wish, in which case you will receive the mark given to your best five items.
- Project 40%. A group project in an area of interest that you select, including a group presentation (20%) and a written summary (20%). The group presentations will be made during the class time in week 12 (Tuesday 4 Nov) and the written summary is due by Friday 7 Nov.
- Exam 35%. You will be given an individual take-home examination during the last week of semester (available on the evening of Saturday 8 November, due by the evening of Saturday 17 November). This will be in the form of a consulting problem requiring data analysis and preparation of a report including presentation graphics, requiring about 3 hours work.

The portfolio will allow you to demonstrate the whole range of learning outcomes (particularly 1, 2 and 4): it may also be useful to collect examples of your work for later professional use.

The group project will address outcomes 3, 4 and 5 in a group of two or three colleagues and will allow you to develop teamwork, communication and information technology skills.

The exam will assess elements of the whole range of learning outcomes, but particularly outcomes 3, 4 and 5, in an individual setting: you are expected to do the exam on your own with whatever print and electronic resources you wish to use.

TEACHING AND LEARNING STRATEGIES

With the small number of students enrolled and the advanced (masters) level of this unit, we will be relying less on formal lectures and more on individual reading, preparation and learning to use the computer, and on collaborative investigation and discussion of problems. However, we will have a number of 'guest lectures' which will be presented live and available in some electronic form afterwards. There will be weekly readings (usually electronic), weekly data investigations (using a computer package or language), weekly discussions (live and using Blackboard/WebCT or Wimba) and regular opportunities to create and add materials to your portfolio.

The following standard information is included in all Macquarie unit outlines:

EXAMINATIONS – GENERAL INFORMATION

Since this unit has a take-home exam, there is no relevant information about examinations. If you have some medical or other reason for not being able to complete the take-home exam in the scheduled time period, please contact the lecturer to make alternative arrangements. The same applies for the group project and presentation.

PLAGIARISM – IMPORTANT NOTES

The University defines plagiarism in its rules: "Plagiarism involves using the work of another person and presenting it as one's own." Plagiarism is a serious breach of the University's rules and carries significant penalties. You must read the University's practices and procedures on plagiarism. These can be found in the *Handbook of Undergraduate Studies* or on the web at: <http://www.student.mq.edu.au/plagiarism/>.

The policies and procedures explain what plagiarism is, how to avoid it, the procedures that will be taken in cases of suspected plagiarism, and the penalties if you are found guilty. Penalties may include a deduction of marks, failure in the unit, and/or referral to the University Discipline Committee.

UNIVERSITY POLICY ON GRADING

Academic Senate has a set of guidelines on the distribution of grades across the range from fail to high distinction. Your final result will include one of these grades plus a standardised numerical grade (SNG). On occasion your raw mark for a unit (i.e., the total of your marks for each assessment item) may not be the same as the SNG which you receive. Under the Senate guidelines, results may be scaled to ensure that there is a degree of comparability across the university, so that units with the same past performances of their students should achieve similar results.

It is important that you realise that the policy does not require that a minimum number of students are to be failed in any unit. In fact it does something like the opposite, in requiring examiners to explain their actions if more than 20% of students fail in a unit. The process of scaling does not change the order of marks among students. A student who receives a higher raw mark than another will also receive a higher final scaled mark.

STUDENT SUPPORT SERVICES

Macquarie University provides a range of Academic Student Support Services. Details of these services can be accessed at <http://www.student.mq.edu.au>. For students taking units in the Division of Economic and Financial Studies, more detailed information is given electronically at http://www.efs.mq.edu.au/student_support, or live in ERIC in E4B 106.

Stat823 Statistical Graphics – Semester 2, 2008

Date <i>(Tuesday E4B 202)</i>	Wk	Topic	Readings/exercises
5 Aug	1	Introduction: what do we know about graphics?	Examples of graphs (text, excel), discuss and improve Install/run S-plus and get familiar with the package
12 Aug	2	Historical background of graphics	Friendly <i>A brief history of data visualization</i> http://www.math.yorku.ca/SCS/Papers/hbook.pdf [HDV] (see http://www.math.yorku.ca/SCS/Gallery/milestone)
19 Aug	3	Creating graphics	Using S-plus for creating graphics – S-plus tutorial Exploration vs presentation graphics
26 Aug	4	Principles of graphics	Unwin <i>Good graphics</i> [HDV]; Tufte <i>Graphical integrity</i> Using these principles to critique graphs Install and introduce R
2 Sept	5	Trellis graphs	Theus <i>Trellis displays</i> http://home.vrweb.de/~martin.theus/Trellis_ESS.pdf or http://home.vrweb.de/~martin.theus/Trellis_Softstat.pdf
9 Sept	6	<i>Guest lecture:</i> Linear models and graphics (PP)	
16 Sept	7	Mosaic plots	Hofman <i>Mosaic plots and their variants</i> [HDV] Displaying categorical data Using Mondrian (or R) for mosaic plots
23 Sept		<i>Mid semester break</i>	
30 Sept		<i>Mid semester break</i>	
7 Oct	8	<i>Guest lecture:</i> Graphical design (DT)	
14 Oct	9	Interactive graphics: brushing and linking	Wills <i>Linked data views</i> [HDV] Brushing and linking in packages
21 Oct	10	<i>Guest lecture:</i> Web-based graphs with html (HG)	
28 Oct	11	Graphics for many dimensions	Theus <i>High dimensional data visualization</i> [HDV] Including Grand Tours (with Ggobi)
4 Nov	12	Group presentations	
11 Nov	13	Take-home exam	

[HDV = Handbook of Data Visualization]