School of Economic and Financial Studies
Actuarial Studies Department

ACST357
General Insurance Pricing and Reserving
SECOND SEMESTER 2006

UNIT OUTLINE

Teaching Staff Involved in the Unit

The staff involved in the teaching of this unit are

Staff Member	Weeks	Room	Email
Professor Piet de Jong (Unit coordinator)	8-13	E4A611	piet.dejong@mq.edu.au
Mr. Glen Barnett	1-3		
Dr. Jun Ma	4-7	E4A530	JMA@efs.mq.edu.au

Questions relating to the administration of the unit or unit content should be directed to the Unit Co-ordinator. Questions about the course content should be directed to the staff member teaching that part of the course.

Unit Details

Unit Name: General Insurance Pricing and Reserving
Credit Points: 3

Prerequisites: ACST356(P) or ACST399(P); STAT271(P)

Corequisites: None
Please consult with the unit co-ordinator if you do not meet any of the prerequisite requirements for the unit.

Other units recommended for students interested in working in the financial services industry in areas related to the topics in this unit include ECON232 Econometric principles, ECON233 Econometric Analysis, ECON333 Econometric Methods, STAT278 Computer Simulation, and STAT305 Simulation and Forecasting.

Unit Description

The unit is divided into three parts. Each part will be taught by a different lecturer.
The first part (week 1-3): run-off triangles;
The second part (week 4-7): generalized linear models; and
The third part (week 8-13): time series.

Unit Objectives / Syllabus

The course will cover most of the material in the second half of the UK Institute's syllabus for Subject CT6 Statistics Method. Core Technical.

Part one:

- Be familiar with the main structure and kinds of loss data used in reserving

- Understand the basic assumptions of ratio models such as the chain ladder and be able to check that the main assumptions are satisfied

- Be able to obtain predictions using ratio models, especially the chain ladder

- Be familiar with some common measures of exposure and their use

- Understand the ideas of economic and superimposed inflation, how to identify changing superimposed inflation, and the difficulties separating constant growth in the accident and calendar period direction

- Understand the underlying assumptions of Payments per exposure (especially Payments per claim) approaches and be able to perform basic payments per claim analysis

- Understand and be able to assess some of the assumptions of the Bornheutter-Ferguson approach and be able to perform it.

- Be able to write ratio models and Payments per exposure models as stochastic models, how to fit them, extend the models and use them as diagnostic tools

Part two:

- Be familiar with the principles of Multiple Linear Regression and the Normal Linear Model.

- Define on exponential family of distributions. Show that the following distribution be written in this form: binomial, Poisson, exponential, gamma, normal

- State the mean and variance for an exponential family, and define the variance function and the scale parameter.

- Explain what is meant by the link function and the canonical link function, referring to the distributions in 2.

- Explain what is meant by a variable, a factor taking categorical values and an interaction term. Define the linear predictor, illustrating its form for simple models, including polynomial models and models involving factors.

- Define the deviance and scaled deviance and state how the parameters of a GLM may be estimated. Describe how a suitable model may be chosen by using an analysis of deviance and by examining the significance of the parameters.

- Define the Pearson and deviance residuals and describe how they may be used.

Part Three:

- Explain the concept and general properties of stationary, I(0), and integrated, I(1), univariate time series.

- Explain the concept of a stationary random series.

- Know the notation for backwards shift operator, backwards difference operator, and the concept of roots of the characteristic equation of time series.

- Explain the concepts and basic properties of autoregressive (AR), moving average (MA), autoregressive moving average (ARMA) and autoregressive integrated moving average (ARIMA) time series.

- Explain the concepts and properties of discrete random walks and random walks with normally distributed increments, both with and without drift.

- Show that certain univariate time series models have the Markov property and describe how to rearrange a univariate time series model as a multivariate Markov model.

- Describe simple applications of a time series model, including random walk, autoregressive and cointegrated models as applied to investment variables.

Assumed Knowledge and Skills

See course prerequisites.

Lectures and Tutorials

This unit will consist of 4 hours of combined lectures and workshops per week. There will be no formal tutorials - workshops covering examples and applications will be held during lectures.

Lectures are held at the following times:

Day	Time	Location
Thursday	11.00 pm – 13:00 pm	E7B T2
Friday	12:00 pm – 14:00 pm	W5A T1

ACST357 Web site

This web site uses software called WebCT. To access this web site, go to http://online.mq.edu.au and log on. This leads you to a page which lists all Macquarie University WebCT sites to which you have access.

If you did not understand the above, you can obtain training on how to use a web browser by contacting the Information Technology Training Unit on Level 1 of the Library. If you can't access the site due to having forgotten your password, contact the Information Technology Customer Support Desk also on Level 1 of the Library.

Before logging in to this site, you should follow the link labelled "Technical Information" and read all the information there, including the Computer and Communications Security Policy and the Computer and Communications Usage Rules. This technical information mentions a number of "plugins" that may be required. Of those listed, in this unit you will only need Acrobat Reader.

You can access this web site from any computer with internet access including those in the library.

The website will be used extensively for this unit so please consult the website regularly for course information.

Textbooks

Course notes are from the ActEd Study Materials (subject CT6 **Statistics Method. Core Technical**).

Other useful references are:

An Introduction to Generalised Linear Models *Dobson Annette* CRC Pr I Llc 2001

Time Series *Kendall, M.*, Charles Griffin (1976)

Time Series Analysis: Forecasting & Control (3rd Edition) *George Box, Gwilym M. Jenkins,* Holden-Day, Incorporated (1990)

Forecasting: Methods and Applications (3rd edition) *Spyros G. Makridakis, Steven C. Wheelwright, Rob J. Hyndman*John Wiley & Sons Inc 1998

Statistical Methods for Forecasting *Bovas Abraham, Johannes Ledolter* Wiley-Interscience 2005

Barnett G., and B. Zehnwirth (2000) "**Best Estimates for Reserves**", *Proceedings of the Casualty Actuarial Society, LXXXVII, No. 166-167, pp. 245-303.*
(especially Secs 1&2 and appendices A-D; this paper on the list of readings for the CAS syllabus)
If not already linked on WebCT get it from www.casact.org/pubs/proceed/proceed00/00245.pdf

A link to a list of errata for this paper and a spreadsheet that can carry out some of the calculations is at http://www.insureware.com/Library/Technical/technical.php#BestEstimates

Grading

Macquarie University uses the grades HD, D, Cr, P, PC and F for grading the achievements of students in units of study. The grades of achievement are defined as follows:

High Distinction (HD) denotes performance which meets all unit objectives in such an exceptional way and with such marked excellence that it deserves the highest level of recognition.

Distinction (D) denotes performance which clearly deserves a very high level of recognition as an excellent achievement in the unit.

Credit (C) denotes performance which is substantially better than would normally be expected of competent students in the unit.

Pass (P) denotes performance which satisfies unit objectives.

Conceded Pass (PC) denotes performance which meets unit objectives only marginally.

Fail (F) denotes performance which does not meet unit objectives.

The numerical marks resulting from assessment of your work in this unit will be used as an initial indicator of the quality of your learning and understanding. The use of these numerical marks is, however, only a starting point in determining the appropriate grade. To obtain a grade you must satisfy the qualitative definition of that grade. Once your grade has been determined, you are allocated a standardised mark indicating your approximate position amongst students assigned that grade. In particular, note that the raw marks may be scaled in order to determine the Single Numerical Grade (SNG).

SNGs are not marks but are a ranking of students based on marks obtained from all facets of the unit assessment. The SNGs awarded in a particular unit are designed to indicate that the students in each performance band, from HD to CP, have satisfied the criteria for inclusion in that band and ranks them by their performance within that band. Since the ranges of SNGs differ from band to band the relationship between the raw marks and the SNGs may differ from band to band even within the same unit. The relationship between raw marks and SNGs would almost always differ between units.

Assessment

The following table gives an indication of the relative weighting of the assessment components:

Mid-term test	30%
Final Examination	70%

You need to achieve a pass both in the final exam and overall to pass the subject.

Mid-termTest

There will be one mid-semester test of ninety (90) minutes duration with five (5) minutes reading time, which covers the topics from Weeks 1 to 7. The test is scheduled for pm 12:00- 13:30 Friday 6th October, 2006 and will be conducted during the lecture time. The venue for the test will be confirmed in the lectures and posted on the discussion board on WebCT. Please note that the mid-semester test date, time and coverage may be subject to change and that any alterations will be advised in lectures/on WebCT.

The format of the mid-semester test will be a written paper consisting of three (3) questions. You will answer in the spaces provided on the test paper, although a writing booklet will be distributed to you for scribbling (which is NOT collected or marked). All answers must be written in black or blue pen or a pencil (do NOT use a red pen).

Normal examination rules apply to the conduct of mid-semester test. These rules are set out under the heading "Conduct of Examinations" in the Student Information – Assessment section of the current Macquarie University Handbook of Undergraduate Studies. You are responsible for familiarising themselves with these rules prior to the class test. There will not be a make-up test for those who are absent for the mid-semester test. You must provide a legitimate reason for your absence and where approved, your final grade for ACST357 will depend SOLELY on your performance in the final examination.

The test will be returned to you at lectures.

You will be allowed to take a calculator that is silent and has no text-retrieval capacity plus one A4 page into the test (handwritten or typed and filled in on however many sides).

Final Examination

The final examination will be a three-hour written paper with ten minutes reading time.

The final exam will cover all of the material in the course. Students will be allowed to take a calculator and one A4 page into the exam (filled in on however many sides)

Legibility of Handwriting

You should ensure that your handwriting in the class assessment tasks and in the final examination is legible. Sections of work that are not legible will not be marked. For true/false questions, answers that are not clearly legible as either T or F will be assumed to be wrong and marked accordingly.

Special Consideration

Applications for special consideration in respect of a class test or other class assessment task must be made on the "Advice of Absence or other Circumstances" form. These are available from and should be submitted to the Student Enquiry Service on Level 1 of the Lincoln Building.

Applications in respect of the final exam must be made on the "Request for Special Consideration" form. These forms are available from and should be submitted to the Academic Program Section on Level 4 of the Lincoln Building.

Applications based on medical grounds (whether for a class test or other class assessment task, or for the final examination) **must** be accompanied by the Professional Authority Form. Applications omitting this form (such as those which only supply a doctor's certificate) will be ignored.

Application forms are also online at http://www.registrar.mq.edu.au/academic-index.htm

Exemptions

The unit ACST 357 corresponds to the professional subject CT6. **You require a Credit grade or higher to receive the exemption.**

Mobile Phones

Academic Senate has resolved that no mobile phones should be used in classrooms or be bought into examination rooms. Mobile phones must be switched off during class tests.

Calculators/Computers

Calculators will be allowed in the class tests and the final examination but a clear indication of the steps involved in every calculation must be shown. Any machines that have a text-retrieval capacity, whether or not they have a full alphabet on the keyboard, are not allowed.

Calculators may be checked at the commencement of the class tests and final exam, and the make/model may be recorded.

Use of Computers for Coursework

The computer laboratories available to you are the third year labs where you will have access to all the software relevant to this unit. Please take careful note of the policy of the Department of Actuarial Studies regarding the use of computers, which follows.

DEPARTMENT OF ACTUARIAL STUDIES

NOTICE TO STUDENTS RE USE OF COMPUTERS FOR COURSEWORK

1.   Computers do occasionally break down. This is a normal part of working life. When completing assignments, you should not leave computer work until the last moment, assuming the system will be available when you need it.

2.   You are the person responsible for keeping backup copies of any data or files you create on a computer. If you fail to keep backup copies, loss of data or files, for whatever reason, is not an acceptable excuse for failing to complete an assignment on time.

3.   You should have at least two backups. If you have only one backup disk, then a computer malfunction while you are updating your backups may simultaneously corrupt both the original version (on the hard disk or network) and your backup disk. Do not store your two backups together. Spread your risks.

4.   If you are planning to write a document on one computer (eg. your home computer) and print it from a different computer, you should test well ahead of the due date that the second computer can print your document. This particularly applies if your documents incorporate graphs, tables, unusual fonts or special formatting.

Reference Material

The Economics Resource and Information Centre (ERIC) is on the ground level of C5C. Copies of any additional readings, assignments, and other unit material will be placed in ERIC.

Material for at least some sections of work is available online, along with email and chat facilities, from: http://online.mq.edu.au/student/

The Institute of Actuaries of Australia

Please refer to http://www.actuary.mq.edu.au/current_students/join_institute.shtmlm for information on the advantages of joining the Institute of Actuaries of Australia as a student.

Cheating and Plagiarism

To cheat in the context of university assignments, tests and examinations is to attempt to gain an unfair advantage by violating the principles of intellectual and scholarly integrity. Cheating also encompasses plagiarism, which is the appropriation or imitation of another person's ideas and manner of expressing them.

You are responsible for familiarising yourself with the document entitled "What is plagiarism?" at http://www.student.mq.edu.au/plagiarism.html.