Division of Economic and Financial Studies
Actuarial Studies Department

ACST865

Quantitative Methods in Financial Risk Management

SECOND SEMESTER 2008

UNIT OUTLINE

Teaching Staff Involved in the Unit

The staff involved in the teaching of this unit are

Staff Member	Email	Telephone	Room
Dr. Jiwook Jang (Unit Co-ordinator)	jjang@efs.mq.edu.au	9850 8575	E4A 613
Dr. Nino Kordzakhia (Unit Co-ordinator)	nkordzak@efs.mq.edu.au	9850 8549	E4A 537
Yu-Fan (Jack) Ng (Unit Administrator)	yng@efs.mq.edu.au		E4A 622C

All academic queries should be directed to the Unit Co-ordinators via the Macquarie University e-mail system. All non-academic queries should be addressed to the Unit Administrator.

Unit Details

Unit Name: Quantitative Methods in Financial Risk Management

Credit Points: 4

Prerequisites: ACST305/858(P) or ACST828(P) or STAT401/890(P) or Dean of Division Approval

Please consult the Unit Co-ordinator if you do not meet any of the prerequisite requirements for the unit.

Unit Description

The unit encompasses theoretical and practical aspects of quantification of three main types of financial risk, namely, market, credit and operational risk. The numerical and statistical modeling techniques introduced in the unit represent the tools adopted by actuarial and banking business to comply with advanced regulatory requirements.

Topics covered include:

- Credit Risk – the risk of default of counterparty
  1. Modeling credit risk: one-factor model.
     Correlations and dependence: copulae.
  2. Traditional approaches: default probabilities and transition matrices
  3. Modeling credit risk: the structural and reduced form models
  4. Credit Derivatives: CDS, CDO and default times for first to default swaps.

- Operational Risk – the risk of losses resulting from failed internal or external processes.
  1. The elementary approaches
  2. Regulatory capital for operational risk

- Market Risk – the risk of change in the value of position due to changes in underlying market variable
  1. The VAR measure and other risk measures
  2. Extreme value theory
  3. Market risk VaR: Historical simulation approach, Back testing and Stress testing
  4. Market risk VaR: Model-building approach, Monte Carlo simulation
  5. Principle component analysis to calculate to VaR

Unit Objectives

The unit aims to cover the key properties of statistical models and measurement techniques specific to financial risk management with a focus on development of computational applications. Students will be exposed to simulation and financial data analysis at the level of development of their own computational routines for a model parameterization and evaluation of model specific risk measures.

Assumed Knowledge and Skills

Some preliminary knowledge of discrete and continuous time models and related statistical modeling techniques utilised in pricing theory of financial derivatives is required. Students need to be able to use a computer to analyse problems in risk management. You should be able to use a word processing package (such as WORD), a spreadsheet (such as EXCEL), a statistical package (such as MINITAB) and a programming language (such as Visual Basic, Matlab or C++).

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Lectures and Tutorials

The unit material is covered in the three hours that combines lectures and tutorials each week. Combined lectures and tutorials are held at the following times:

Day	Time	Location
Thursday	**9.00 am – 11:00 am**	**E6A 131**
Thursday	**1.00 pm – 2:00 pm**	**W6B 338**

Weekly lecture & tutorial materials will be available from the Blackboard. Solutions to the examples/exercises covered in lectures/tutorials will be available from the Blackboard after the lecture/tutorial.

Any alterations to the combined lecture or, tutorial times, locations or enrolments will be advised in lectures and/or on the Blackboard.

ACST865 Web site

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

If you are experiencing any difficulty, training on how to use a web browser is available 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 "plug-ins" that may be required. Of those listed, you will only need Acrobat Reader.

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

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

Textbooks

The recommended textbook is:

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Title	Author
Risk Management and Financial Institutions	John Hull

The textbook by Hull includes the worked examples and exercises. Two copies of this book will be placed in the Reserve Section of the Library.

Other recommended books for this course are:

- Hull, J. (2006, 6th Edition): Option, Futures and Other Derivatives
- Dowd, K. (2003): Measuring Market Risk.
- A. J. McNeil, R. Frey and P. Embrechts (2005): Quantitative Risk Management, Princeton University Press.
- Bluhm, C., L. Overbeck and C. Wagner (2002): An introduction to credit risk modelling, Chapman & Hall.
- Schonbucher, P. J. (2003): Credit Derivatives Pricing Models, Wiley.
- Jackel, P. (2002): Monte Carlo Methods in Finance, Wiley.
- Jackson, M., M. Staunton (2002): Advanced modelling in finance using Excel and VBA, Wiley.
- Glasserman, P. (2002): Monte Carlo Methods in Financial Engineering, Springer.
- Lando, D. (2004): Credit Risk Modeling: Theory and Applications. Princeton University Press.
- Crouhy, M., Galai D. and R. Mark (2001): Risk Management. McGraw-Hill.

Assessment

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

Assignment 1	**20%**
Assignment 2	**20%**
Final Examination	**60%**

Assignment

- **Assignment 1 due: Thursday 18 September 2008, 9:00 am**
- **Assignment 2 due : Thursday 6 November 2008, 9:00 am**

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Assignments should be handed to the Unit Co-ordinator at the commencement of the lecture in the week the assignment is due. **Late assignments will not be marked.**

The assignments you submit must be your **own** work. Students who copy other student's assignment solutions will be penalised.

Final Examination

The final examination will be a three-hour written paper with ten (10) minutes reading time. The examination will cover the entire course.

There will be a mix of calculation questions and short answer questions that require you to demonstrate a deeper understanding of the material.

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

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 (Cr) 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.

This subject, while quantitative in nature, requires students to demonstrate substantial problem-solving skills and a clear understanding of the theory. It is not possible to achieve a Distinction grade or above by just memorising formulae or principles.

The assessment tasks in ACST865 aim to test your knowledge and understanding of the basic formulae and principles as well as your ability to apply what you have learnt in practical situations. As professionals in the future, you will often encounter business problems that are unfamiliar to you but they are in fact an extension of the theory you have already learnt. In being able to recognise the problem in that context will allow you to come up with a solution.

This table is a guide to the meaning of each grade in the context of ACST865:

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Grade	Level of understanding represented by that grade
HD	•Able to apply basic principles to solve unfamiliar, non-standard problems •Able to accurately perform complex numeric procedures & explain or interpret results using non-technical terms
D	•Able to apply basic principles to solve problems which differ significantly from the familiar •Able to accurately perform more demanding numeric procedures & explain or interpret results clearly and concisely
CR	•Able to apply basic principles to solve problems which differ slightly from the familiar •Able to perform numeric procedures that require some problem-solving skills & explain or interpret results on some occasions
P	•Able to apply basic principles to solve standard problems in familiar scenarios •Able to accurately perform standard numeric procedures that are more mechanical in nature, or those that require very little problem-solving skills
PC	•Marginally satisfactory achievement of P level understanding •Able to accurately perform a limited range of numeric procedures, but not able to explain them clearly
F	•No evidence of achieving P level understanding

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).

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

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 legibly written 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.

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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.html

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 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.

Reference Material

Copies of any additional readings, assignments, and other unit material will be placed in the Reserve Section of the Library.

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

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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.

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