

F71RM Financial Risk Management (BSc)

F71ER Enterprise Risk Management 1 (MSc in Act. Man.; MSc in QFRM)

Lecturer: Andrew Cairns

Office: Colin Maclaurin Building S.08

E-mail: A.Cairns@ma.hw.ac.uk

Course Web Page: <http://www.ma.hw.ac.uk/~andrewc/erm/>

Tel: 0131 451 3245

Aim

To provide: an introduction to the advanced statistical methods underpinning Financial Risk Management (FRM) and Enterprise Risk Management (ERM), including credit risk; a thorough grounding in the wide range of risks facing a company. To develop key risk assessment skills.

Summary

In this course we will cover the following topics

- Introduction
 - What is ERM and why is it worthwhile
 - Direct and indirect stakeholders in an enterprise
 - Different types of risk
- Quantitative analysis of financial data
 - Quantifiable and non-quantifiable risks
 - Modelling univariate financial time series; model fitting and diagnostic tests
 - Extreme value theory
 - Econometric models for stochastic volatility
 - Modelling multivariate risks including the use of copulas
 - Different measures of correlation and dependency
 - Risk measures; coherent risk measures

- Scenario analysis and stress testing
- Model and parameter risk
- Contagion and credit risk (MSc students only)
 - Different sources of credit risk; contagion
 - Corporate bonds and components of credit spreads
 - Different theoretical and commercial approaches to modelling credit risk

Much of the course will focus on a small number of financial risks that banks and insurers are exposed to. We will discuss how these risks can be analysed and the methods discussed in lectures will be implemented in the weekly computer labs.

Learning outcomes

At the end of the course you should be able to:

In terms of subject mastery:

- Demonstrate an understanding of the different reasons for measuring financial risk.
- Describe and apply the different measures of financial risk
- Define what is meant by a coherent measure of risk
- Determine the main characteristics of a univariate financial time series
- Use appropriate statistical and computational methods to determine the fatness of the tails of returns data
- Describe and apply the main univariate and multivariate distributions to financial data
- Describe and apply the fundamental concepts and theorems in Extreme Value Theory (EVT)
- Describe how analysis of financial data using EVT differs from traditional statistical methods
- Describe and apply the main statistical methods in EVT to financial data
- Demonstrate how multivariate returns can be described using marginal distributions and copulas
- Describe and apply the main copulas
- Explain how the use of different copulas can affect the returns distribution on a portfolio containing two assets

- Describe some empirical techniques that can be applied to financial time series data to establish the presence of stochastic volatility
- Describe some simple time series models for stochastic volatility and explain how these affect the distribution of returns over time
- Use appropriate statistical software to analyse problems involving financial risk
- Demonstrate a good understanding of the different sources of credit risk and credit spreads (*)
- Show an awareness of the different approaches to modelling and managing credit risk (*)

(*) MSc students only.

In terms of personal abilities:

- Awareness of the principal statistical methods and models used in assessing risk in financial work.
- Possession of the knowledge required to work in the area of risk management in the financial context.
- Use statistical modelling appropriately and rigorously to formulate workable solutions to important financial problems.
- Show an appreciation of the interface between academic theory and industrial practice
- Demonstrate the ability to learn independently and as part of a group
- Manage time, work to deadlines and prioritise workloads
- Use an appropriate computer package to analyse financial data and solve complex problems
- Present results in a way that demonstrates that they have understood the technical and broader issues of financial risk management
- Show an appreciation of the societal role of risk management in protecting the consumer and other stakeholders

Timetable

The timetable has 5 hours per week for each group (BSc, MSc):

- Lectures: Wednesdays 9.15am and 1.15pm (EM 3.36), and Thursdays 9.15am (EM 1.83)
- Tutorials (examples and discussion class): Tuesdays 10.15am (WP 1.08)
- Computer labs: Thursdays 12.15pm (EM 2.52)
- Additional classes for MSc students: please keep Thursdays at 1.15pm free. I will use these times later in the semester to prepare you for the rigours of an ST9-level exam.

Occasionally I may be away from university and unable to give timetabled classes. I will give you plenty of advance warning if this is likely to be the case.

I will be away from the university on the following dates:

- Wednesday 14 September
- Tuesday 8 November
- Tuesday 22 November

Office Hours

I will be available for individual discussions on Thursdays from 2.30-5.00pm.

If you do not live out at Heriot-Watt then it would be sensible to phone or e-mail me first to make sure that I will be around if you want to call in.

Lectures

Lectures will consist of a mixture of notes and discussion supplemented by printed lecture notes.

It is essential that you listen carefully during the discussions and take notes as appropriate. (If I don't give you enough time to note down the points made in class please let me know, so that I can slow down!)

- As far as possible, the printed lecture notes will be handed out in advance and available on HW Vision.
- You should read these notes before I discuss them in lectures. This way you will gain more from what I am saying in class.
- Also: you are recommended to find out as much as you can beyond the recommended reading about related risk management topics. This will help you tackle those parts of the course assessment that require a substantial amount of independent and creative thinking.

Computer labs

You should attend all of the supervised computer labs, as this is a core part of the learning experience for this course. Additionally, you should carry out lab work outside of the scheduled hours in order to keep up with the coursework.

The main computing package to be used in this course is the statistics package *R*.

Attendance at the lab sessions is compulsory.

- They will help you to understand the statistical techniques and analyses that are being discussed in lectures. For example, you will be required to repeat the analyses discussed in class and then apply these to other datasets.
- The course is assessed partly by coursework that might require computer-based statistical analysis.

Feedback

The course offers various opportunities for feedback on your progress:

- General feedback on the assignment. (Timings are such that it might not be possible to give detailed individual feedback before the exam in December.)
- Weekly tutorials: by preparing thoroughly *in advance of each tutorial* you will have the opportunity to discuss aspects of each tutorial question with fellow students and the lecturer.

- Weekly computer labs: regular attendance means you will be able to discuss any difficulties with the lecturer, and also discuss your numerical results and conclusions with the lecturer.
- You can get feedback on other aspects of the course by visiting the lecturer during office hours or by making an appointment by e-mail.

Special needs

If you have any relevant special needs or disabilities that have not been notified to the university, then please see the Student Welfare Service as soon as possible. Where appropriate, the lecturer will prepare special handouts, or you might be allowed extra time in exams. For example, anyone with visual impairments should notify the university in order that I can prepare suitable handouts.

Assessment

- All students
 - 20% of the final mark will be based on coursework that will be carried out during semester 1.

MSc students: The planned date for handing in the Assignment is Friday 18 November.

BSc students: The planned date for handing in the Assignment will be around Friday 4 November but the exact date has still to be finalised.
 - 80% of the final mark will be derived from the final 2-hour exam at the end of Semester 1 in December. **Note that the timing of this exam is different from previous years!**

There are different papers with some overlap for the BSc and MSc students. In part this reflects the slightly longer syllabus for MSc students, but it will also reflect the UK actuarial profession's requirements for exemption from subject ST9.
 - For MSc students there will be a further change from what you will see in past papers. More of the questions will require a substantial element of independent and creative thinking, without much detailed guidance in the exam question.

The course website will have some past exam papers.

However, note the syllabus changed in 2009/10 so the exams up to 2008/9 will be a bit different from the past paper you will see for 2009/10 and 2010/11 and the exam you will see in December 2011. Also, for MSc students only: previous years had one 3-hour exam covering ERM 1 and 2 in April/May. This year ERM 1 will be examined in December, and ERM 2 will be examined in April/May.

Reading

The required reading for the lecture course will be a set of printed lecture notes that I will provide.

For additional reading, an excellent textbook is that by McNeil, Frey and Embrechts (2005). The majority of the topics covered in the lecture course are discussed in detail in this book.

The book by Crouhy, Galai and Mark (2006) is also an excellent one (modestly priced!) covering the non-quantitative parts of the course.

Finally, there is a new textbook by Sweeting (2011) that I have still to assess! This book covers many of the topics in both this module (FRM and ERM 1) and next semester's module (ERM 2) for MSc students.

1. ALEXANDER J. MCNEIL, RUDIGER FREY, PAUL EMBRECHTS (2005) *Quantitative Risk Management: Concepts, Techniques and Tools*. Princeton University Press,
2. M. CROUHY, D. GALAI, & R. MARK (2006) *The Essentials of Risk Management*. McGraw Hill,
3. P. SWEETING (2011) *Financial Enterprise Risk Management*. Cambridge University Press,

Mobile Phones

Mobile phones must be switched off at all times in lectures, tutorials and lab sessions.

At exam time mobile phones may not be taken into the exam hall.