

WELCOME

Math48181/68181: Extreme Values and Financial Risk
Semester 1
Lecturer: Dr. Saralees Nadarajah

Office: Alan Turing 2.223.

Office Phone: 0161 275 5912. 24 / 7

Zoom link is <https://zoom.us/my/saraleesnadarajah>, you are most welcome to Zoom me 24 / 7.

Office Hours: Wednesday 11:00-12:00 and Fridays 11:00-12:00, you are most welcome to see me any other time, no appointments needed.

Skype id is "saraleesan", you are most welcome to skype me 24 / 7.

E-mail: mbbssn2@manchester.ac.uk, you are most welcome to email me 24 / 7.

I am also happy to meet you in person anywhere 24 / 7 for tutoring.

WWW: <https://minerva.it.manchester.ac.uk/~saralees/extremes6.html>

**Math48181/68181: Extreme Values and Financial Risk
Semester 1**

Credit rating: 15.

Pre-requisite units: Statistical methods (Math20802).

[http://minerva.it.manchester.ac.uk/
~sarales/MATH20802.html](http://minerva.it.manchester.ac.uk/~sarales/MATH20802.html)

Math48181/68181: Extreme Values and Financial Risk Semester 1

Aims: To introduce probabilistic fundamentals and some statistical models in extreme value theory with applications to finance.

Brief description: The course will give some probabilistic and statistical details of univariate and bivariate extreme value theory. The topics covered will include: fundamental of univariate extreme value theory, the three extreme value distributions, various models for univariate extremes, fundamentals of bivariate extreme value theory, and various models for bivariate extremes. The course will contain a great deal material on applications of the models to finance. Software in R will be used.

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Intended Learning Outcomes

On successful completion of this unit students will: 1) have some understanding of the probabilistic fundamentals of univariate and bivariate extreme value theory; 2) be able to choose and fit appropriate extreme value models for a given data (univariate and bivariate); 3) be able to calculate probabilities associated with total portfolio loss, maximum portfolio loss and minimum portfolio loss; 4) be able to estimate financial risk measures; 5) be able to fit copulas to real data sets; 6) be able to fit GARCH type models to real data sets.

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Course Contents

I plan to cover all of the following topics:

1. Fluctuations of univariate maxima: the theory,
2. Fluctuations of univariate upper order statistics: the theory,
3. Some statistical models for univariate extremes,
4. Real data applications for univariate extremes using the R software,
5. Portfolio theory,
6. Real data applications,
7. Financial risk measures and their estimation,
8. Real data applications,
9. Models for stock returns,
10. Real data applications,
11. Some models for bivariate extremes,
12. Real data applications for bivariate extremes using the R software,
13. Copulas,
14. Real data applications,
15. GARCH type models,
16. Real data applications.

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Textbooks

Embrechts, P., Klüppelberg, C. and Mikosch, T. (1997) Modelling Extremal Events: for Insurance and Finance, Springer-Verlag, Berlin.

Leadbetter, M.R., Lindgren, G. and Rootzén, H. (1983) Extremes and Related Properties of Random Sequences and Processes, Springer-Verlag, Berlin.

Resnick, S.I. (1987) Extreme values, Regular Variation and Point Processes, Springer-Verlag, Berlin.

Coles S. (2001) An Introduction to Statistical Modelling of Extreme Values, Springer-Verlag, London.

Kotz, S. and Nadarajah, S. (2000) Extreme Value Distributions: Theory and Applications, Imperial College Press, London.

PDF files of these books
are posted in the course
website.

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Learning and Teaching Processes

One review session and one example class each week. In addition students are expected to do at least four hours private study each week on this course unit.

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Quizzes

There will be ten quizzes due at the following times:

<https://minerva.it.manchester.ac.uk/~saralees/ext2021quizz1.pdf> due by 11:00am on Wednesday, 13 October 2021

<https://minerva.it.manchester.ac.uk/~saralees/ext2021quizz2.pdf> due by 11:00am on Wednesday, 20 October 2021

<https://minerva.it.manchester.ac.uk/~saralees/ext2021quizz3.pdf> due by 11:00am on Wednesday, 27 October 2021

<https://minerva.it.manchester.ac.uk/~saralees/ext2021quizz4.pdf> due by 11:00am on Wednesday, 10 November 2021

<https://minerva.it.manchester.ac.uk/~saralees/ext2021quizz5.pdf> due by 11:00am on Wednesday, 17 November 2021

<https://minerva.it.manchester.ac.uk/~saralees/ext2021quizz6.pdf> due by 11:00am on Wednesday, 24 November 2021

<https://minerva.it.manchester.ac.uk/~saralees/ext2021quizz7.pdf> due by 11:00am on Wednesday, 1 December 2021

<https://minerva.it.manchester.ac.uk/~saralees/ext2021quizz8.pdf> due by 11:00am on Wednesday, 8 December 2021

<https://minerva.it.manchester.ac.uk/~saralees/ext2021quizz9.pdf> due by 11:00am on Wednesday, 15 December 2021

<https://minerva.it.manchester.ac.uk/~saralees/ext2021quizz10.pdf> due by 11:00am on Wednesday, 5 January 2022

Each quiz will be worth 1 percent.

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In-class test

There will be an in-class test on Friday 17 December 2021 accounting for 10 percent. The formulas you will need to remember for this test are in

<https://minerva.it.manchester.ac.uk/~saralees/cwformula2021.pdf>

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Final exam

The final exam for this course will be in January 2022, the formulas you will need to remember for this exam are in

<https://minerva.it.manchester.ac.uk/~saralees/formula202120.pdf>

The final exam will account for 80 percent of your final mark.