

ACTS:7730 Advanced Topics in Actuarial Science/Financial Mathematics - Quantitative Risk Management for Insurance and Finance

Instructor: Dr. Qihe Tang

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Course Schedule: 12:30 – 1:50 P.M., Tuesday and Thursday, 150 SH

Office Hours: 3:30–4:30 P.M., Monday, Wednesday and Friday, or by appointment

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Course Description

In recent decades, we have witnessed explosive developments of quantitative risk management. The Great Recession, which was triggered by the collapse of the sub-prime mortgage market in the United States in 2008, is arguably one of the worst global recessions since the Great Depression in 1930's. It has intensified the need for quantitative risk management among financial institutions and insurance companies and, in particular, it has expedited the evolutions of modern regulatory frameworks for banking and insurance.

In this advanced topics course we shall follow the first two parts of McNeil-Frey-Embrechts (2015) to learn basics in quantitative risk management, with topics including:

- Risk in Perspective
- Basic Concepts in Risk Management
- Extreme Value Theory
- Multivariate Models
- Copulas and Dependence
- Aggregate Risk

This course is designed for graduate students or high-level undergraduate students with a good background in mathematics, probability, and statistics to seek an entrance to the area of quantitative risk management. It will stress the fundamentals and explore the topics at a somewhat technical level. Nevertheless, the course will be made as self-contained as possible so that students who are strong in mathematics but have not taken advanced courses in probability and statistics can still follow.

An important feature of this course is that, while studying the intended topics and some selected papers, we shall initiate and focus on some interesting research problems, either theoretical or applied, in the interdisciplinary area of statistics, insurance, and finance. The course is particularly suitable for those who desire to pursue a research topic on quantitative risk management for insurance and finance.

Main References

- McNeil, A. J.; Frey, R.; Embrechts, P. *Quantitative Risk Management: Concepts, Techniques and Tools*. Princeton University Press, 2015. [PDF of the 2005 edition available on internet]
- Embrechts, P.; Klüppelberg, C.; Mikosch, T. *Modelling Extremal Events for Insurance and Finance*. Springer, Berlin, 1997.
- Joe, H. *Dependence Modeling with Copulas*. CRC Press, Boca Raton, FL, 2015.
- Nelsen, R. B. *An introduction to Copulas*. Springer Science & Business Media, 2006.
- A list of papers and book chapters selected from the recent literature of insurance, finance and risk management.

Evaluation System

Each student has the option to choose an A/B/C/D grade or an S/U grade. For those who choose an A/B/C/D grade, the grades will be given based on the following:

- Two homework assignments: 60%

You are *not* allowed to discuss homework problems with other students. *What you hand in must ultimately be your own work.*

- One final project: 30%

At the beginning of November, a list of papers and book chapters selected from the recent literature of insurance, finance, and risk management will be released. Each student will be asked to pick up one from the list, to study it and make a 30-minute presentation.

- Class attendance and engagement in discussions: 10%

For the CLAS (College of Liberal Arts and Sciences) policies and procedures, please click: <http://clas.uiowa.edu/faculty/teaching-policies-resources-syllabus-insert>