Technische Universität München

Module Description
MA5715: Financial Engineering with Copulas

TUM Department of Mathematics

Module Level:	Language:	Duration:	Frequency:
Master	English	one semester	one-time

Credits:*	Total Hours:	Self-study Hours:	Contact Hours:
6	180	120	60

Number of credits may vary according to degree program. Please see Transcript of Records.

Description of Examination Method:
Written or oral exam

Type of Examination:	Duration of Examination (min.):	Repeat Examination:
written or oral	60 (schriftlich) oder 20-30 (mündlich)	End of Semester

(Recommended) Prerequisites:
MA2402 - Basic Statistics

Content:
Motivating examples (e.g. dependence in asset returns and default times), definition of copulas and Sklar's Theorem, dependence measures and their properties, computation rules for multivariate probability distributions, families of copulas and general construction principles, parameter estimation, stochastic simulation, applications (e.g. to portfolio credit-risk modelling), uncertainty concerning dependence.

Intended Learning Outcomes:
After successful completion of the module, students have a sound understanding of the dependence structure behind multivariate stochastic problems, which is one of the key challenges for modern financial engineering. They understand the relevant tools and intuition behind copulas and are able to successfully apply them in applications. They are able to measure and model dependence, select a problem-adequate dependence structure, and fit the constructed model to empirical data. This includes the use of statistical software (e.g. R) to estimate copula models, visualize multivariate data, and perform efficient high-dimensional simulations.

Teaching and Learning Methods:
Lecture, Excersises, Computer exercises, Homework sheets.

Media:
Blackboard, beamer slides, R (statistic programme), exercise sheets

Reading List:

1. H. Joe, Multivariate Models and Dependence Concepts, Chapman and Hall/CRC, London (1997).
2. J.-F. Mai, M. Scherer, Simulating copulas: Stochastic models, simulation algorithms, and applications, Imperial College Press (2012).
3. J.-F. Mai, M. Scherer, Financial Engineering with Copulas explained, Palgrave (2014).
4. A.J. McNeil, R. Frey, P. Embrechts, Quantitative Risk Management, Princeton University Press, Princeton, New Jersey (2005).
5. R.B. Nelsen, An Introduction to Copulas, second edition, Springer, New York (2006).

Responsible for Module:

Matthias Scherer, scherer@tum.de

Courses (Type of course, Weekly hours per semester), Instructor:

Financial Engineering with Copulas (Programming Practical) (Practical Course, 1 SWS)
Scherer M

Financial Engineering with Copulas (Exercise Session) (Exercise, 1 SWS)
Scherer M, Fernandez L, Khedher A

For further information in this module, please click
www.campus.tum.de or here.