

**Ph.D. Program in Consumers and Markets**

*Curriculum: Finance, markets and regulation*

**Tail Dependence and Systemic Tail Risk in Finance**

**Given by** Davide Lauria | Researcher in financial mathematics, applied probability and stochastic programming at University of Bergamo, Department of Management.

**When** Tuesday 27<sup>th</sup> May, h: 11:00 – 14:00; Wednesday 28<sup>th</sup> May, h: 11:00 – 14:00; Thursday 29<sup>th</sup> May, h: 11:00 – 13:00/15:00 – 17:00

**Where** Computer lab (small room), ground floor | Department of Business Studies – Roma Tre University | Via Silvio D'Amico, 77, 00145 - Rome, Italy | [Google Maps](#)

**Main Topics:**

**LECTURE I (3 hours)**

- Introduction to Copulas: definitions and main properties.
- Bivariate Copulas: dependence, tail behavior, and asymmetries.
- Estimation.
- Examples of copula families.

**LECTURE II (3 hours)**

- Estimation of Tail Dependence.
- Parametric, semi-parametric, and non-parametric estimators.
- Financial examples.

**LECTURE III (2 hours)**

- Measures of Systemic Tail Risk.
- CoVaR, CoES and related measures.
- Examples.

**LECTURE IV (2 hours)**

- Surface Integrals.
- Asymmetric measures of tail dependence based on surface integrals.

**Material:**

Supplementary materials and MATLAB scripts will be made available during the course.

**Main References:**

1. Nelsen, R. B. *An Introduction to Copulas*. Springer Publishing Company, Incorporated, 2010.
2. Joe, H. *Multivariate Models and Multivariate Dependence Concepts*. Chapman & Hall/CRC Monographs on Statistics & Applied Probability. Taylor & Francis, 1997.
3. Mainik, G., and Schaanning, E. On dependence consistency of CoVaR and some other systemic risk measures. *Statistics & Risk Modeling* 31, 1 (2014), 49–77.
4. Supper, H., Irresberger, F., and Weiß, G. A comparison of tail dependence estimators. *European journal of operational research* 284, 2 (2020), 728–742.