

# Introduction to risk measures

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The course is aimed at those interested in learning about the probabilistic aspects of financial and insurance risk. After completing the course, the students will have an insight into the rich theory of risk measures as it is used in financial mathematics and actuarial science.

The following is a tentative outline of the course:

- Stochastic orders (increasing, increasing convex, convex, ...).
- Risk measures (monetary, convex, coherent, law-invariant, comonotone, ...). Acceptance sets. Dual representations. Risk measures consistent with a given stochastic order. Choquet integrals. Distortion risk measures.
- Dynamic risk measures.
- Risk measures induced by Backward stochastic differential equations: existence, uniqueness, comparison, non-linear expectation ( $g$ -expectation).

The course will be particularly useful to those wishing to pursue with a Bachelor's or Master's thesis in this area and to those who envisage an internship in the banking or (re)insurance industry.

Prerequisites: probability theory, some notions of functional analysis; some knowledge on Brownian motion will be helpful in the last part of the course.

No preliminary knowledge of financial mathematics is necessary.

Course language: English

First course: the 13<sup>th</sup> of April

First tutorial: the 24<sup>th</sup> of April

## List of references (non-comprehensive):

Föllmer, H. and A. Schied (2016): *Stochastic finance. An introduction in discrete time*, De Gruyter Studies in Mathematics, 4th edition.

El Karoui N. and M.-C. Quenez (1997): *Non-linear Pricing Theory and Backward Stochastic Differential Equations*, *Financial Mathematics*, Lect. Notes in Mathematics 1656, Ed. W. Runggaldier, Springer.

Müller, A. and D. Stoyan (2002): *Comparison Methods for Stochastic Models and Risks*, Wiley Series in Probability and Statistics, Wiley.