**课程简介：**

Actuarial and Financial Models)

# Professor: Jan Dhaene

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Aims:

The purpose of this course is to introduce master and PhD students to some current research topics in actuarial science and/or financial mathematics. After following this course, students should be more familiar with current actuarial and financial research papers.

Prerequisite:

Given the quantitative nature of this course, a sound mathematical background and sufficient knowledge of probability theory and calculus is indispensable. Students must at least have mastered the topics, concepts and derivations covered in the following international standard textbooks (or similar textbooks at undergraduate level):

- Ross, S. (2009) A First Course in Probability (8th edition), Prentice Hall.

- Barnett, R., Ziegler, M., Byleen, K. (2014). Calculus for Business, Economics, Life Sciences and Social Sciences (13th edition), Pearson.

Furthermore, a profound knowledge of the standard models and techniques of actuarial science and financial mathematics is required.

Contents:

In the last couple of decades financial and actuarial research has made an enormous progress. In this course some (overview-) papers on recently developed financial - actuarial models and techniques will be studied. Attention is paid to the underlying assumptions of the models and how to evaluate their applicability in practice. The recently developed techniques and models that will be considered are not only attractive from a theoretical point of view, but they are also effective in solving finance and insurance problems occurring in the daily practice.

Possible research topics:

* Risk measurement,
* Optimal portfolio selection,
* Capital allocation,
* Market consistent valuation of insurance liabilities,
* Model-free approaches to option pricing and hedging,
* Measuring systemic risk in financial markets..

Teaching activities:

10 lectures of 3 hours.

Course Material:

A (non-exclusive list) of possible actuarial-financial (overview) papers:

- *The concept of comonotonicity in actuarial science and finance: theory.*

J. Dhaene, M. Denuit, M.J. Goovaerts, R. Kaas & D. Vyncke (2002). Insurance: Mathematics & Economics, 31 (1), 3-33.

- *The concept of comonotonicity in actuarial science and finance: applications*.

J. Dhaene, M. Denuit, M.J. Goovaerts, R. Kaas & D. Vyncke (2002). Insurance: Mathematics & Economics, 31 (2), 133-161.

*- Risk measures and comonotonicity: a review*.

J. Dhaene, S. Vanduffel, M. Goovaerts, R. Kaas, D. Vyncke & Q.Tang. (2006). Stochastic Models, 22, 573-606.

- *Optimal capital allocation principles*.

J. Dhaene, A. Tsanakas, E. Valdez & S. Vanduffel (2012). Journal of Risk and Insurance, 79(1), 1-28.

- *Index options: a model-free approach*.

D. Linders, J. Dhaene, H. Hounnon & M. Vanmaele (2012). Research report AFI-1265, FEB, KU Leuven.

- *The multivariate Black & Scholes market: conditions for completeness and no-arbitrage*.

J. Dhaene, A. Kukush & D. Linders (2013). Theory of Probability and Mathematical Statistics, No. 88, 2013, 1-14.

- *On the (in-)dependence between financial and actuarial risks*.

J. Dhaene, A. Kukush, E. Luciano, W. Schoutens & B. Stassen (2013). Insurance: Mathematics and Economics, 52(3), 522-531.

- *Option prices and model-free measurement of implied herd behavior in stock markets*.

D. Linders, J. Dhaene & W. Schoutens (2015). Research report AFI-1597 FEB, KU Leuven.

- Market-consistent valuation of insurance liabilities.

J. Dhaene, B. Stassen, M. Vellekoop. Working paper.

**Exam:**

Written exam (open book).