KU LEUVEN


# Foundations of Quantitative Risk Measurement

October 1, 2018

Introduction

Daniël Linders

# Who we are

dr. Daniël Linders (substitute for Jan Dhaene)

- Assistant professor at the University of Illinois (USA)
- Guest Lecturer at the KU Leuven
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# Who we are

- Prof. dr. Jan Dhaene
  - Appointed at KU Leuven
  - Office: HOGM 01.100
  - jan.dhaene@kuleuven.be
  - Website: http://jandhaene.org

- Karim Barigou (TA)
  - Appointed at KU Leuven
  - Office: HOGM 01.158
  - Karim.barigou@kuleuven.be

# Aim of the course

- This course describes important *concepts* in risk measurement.
- This course is **not** a cookbook, explaining today's risk management models.
  - We investigate the concepts, not their implementation.
  - This course can be used today (e.g. Solvency II), but also *tomorrow (e.g. Solvency III, IV, …. X).*
  - we explain how these concepts are used in the industry.
- The aim is to:
  - make the students familiar risk measurement concepts;
  - give students insight in risk measurement;
  - have students think critical about risk measurement practices.

# Content of the course

- Expected Utility theory
- Comonotonicity
- The dual theory of choice under risk
- Modeling and measuring dependence
- Risk Measures
- Subadditivity
- Methods for aggregating dependent risks
- Application: risk management for multivariate derivatives and longevity bonds

# Preliminaries of the course

- Basic knowledge about calculus
  - Increasing/decreasing, continuous, differentiable,… functions.
  - We use integrals and derivatives a lot.
- Probability theory
  - Random variables, cumulative and probability distributions, equality in distribution, …
  - Expected value, variance, higher moments,…
- Matlab
  - Matlab will be used to illustrate the theory.

# Preliminaries of the course

- The course is about ***mathematical*** modeling of risks.
- If you find out that your knowledge about mathematics and/or probability theory is not sufficient,….

**do something!!!!!!**

- For example…
  - look at the slides on toledo, which give a crash course in prob. theory;
  - study the brief introduction to probability theory in the appendix of the course notes;
  - try the exercises;
  - discuss with classmates or contact me or the TA.

# Material used during the course

- <u>Slides handled during the lectures + additional notes</u>
  - Only the material handled during the lectures has to be studied for the exam.
- <u>Matlab code</u>
  - The code will be available on Toledo.
- <u>Course notes</u>
  - Chapters from the book
    - ‘Measuring and Managing Actuarial Risks’, Dhaene, J., Denuit, M., Goovaerts, M., Kaas, R. & Linders, D, To be published, 2018.
- <u>Course website:</u>
  - http://daniellinders.com/fqrm
  - Toledo.

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# Material used during the course

- Exercises
  - Exercises will be handled during the lectures and exercise classes.
  - The exercises will help you to:
    - test and improve your mathematical skills;
    - apply the general theory in a particular situation;
    - gain more insight in the theory.
- Solutions of the exercises will be provided, but…
  - try to finish the exercises without the solutions;
  - discuss with your classmates;
  - ask me if you have any questions!!!

If you want to pass the exam, you should be able to make the exercises ***yourself***!!!!

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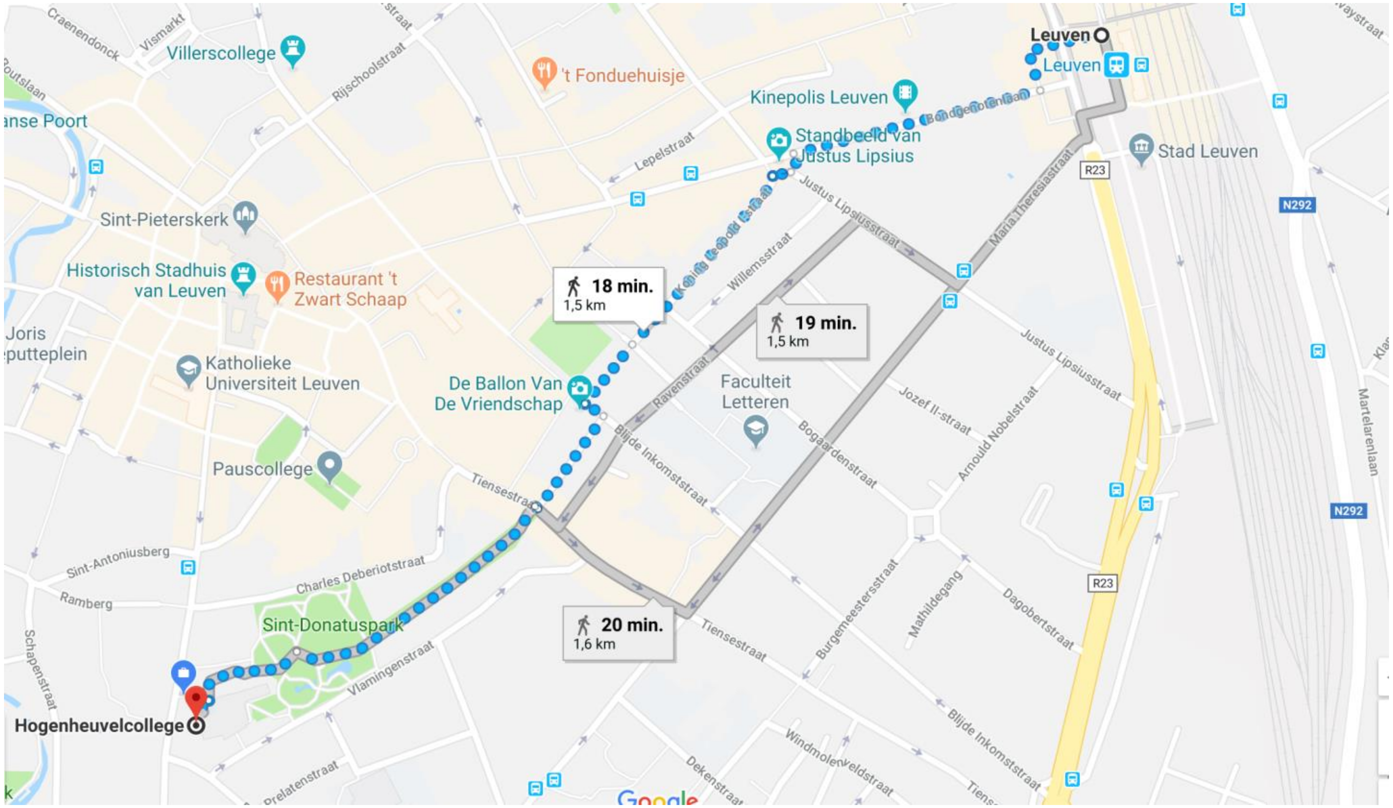
# The course

***Online*** and ***in-class*** lectures.

- In-class lectures @KU Leuven:
  - October 22 (HOGC-02.28): 9am – 11am.
  - October 22 (HOGM-01.85):1pm – 4pm.
  - October 23 (HOGM-01.85): 9am – 11am.
  - November 19 (HOGC-02.28): 9am – 11am.
  - November 19 (HOGM-01.85): 1pm – 4pm.
  - November 20 (HOGM-01.85): 9am – 11am.
  - December 17 (HOGC-02.28): 9am – 11am.

# The course

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# The course

- Online lectures: (can be watched via Youtube).
  - October 8.
  - October 15.
  - October 29.
  - November 5.
- Exercise classes:
  - October 29 (HOGC-02.28): 9am – 11am
  - December 10 (HOGC-02.28): 9am – 11am

# Office hours

- Online office hours.
  - Upcoming online office hours will be announced via Toledo and the course website.
- First online office hours: **October 11, from 15-18h.**
  - You can call any time between 15h and 18h, but you may have to wait in the 'lobby' if someone is already in a meeting.
  - Students can attend the meeting in group (let me know who is in your group).
  - Join the meeting via Skype for Business
    - Click on this link: **Join Skype Meeting**
    - Trouble Joining? Try Skype Web App

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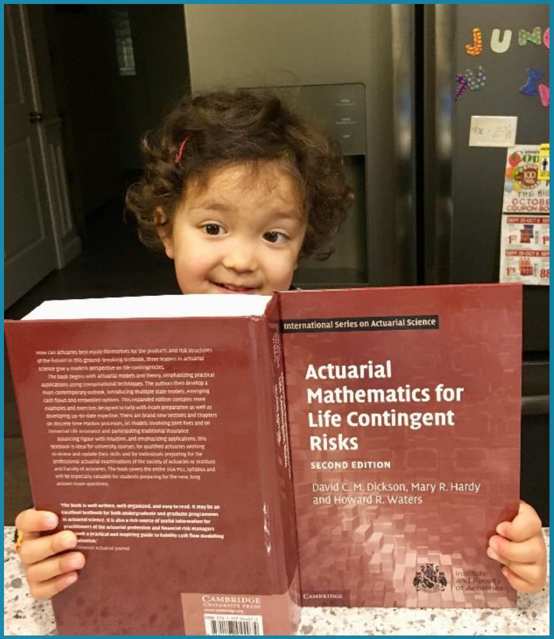
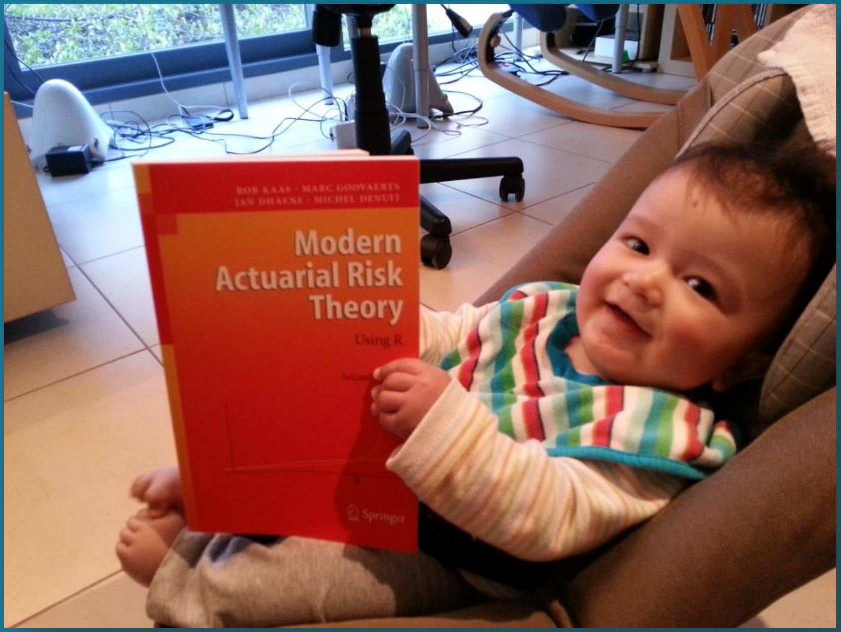
# The exam

- Open book exam during the exam period. You can bring
  - pocket calculator.
  - the course notes, slides, exercises, etc which are available on Toledo/course website;
  - ***but*** it is not allowed to add your own notes on this material.

- The exam consists of 4-5 questions
  - exam questions will be presented during the lectures and exercise sessions.




Do not wait untill the exam period, but start studying as early as possible!!

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