KU LEUVEN

Foundations of Quantitative Risk Measurement

September 30, 2019
Introduction

Daniël Linders

Who we are

dr. Daniël Linders (substitute for Jan Dhaene)

- Assistant professor at the
  - University of Illinois (USA),
  - University of Amsterdam (Netherlands).
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Who we are

- Prof. dr. Jan Dhaene
  - Appointed at KU Leuven
  - Office: HOGM 01.100
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- Said Safarveisi (TA)
  - Appointed at KU Leuven
  - Office: HOGM 01.158
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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).*
- <u>The aim is to:</u>
  - 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
- Integral Stochastic Orders
- Dependence Modeling
- Comonotonicity
- The dual theory of choice under risk
- Risk Measures
- Subadditivity
- Methods for aggregating dependent risks

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 and R
  - Matlab and R will be used to illustrate the theory.

Preliminaries of the course

- The course is about ***mathematical*** modeling and measurement 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
  - contact me or the TA.

Material used during the course

- Slides handled during the lectures + additional notes
  - Only the material handled during the lectures has to be studied for the exam.
- Matlab and R code
  - The code will be available on Toledo and can come back on an exam.
- Course websites:
  - http://daniellinders.com/fqrm
  - Toledo.

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***!!!!

The course

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

- **KU Leuven:**
  - Monday 30/09 (HOGC-02.28): 9h-11h
  - Monday 30/09 (HOGM-01.85): 13h-16h
  - Tuesday 1/10 (PSI 02.51): 9h-11h
- **Online:**
  - Monday 21/10
  - Monday 4/11
  - Monday 1/118

- **KU Leuven:**
  - Monday 25/11 (HOGC-02.28): 9h-11h:
  - Monday 26/11 (HOGM-01.85) 13h-16h:
  - Tuesday 27/11 (HOG 01.158): 9h-12h: Office hours.
  - Monday 2/12 (HOGC-02.28): 9-11h
  - Monday 16/12 (HOGC-02.28): 9-11h
  - Monday 16/12 (HOGM-01.85) 13h-16h

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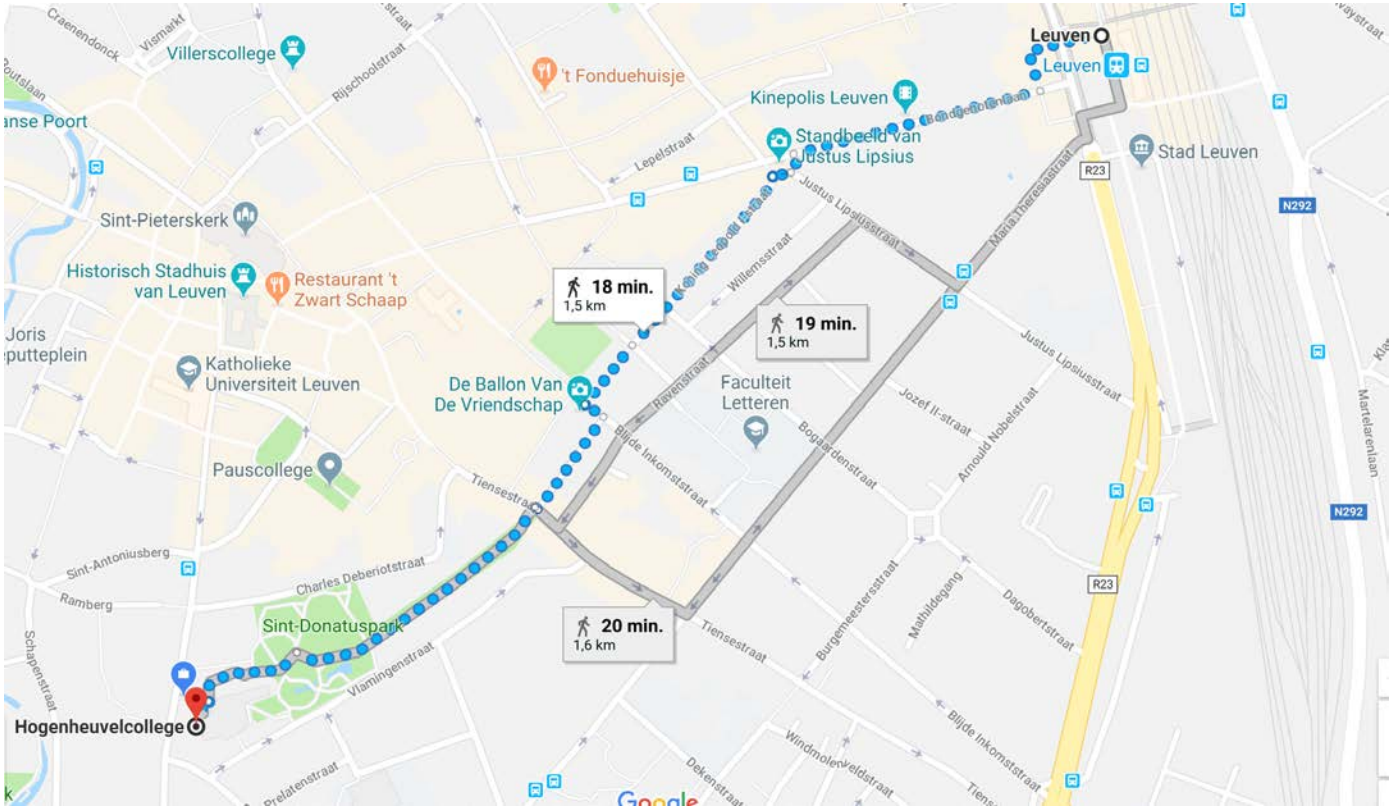
The course



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3000 Leuven

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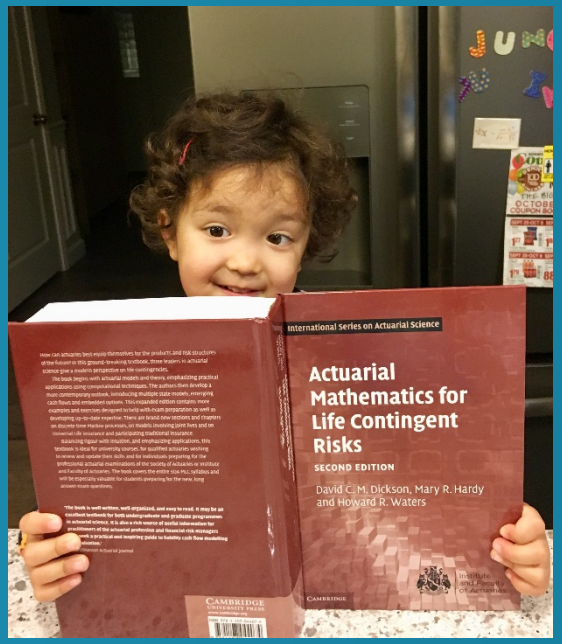
Office hours

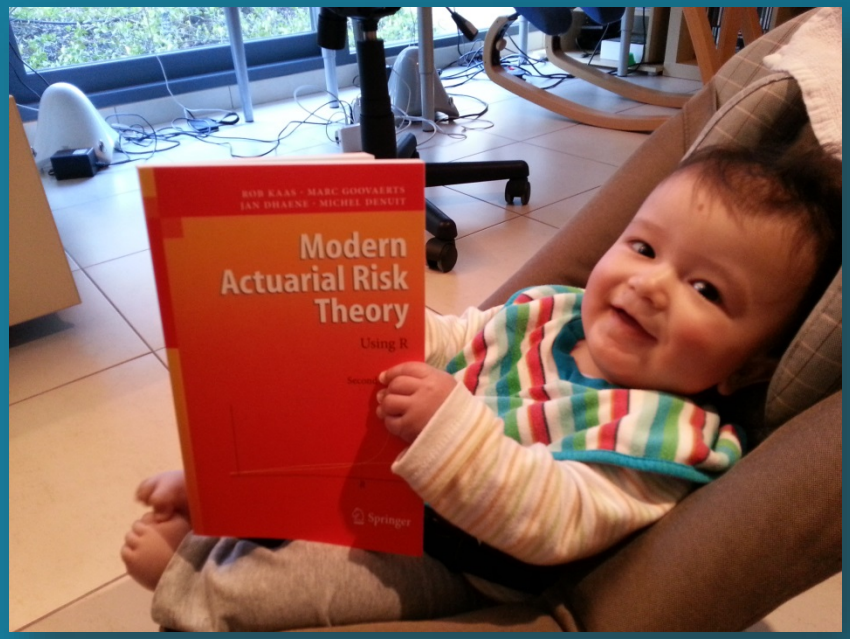
- Online office hours.
  - Upcoming online office hours will be announced via Toledo and the course website.
- First online office hours: **October 4, from 16-17h.**
  - Use Skype or Facetime.
  - Send me an email to make an appointment.

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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