

Information about Course SF2942
“Portfolio Theory and Risk Management”
Fall term 2019

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Instructor and Teaching Assistant

Instructor:

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Place and time

Meeting times: Tuesday, Thursday, Friday 8:00–10:00 + first three weeks: Thursday 15:00–17:00

Please check <https://www.kth.se/social/course/SF2942/calendar/> or schema for up to date information and rooms.

Brief description of course contents

Although always present, in recent years the demands on financial institutions and insurance companies to quantify and report their risks have become increasingly stringent. This requires taking a quantitative approach to dealing with questions on investments and risk management, which is the topic of this course. The course gives an introduction to some of the principles involved when making decisions in the presence of hedgeable and non-hedgeable risks. It is intended to provide students a solid understanding of some essential features of investment and risk management problems.

The course is based on the first six chapters, i.e. part I, of the book
Hult, H., Lindskog, F., Hammarlid, O. and Rehn, C. J.:
Risk and Portfolio Analysis: Principles and Methods.
Springer, New York, 2012.

Prerequisites

Courses in single and multivariable calculus, linear algebra, differential equations, probability theory and statistics and numerical analysis. Knowledge of optimization theory is helpful but not required.

Instructional method and organization of the course

Lectures can be divided into two types: Theory and problem sessions.

Theory sessions / lectures will cover the basic theoretical concepts of the course, as well as relevant examples and applications that highlight the theory.

The instructional method will be a mixture of blackboard presentations, slides and electronic presentations when appropriate. In particular, when discussing examples, computations in R (<https://cran.r-project.org/>) are sometimes used to illustrate the steps towards the solution. Slides will be available latest on the afternoon of the day before the corresponding lecture.

At problem sessions with TA Carl, exercises will be discussed and solutions to them will be presented. The exercises will be announced a few days in advance in Canvas. In order to enhance the use of the exercises, students are encouraged to look into the exercises for themselves before problem sessions.

Course material

The main text for the course is the aforementioned:

Hult, H., Lindskog, F., Hammarlid, O. and Rehn, C. J.:
Risk and Portfolio Analysis: Principles and Methods.
Springer, New York, 2012.

The book is also available as an e-book via KTH library.

The course will cover the first part of the book, labelled “Principles”, consisting of the first six chapters (the second part of the book will be covered in SF2980 ”Risk Management“, period 2). Additional texts that can be helpful are

- lecture notes from SF2701 (either by Harald Lang or Camilla Landén)

and (any edition of)

- Hull, J. C.: Fundamentals of Futures and Options Markets. Pearson Prentice Hall, Upper Saddle River, NJ (2013)
- Hull, J. C.: Options, Futures, and Other Derivatives. Pearson Prentice Hall, Upper Saddle River, NJ (2015)

For a slightly more “lighthearted” approach to some of the topics mentioned, one can also have a look at

- Petters, A. O. and Dong, X.: An Introduction to Mathematical Finance with Applications: Understanding and Building Financial Intuition. Springer Undergraduate Texts in Mathematics and Technology, Springer New York (2016)
(available as e-book at KTH library).

However, the main text is self-contained and is the only required reading for the course.

Course goals and objectives

By the end of the course students should:

- be able to rigorously define, explain and apply fundamental concepts within interest rate theory, portfolio theory and risk management.
- be familiar with common instruments for risk management.
- be able to define and apply different frameworks and criteria for portfolio choices and explain their strengths and weaknesses.
- be able to construct optimal portfolios / make optimal investment decisions based on the methods covered in the course.
- be able to give examples of some standard risk measures and to apply them.

Examination

There will be a written exam on Friday, 25.10., 14:00–19:00. Registration for the exam is required. Please refer to Studentexpeditionen Matematik / Student Affairs' Office Mathematics for any questions regarding enrollment in the course and registration for the exam.

Allowed aids at the exam: At the exam, students must bring a calculator and are allowed to bring a copy or printout of the aforementioned book by Hult et al. as well as a copy of the BETA mathematics handbook. At the exam, also a print-out of Appendix 2 from Allan Gut's book (to be found under "resources" here in Canvas) will be provided. The brought books may contain a few personal annotations up to an usual extent for course literature (please contact me in advance if you feel unsure about this). No additional sheets / pages in the books and no other aids are allowed.

Grades are based on the final exam and given in the range A-F, and Fx. The grade Fx gives you the right to a complementary examination to reach the grade E. The criteria for Fx is F and that an isolated part of the course can be identified where you have shown particular lack of knowledge. A complementary examination on this part can give the grade E. A request for a complementary examination must be received within six weeks.

There will also be weekly quizzes in Canvas that can give bonus points on the final exam (see next section).

Weekly quizzes for bonus points

From week 36 to 41 (six weeks) there will be a new quiz in Canvas every week. Participating in the quizzes is voluntary (i.e. not required to pass the course) and can give bonus points for the exam.

Further information:

- Each quiz will consist of one or several questions about the course.
- Each quiz gives exactly one point if all questions are answered correctly. In case of several questions, the one point will be split up and correct answers to some but not all questions will give partial credit.
- The questions are available from Friday 12:00 noon until the Friday morning one week later at 7AM. The first quiz opens Friday 30/8.
- Questions may be randomly selected (from a pool of questions) and each student has to answer via his / her Canvas account.
- There is only one attempt for each quiz, i.e. answers cannot be changed once the “submit” button has been used, even if the deadline has not passed yet. If an answer has been selected (but not submitted), it is supposed to be stored in Canvas and one can come back to the quiz and change this answer at any time before the submission deadline. (You might want to check that the answer has really been saved by leaving the quiz page and then resuming the quiz. Your stored answers should then be selected / shown.) In case that there is a stored (but not submitted) answer at the time of the deadline, Canvas will automatically take this last stored answer as a submission.

Please note that no manual adjustments for additional points are possible to make up for any technical problems / typos in answers / misconceptions. If you are unsure about a question or think that the formulation is unclear, contact the course responsible in good time for clarification.

The rules for bonus points are

- The six quizzes together allow for a maximal number of 6 points. The scheme for the translation of quiz scores to bonus points in the exam (which has 50 points in total) is as follows:

$$\text{exam bonus points} = \min(5, \text{floor}(\text{quiz points})).$$

(The floor function $\text{floor}(x)$ denotes the greatest integer smaller or equal to x .)

Important: The bonus points from the quizzes will only be added to the points scored in the exam, if the latter alone are sufficient to pass the exam, i.e. if the points in the exam alone will lead to a grade A-E. Bonus points are also only valid for exam and re-exam in this year (2019) and bonus points from previous years are not valid for this year's exam.

Re-exam

The re-exam (omtentamen) will take place Monday, 16.12., 14:00–19:00. The rules regarding the bonus points from the two assignments are the same as for the first exam, if the student did not attend the first exam or did not pass. However, points can only be used once, so if the re-exam is only taken for grade improvement, the bonus points will not be added.

Expectation of students

There is no official requirement to attend class. Students who elect to not attend class are themselves responsible for knowing what is being covered in class and to obtain the relevant material. The course logbook on the Canvas page can help with this task. In addition to what is available on the Canvas page and to all participating students, written lecture notes, sample solutions or similar will not be provided except under special circumstances.

Further material

On the homepage of 2016's instance of the course, <http://www.math.kth.se/matstat/gru/sf2942/>, you can find some additional material which may be of interest. This includes previous exams, including solutions. Exams from 2016–2018 can be found under “files” in the Canvas page of this course. Note that in these years, the exams were also open book, so the exams are a good guideline for this year's exam. However, before 2016, for most of the exams the students were not allowed to bring any help except for a calculator. Therefore, the exam this year will be different from exams ≤ 2015 , but working on the old exercises is still a good preparation for the exam.

PINGO surveys

Occasionally during lectures there will be student surveys, for example short quizzes. We will use the PINGO system for them (<http://pingo.upb.de/>). All students who attend the lecture can take part in those quizzes if they have some device which is connected to the internet. No signing up or additional software is needed. When a survey is started, it will be visible at the PINGO surveypage for this course: <http://pingo.upb.de/372214>. (Or go to <http://pingo.upb.de/> and enter the session number 372214.)