

# Theory and Practice of Risk Measurement

## Short Course, Peking University, Spring 2016

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### Main content

The course focuses on an academic study of

- axiomatic theory of risk measures
- issues in the practice of regulatory risk measures

Some recent research advances and regulatory debates will be incorporated in the course.

### Schedule

Lecture hours: 19:00 - 21:00 Wednesdays and Thursdays, March 30 to April 27, 2016

Location: 1560, Science Building No.1, Peking University

Planned lecture hours: 18

### References

The course will be mainly based on the instructor's personal research and learning experience. Many results are from recently published research papers and the materials will not follow a particular book.

The relevant reference books are

- (i) Föllmer, H. and Schied, A. (2011). *Stochastic Finance: An Introduction in Discrete Time*. Walter de Gruyter, Third Edition.
- (ii) Delbaen, F. (2012). *Monetary Utility Functions*. Osaka University Press.
- (iii) McNeil, A. J., Frey, R. and Embrechts, P. (2015). *Quantitative Risk Management: Concepts, Techniques, and Tools*. Princeton, NJ: Princeton University Press, Revised Edition.

- You are not required to purchase those books.
- You are encouraged to read some regulatory documents for financial and insurance institutions. References will be provided in the lectures.

### **Main objectives of the course**

- general framework of risk measurement and capital requirement
- Value-at-Risk and Expected Shortfall
- the current (2013-2015) debates and developments on regulatory risk measures
- monetary risk measures: coherent and convex risk measures, distortion risk measures, utility-based shortfall risks
- mathematics of risk measures: axiomatic theory and representation
- statistical and computational issues of risk measures: estimation, simulation, robustness, forecasting
- some recent research developments
- current challenges

The depth of the topics will be at the level of recent research advances.

### **Course Evaluation**

To be determined; most likely there will be a final exam.

## Schedule

	<b>Time</b>	<b>Topics</b>
<b>Part I</b> <b>Risk measures, regulatory capital and risk management</b>	Hours 1-4	Risk measures and capital requirement Value-at-Risk and Expected Shortfall Estimation and modeling Current debates in the regulation
<b>Part II</b> <b>Axiomatic theory of general risk measures</b>	Hours 5-10	Monetary risk measures Acceptance sets and duality Coherent and convex risk measures
<b>Part III</b> <b>Axiomatic theory of law-determined risk measures</b>	Hours 11-14	Distortion risk measures Law-determined coherent risk measures Utility-based shortfall risks Risk aversion in risk measures
<b>Part IV</b> <b>Selected recent research advances on risk measures</b>	Hours 15-18	Capital allocation and risk sharing Robustness issues Aggregation of risk measures Risk measures with convex level-sets Forecasting and elicibility Change of currency Systemic risk measures

Note: Part IV will be complemented by two seminar talks on risk measures at Peking University.