

NATIONAL UNIVERSITY OF SINGAPORE
NUS BUSINESS SCHOOL
Dept of Analytics & Operations

DSC5211C QUANTITATIVE RISK MANAGEMENT

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Session : Semester II, 2017/2018

Summary

We analyze quantitative risk management in operations. The course is designed to give the participants a broad understanding of the main theoretical issues in risk management and is built around a series of cases on typical real world problems. These cases will be discussed in the tutorial sessions, which are a key part of the course.

Topics

- Attitudes Towards Risk
- Monte-Carlo Simulation
- Times Series Analysis and Forecasting
- Stochastic Programming
- Dynamic Stochastic Programming
- Optimal Decisions Under Risk Aversion
- Managing Catastrophic Risk

Programming Languages

The students will be exposed to problems that will require a statistical package (e.g., R) and/or an optimization package (e.g., GAMS).

Bibliography

- Winston, W. 2004. "Operations Research, Applications and Algorithms," 4th edition, Thomson.
- Choudhry, M., "An Introduction to Value-at-Risk," 4th edition, John Wiley & Sons, 2006.
- Frances, P. H. (1998). *Time Series Models for Business and Economic Forecasting*. Cambridge University Press.
- Hanke, J.E., Wichern, D.W. (2008). *Business Forecasting, 9th ed*. Prentice Hall.
- Sutton, R. S., Barto, A. G., 1998. Reinforcement Learning: An Introduction. MIT Press.
- Vose, D., "Risk Analysis: A Quantitative Guide", J. Wiley & Sons, 2008.

- Williams Jr., C. Arthur, M. Smith, P. Young, “Risk Management and Insurance,” McGraw-Hill, 1998.

This biography is just introductory. The course will be based mainly on papers published in scientific journals.

Assessments

Component	Weight
In-class project	40%
Group projects	40%
Class Participation	20%

Tentative Schedule

- 1 Introduction to Risk Analysis and Risk Attitudes
- 2 Monte-Carlo Simulation for Multivariate Models
- 3 Time Series Analysis and Stationarity
- 4 ARIMA Modeling
- 5 Vector Autoregression and Cointegration
- 6 Stochastic Programming Models
- 7 Stochastic Dynamic Programming
- 8 Optimization of the Conditional Value at Risk
- 9 Project Risk Management
- 10 Strategic Inventory Planning
- 11 Catastrophic Risk Management
- 12 Risk Management with Financial Options
- 13 In-class Project

Note: The topics covered in sessions 9 – 12 may be modified to better fit the interests of the participants.

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