

Brush-up in Probability and Statistics

Programs: Economics Program, PhD Track Program, and Finance Program

Brush-up course

Professor

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Overview and objectives

This course provides an introduction to basic probability theory. The course is loosely based on the first chapters of Grimmet and Stirzaker (2001). Another classic textbook that may be used as reference is Casella and Berger (2001). More advance material can be found in Rosenthal (2006) and Williams (1991).

Course outline

0 Introduction to Naive Set Theory

1 Probability Foundations

- Sample space, events and probability
- Basic properties of probability measures

- Some examples of countable and uncountable sample spaces
- Conditional Probability and Independence

2 Random Variables

- Distribution Function .
- Discrete and Continuous Random Variables
- Multivariate Random Variables
- Joint Distribution Function
- Discrete and Continuous Random Variables
- Marginal Distribution
- Conditional Distribution
- Independent Random Variables
- Independent and Identically Distributed Random Variables
- Transformation of Random Variables
- Common Families of Distributions

3 Expectation

- Expectation of Simple Random Variables
- Expectation of Generic Random Variables
- Expectation and integration

4 Convergence of Random Variables

- Law of Large Number
- Central Limit Theorem

Materials

Casella, G. and Berger, R. L. (2001). Statistical Inference. Duxbury, Pacific Grove, second edition.

Grimmet, G. R. and Stirzaker, D. R. (2001). Probability and Random Processes. Oxford University Press, Oxford, third edition.

Rosenthal, J. (2006). A First Look at Rigorous Probability Theory. World Scientific Publishing, Singapore, second edition.

Williams, D. (1991). Probability with Martingales. Cambridge University Press, Cambridge.