

Stochastic process and applications in Risk Management

Course Description:

Future uncertainty in finance and insurance is made tractable by the introduction of a filtered probability space. Stochastic processes are defined, both in discrete and continuous time. Their properties are thoroughly analyzed, in view of the application to price processes and dynamic risk modeling. Key theoretical results as the Ito's lemma for diffusions are presented, together with simulation methods. Some examples of jump-diffusions are presented. We conclude by an axiomatic introduction to Risk Measures.

Objectives:

Skills: familiarity with (jump-) diffusion processes and with the Ito's formula, ability to compute financially relevant quantities in a given stochastic model.

Knowledge: (Jump-) Diffusion processes and their properties, relevant to financial and insurance applications. Basics on Risk Measures.

Attitudes: Understanding the role of the probability space; critic attitude towards excessive reliance on a model.

Main Contents:

1. Filtered probability spaces
2. Discrete time processes: definition and examples. Stopping times.
3. Martingales, super and submartingales; Markov property
4. Continuous time processes
5. Brownian motion and transforms
6. Ito's Lemma and diffusions
7. Geometric Brownian Motion
8. Jump-diffusion processes and simulation
9. Axiomatic introduction to Risk Measures