Statistics of diffusion processes

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Course : 24 hours

Goal

The aim of this course is to present some techniques for estimating parameters present in a diffusion model. We treat the case where the trajectory is observed continuously and the case where the scattering is observed discretely with a $\Delta>0$ time interval between each observation.

Outline

- Limit theorems for diffusion processes (ergodicity conditions, invariant measure, LLN and associated CLT)
- Estimation of a drift parameters for a continuously observed diffusion (study of likelihood, consistency of the corresponding estimator, examples)
- Estimation of the invariant measure
- Estimation of parameters from the discrete observation $(X_{i\Delta})_{i=0,\dots,n}$ of a diffusion : the cases of Black et Scholes and Ornstein Ulhenbeck processes.
- Estimation of volatility pararameters from high frequency discrete observations. Estimation functions and applications to diffusion models.
- Jump detection. "Multipower Realized Variation" estimators.

Bibliography

- Richard Durett (1996), Stochastic calculus : a practical introduction (probability and stochastic series
- Rafail Khasminskii (2012), Stochastic Stability of Differential Equations 2nd ed. Springer
- Yury Kutoyants (2003) Statistical Inference for Ergodic Diffusion Processes, Springer Series in Statistics, Springer Verlag
- Michael Sørensen (1998): Estimating functions for discretely observed diffusions: A review. In Basawa, I.V., Godambe, V.P. and Taylor, R.L. (eds.): Selected Proceedings of the Symposiumon Estimating Functions. IMS Lecture Notes - Monograph Series, Vol. 32, 305 - 325