Introduction to Stochastic Analysis **Andreas Eberle**

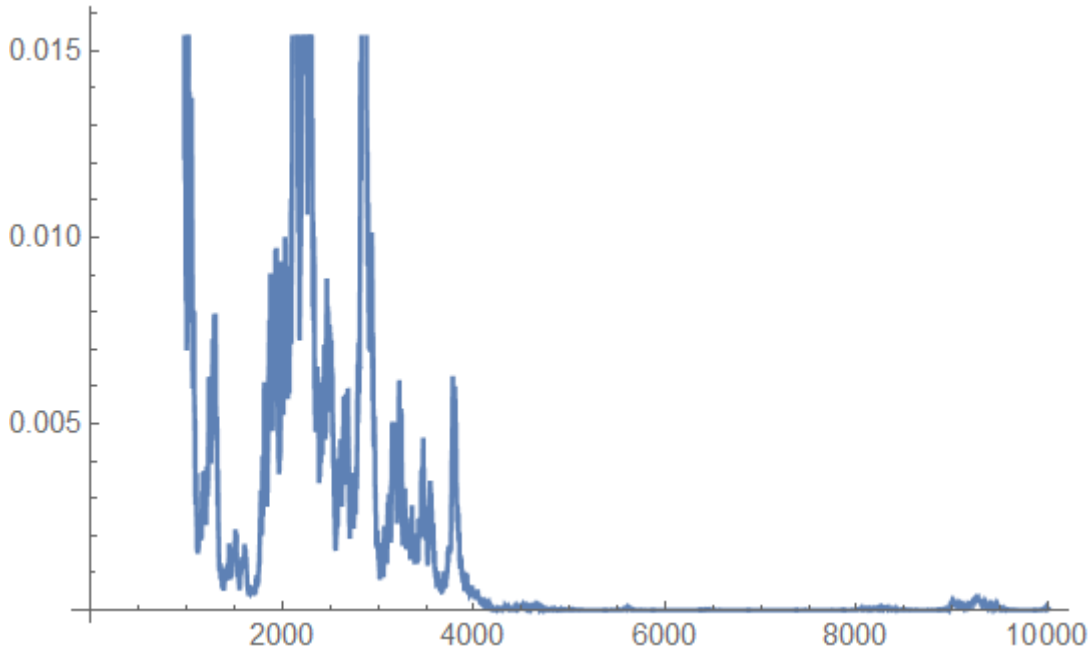
In stochastic analysis, more general stochastic processes in continuous time are constructed from Brownian motion. Stochastic differential calculus (Itō calculus) enables us to compute corresponding expectation values in an elegant way, and to set up connections to differential equations. Stochastic Analysis is important for many application areas (including mathematical finance, but also natural sciences, engineering, and, recently, machine learning). It also has fundamental connections to many other mathematical disciplines, and it is the basis for varoious probability courses in the Master programme.

Contents and prerequisites:

I plan to cover Chapters 5-9 of the lecture notes from 2018/19 on my webpage

https://uni-bonn.sciebo.de/s/kzTUFff5FrWGAay

Chapters 1-4 on Brownian motion and martingales have mostly been covered already in the „Stochastic processes“ course. However, we will start with a recap on these topics, focussing mainly on the required background and results on martingales in continuous time.



The figure shows a typical sample path of geometric Brownian motion. The process is an exponential martingale. In particular, the expectations are constant in time, but nevertheless the sample paths converge to 0 with probability one.