

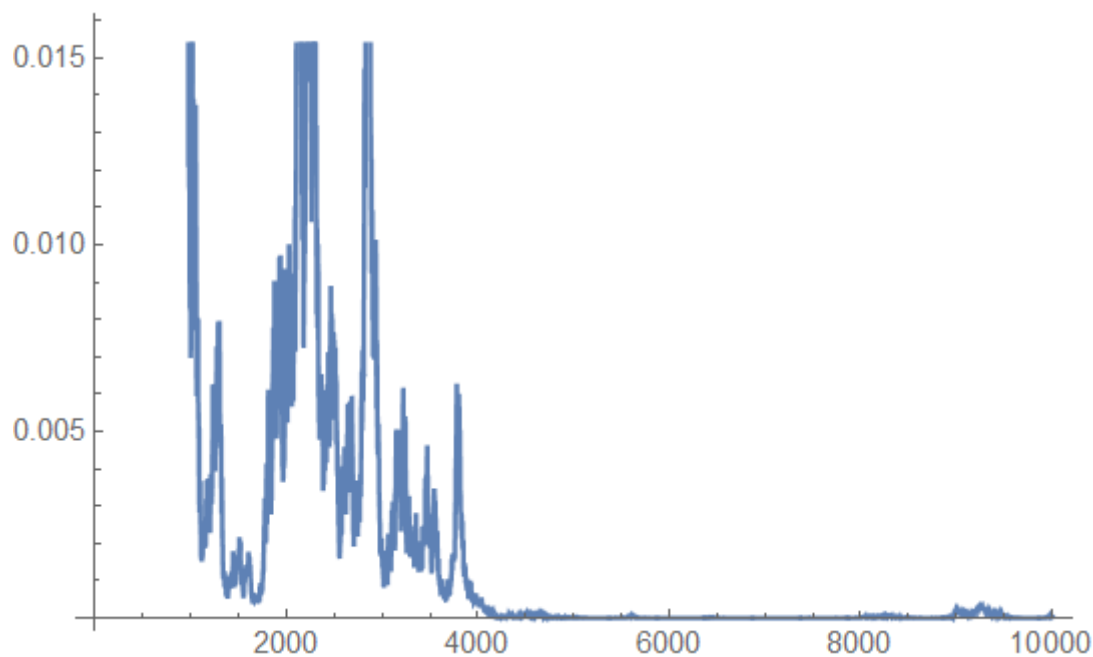
In stochastic analysis, more general stochastic processes in continuous time are constructed from Brownian motion. Stochastic differential calculus (Itô calculus) enables us to compute corresponding expectation values in an elegant way, and to set up connections to differential equations. Stochastic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

Contents and prerequisites:

I plan to cover Chapters 2-8 of the lecture notes on my webpage

<http://wt.iam.uni-bonn.de/eberle/skripten/>

Chapter 1 on Brownian motion will not be discussed during this course, since this material is part of the Stochastic Processes course. Knowledge of the basics about Brownian motion will be assumed from week 5 onwards. During the first 4 to 6 weeks of the course, an introduction to martingales will be given (at first in discrete time). Here only measure theoretic probability and conditional expectations w.r.t. σ -algebras are required as a prerequisite, see for instance Chapter 10 in my lecture notes „Wahrscheinlichkeitstheorie und Stochastische Prozesse“ or Chapter 9 in „Probability with martingales“ by D. Williams.



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.