

Probability with measure theory concepts: Application to Stochastic Calculus

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Abstract: In financial engineering and mathematical finance one of the most important mathematical tools is stochastic calculus, which deals with integration of random variables along random walks. In order to be able to define stochastic integrals and differential equations, e.g. the Black–Scholes equation, a good foundation on probability and measure theory is needed. In this project we focus on building up a rigorous probability theory using measure theory, and then apply it to study stochastic processes, the construction of the important Ito integral and the derivation of Ito’s formula.

References:

- A first look at rigorous probability theory, J.S. Rosenthal, World Scientific, 2006
- <https://www.columbia.edu/~mh2078/FoundationsFE/IntroStochCalc.pdf>
- <https://math.uchicago.edu/~may/REU2019/REUPapers/Han,Valerie.pdf>
- <https://www.math.uchicago.edu/~lawler/finbook.pdf>