Financial Mathematics

MATH 5870/6870[1]
Fall 2021

Le Chen

lzc0090@auburn.edu

Last updated on

November 8, 2021

Auburn University
Auburn AL

[1] Based on Robert L. McDonald's *Derivatives Markets*, 3rd Ed, Pearson, 2013.

Chapter 19. Monte Carlo Valuation

Chapter 19. Monte Carlo Valuation

§ 19.1 Computing the option price as a discounted expected value

§ 19.2 Computing random numbers

§ 19.3 Simulating lognormal stock prices

§ 19.4 Monte Carlo valuation

§ 19.5 Efficient Monte Carlo valuation

§ 19.6 Valuation of American options

$$S_T = S_0 e^{\left(\alpha-\delta-\frac{1}{2}\sigma^2\right)T+\sigma\sqrt{T}Z}$$

$$S_h = S_0 e^{\left(\alpha-\delta-\frac{1}{2}\sigma^2\right)h+\sigma\sqrt{h}Z_1}$$

$$S_{2h} = S_h e^{\left(\alpha-\delta-\frac{1}{2}\sigma^2\right)h+\sigma\sqrt{h}Z_2}$$

$$\vdots \qquad \vdots$$

$$S_{nh} = S_{(n-1)h} e^{\left(\alpha-\delta-\frac{1}{2}\sigma^2\right)h+\sigma\sqrt{h}Z_n}$$

$$\Downarrow$$

$$S_{nh} = S_0 e^{\left(\alpha-\delta-\frac{1}{2}\sigma^2\right)h+\sigma\sqrt{h}\sum_{i=1}^n Z_i} = S_0 e^{\left(\alpha-\delta-\frac{1}{2}\sigma^2\right)h+\sigma\sqrt{T}\left[\frac{1}{\sqrt{n}}\sum_{i=1}^n Z_i\right]}$$

where

$$\frac{1}{\sqrt{n}}\sum_{i=1}^{n} Z_i \sim N(0,1)$$