UNIVERSITY OF TEXAS AT AUSTIN

Homework assignment 11

The log-normal distribution. The Black-Scholes model.

Problem 11.1. (15 points) You roll a fair tetrahedron whose sides are labeled by $1, 2, 3$, and 4 a total of 4000 times. What is the approximate probability that you see a 1 strictly more than 1025 times? There is no need to use the continuity correction.

Problem 11.2. (15 points) *Source: Open Course Intro to Statistics.*
Cholesterol levels for women aged 20 to 34 follow an approximately normal distribution with mean 185 milligrams per deciliter (mg/dl). Women with cholesterol levels above 220 mg/dl are considered to have high cholesterol and about 18.5% of women fall into this category. What is the standard deviation of the distribution of cholesterol levels for women aged 20 to 34?

Problem 11.3. (10 points) Suppose that the failure time (in seconds) of a certain component is modeled as lognormal random variable $Y = e^X$ such that the mean of X is -0.35 and its variance is 0.04.

What is the failure time t^* such that 95% of the components of the same type would still function after that time?

Problem 11.4. (10 points) Assume the Black-Scholes model. Under the risk-neutral probability, you expect the stock price in half a year to be \$86.45. The stock's volatility is 0.30. What is the median stock price in half a year according to that same model?