University of Texas at Austin

Quiz #5

The log-normal distribution. Log-normal stock prices.

Problem 5.1. (5 points) *Source: Problem 18.6 in McDonald.*
Let $X \sim N(mean = 2, variance = 5)$.

(i) (3 points) Find $\mathbb{E}[e^X]$.
(ii) (2 points) Find the median of e^X.

Problem 5.2. (2 points) The product of log-normal random variables is normal. *True or false?*

Problem 5.3. (2 points) The mean of a lognormal stock price is at most as large as its median. *True or false?*

Problem 5.4. Let $S(t)$ denote the time$-t$ stock price for $t \geq 0$. Let us use the Black-Scholes framework for the stock price. Then, the random variable

$$\ln\left(\frac{S(t)}{S(0)}\right)$$

has the log-normal distribution for every t. *True or false?*

Problem 5.5. (5 points)

Assume the Black-Scholes framework for stock prices, i.e., assume the lognormal distribution of the stock prices. Let the mean rate of appreciation on a stock be 0.05 and let its volatility be equal to 0.25.

The continuously compounded risk-free interest rate is 0.04.

What is the probability that the stock will have a positive return over the period of two years?

(a) 0.5438
(b) 0.7704
(c) 0.8554
(d) 1
(e) None of the above.