

IEOR 3600: HMWK 5

1. A stock is now $S_0 = \$100$ per share. Its price at any fixed time t (years) in the future is a (lognormal) random variable distributed as

$$S(t) = S_0 e^{\sigma\sqrt{t}Z + \mu t},$$

where $Z \sim N(0, 1)$ is a standard unit normal, and $\mu = 0.25$ and $\sigma = 0.15$.

(And recall that the expected value of the price at time t is given by $E(S(t)) = S_0 e^{rt}$, where $r = \mu + (\sigma^2/2)$.)

- (a) Compute $E(S(1))$, $E(S(2))$, and $E(S(3))$.
 - (b) Find the probability that the stock's value at time $t = 1$ year from now will be at least 50% higher; that is, $P(S(1) \geq (1.5)S_0)$.
 - (c) Find the probability that the stock's value at time $t = 2$ is at least double what it was at time $t = 0$, that is, $P(S(2) \geq 2S_0)$.
 - (d) Find the value of t so that (for the first time) $P(S(t) \geq 2S_0) \geq 0.75$, the probability of doubling is at least 75%. For this value (denote it by t^*), compute $E(S(t^*))$.
2. From the text: Page 163, Ch.5: 1,2,3,8.