Normal and Lognormal

Normal

Normally distributed random variables X have expected value μ and standard deviation σ.

Lognormal

Y is a lognormally distributed random variable if ln (Y) = X is normally distributed. Write out the following using $\mu=E(X)$ and $\sigma^2 = Var(X)$:

- E(Y) =
- Var(Y) =

Graph the pdf of a normally distributed random variable on the left, and the pdf of the corresponding lognormally distributed random variable on the right:

X = (in terms of Y) Y = (in terms of X)

Normal and Lognormal

Normal	Lognormal
For an initial stock price of $10, with increases/decreases of $3 per step, draw an additive binomial tree with 4 steps below:	For an initial stock price of $10, with increases/decreases of 30% per step, raw a multiplicative binomial tree with 4 steps below:

Which tree has a price distribution symmetric about the mean price after 4 steps? Which tree has only positive prices at the end?

Normal and Lognormal

Normal

Write out cdf and pdf of $Z \sim N(0,1)$, using Φ (capital) and ϕ (lowercase) notation:

Formula for standardizing $X \sim N(\mu, \sigma^2)$ to $Z \sim N(0,1)$:

$$Z =$$

Thus

$$P(X < x) = \quad .$$

Lognormal

For Y lognormally distributed, $\ln(Y) = X$ normally distributed, write out pdf and cdf for Y:

By standardizing, write the following in terms of the function Φ:

$$P(Y < y) = \quad .$$