Summary

- A variable might be modeled as log-normal if it is the multiplicative product of many independent random variables each of which is positive.
- For example, in finance, the variable could represent the compound return from a sequence of many trades (each expressed as its return + 1); or a long-term discount factor can be derived from the product of short-term discount factors. In wireless communication, the attenuation caused by shadowing or slow fading from random objects is often assumed to be log-normally distributed.
- A positive random variable X is said to have a log normal distribution if $\log_e X$ is normally distributed.
- If $X \sim N(\mu, \sigma^2)$, then $Y=e^X$ is called a log normal random variable since logarithm log Y=X is a normal random variable.
- Log normal distribution arises in problems of economics, biology, geology, and reliability theory. In particular it arises in the study of dimensions of particle under pulverization.
- Mgf of log normal distribution does not exist on the domain R but it exists on the half interval $(-\infty, 0)$.
- If $X_1, X_2, \ldots, X_n$ is a set of iid random variables such that mean of each log X_i is μ and variance is σ^2, then the product $X_1.X_2,\ldots,X_n$ is asymptotically distributed according to logarithmic normal distribution and with mean μ and variance $n\sigma^2$.
- Median of log normal distribution is $M=e^{\mu}$ and mode is $e^{\mu+\sigma^2}$
- r^{th} raw moment is given by $\mu_r' = e^{r\mu+r^2\sigma^2/2}$
- log normal distribution is positively skewed and has leptokurtic curve.
- Note that the Pareto distribution and log-normal distribution are alternative distributions for describing the same types of quantities. One of the connections between the two is that they are both the distributions of the exponential of random variables distributed according to other common distributions, respectively the exponential distribution and normal distribution.