

Lognormal Distribution

- $\text{Log}(X)$ normal (natural log)
- Equivalently: $X = e^Y$ where Y normal
- X must be ≥ 0
- “Shifted lognormal”: $\log(X + c)$ normal
- Equivalently: $X = e^Y - c$ where Y normal

Multiplicative Central Limit Theorem

- Under fairly broad circumstances, the product of independent random variable is lognormal.
- Proof: Take logs and use CLT

Random Variables Modeled by Lognormal Distributions

- Concentrations of pollutants
- Sensitivity of individuals to a chemical compound
- Survival times after diagnosis of cancer
- Abundance of plants, fish, birds and insects in ecology
- Income of employed persons

Examples of Models Using the Multiplicative CLT

- Concentration of pollutants: result of successive dilutions.
- The amount of a toxic substance reaching a baby through mother’s milk: the result of many multiplicative processes.
- The degree of deterioration of an engineered process: the result of numerous defects that have a proportional effect.