

The Normal Distribution

The *normal distribution* arises frequently in practice as a consequence of the Central Limit Theorem, and the fact that many phenomena that are observed in practice represent integrations of processes over time or space. The normal distribution is a continuous distribution, and its pdf is given by

$$pdf_{\text{normal}} = P(X) = \frac{1}{(2\pi\sigma^2)^{0.5}} e^{-(X - \mu)^2 / 2\sigma^2},$$

where:

X = the value of a statistic that is known to be normally distributed,

μ = the mean (or location) of the distribution,

σ = the standard deviation (or scale or dispersion) of the distribution.

μ and σ are referred to as the *parameters* of the distribution.

The *standard normal distribution* applies to the special case when $\mu = 0$ and $\sigma = 1$.

The pdf of the standard normal distribution is

$$pdf_{\text{std. normal}} = P(Z) = \frac{1}{(2\pi)^{0.5}} e^{-Z^2 / 2},$$

where:

Z = the value of a statistic that is known to have a standard normal distribution.