

Noncentral t distribution (from <http://www.math.wm.edu/~leemis/chart/UDR/UDR.html>)
 The shorthand $X \sim \text{noncentral } t(n, \delta)$ is used to indicate that the random variable X has the non-central t distribution with positive integer parameter n and real-valued noncentrality parameter δ . A noncentral t random variable X with parameters n and δ has probability density function

$$f(x) = \frac{n^{n/2} e^{-\delta^2/2}}{\sqrt{\pi} \Gamma(n/2) (n+x^2)^{(n+1)/2}} \cdot \sum_{i=0}^{\infty} \frac{\Gamma[(n+i+1)/2]}{i!} \left(\frac{x\delta\sqrt{2}}{\sqrt{n+x^2}} \right)^i \quad -\infty < x < \infty,$$

for all δ and any positive integer n .

The cumulative distribution, survivor, hazard, cumulative hazard, inverse distribution, moment generating, and characteristic functions on the support of X are mathematically intractable.

The population mean and variance of X are

$$E[X] = \delta \sqrt{\frac{n}{2}} \frac{\Gamma((n-1)/2)}{\Gamma(n/2)} \quad n > 1$$

$$V[X] = \frac{n(1+\delta^2)}{n-2} - \frac{\delta^2 n}{2} \left(\frac{\Gamma((n-1)/2)}{\Gamma(n/2)} \right)^2 \quad n > 2.$$