Equations of the distributions

Year 2018

Equations of the probability density functions are given below in alphabetical order.

1 Beta

The probability density function of the beta distribution is:

$$f(y, \alpha, \beta) = \frac{1}{k \cdot B(\alpha, \beta)} y^{\alpha-1}(1-y)^{\beta-1} \tag{1}$$

where $y = (x - \mu)/k$, μ is the location, k is the scale, α and β are the shape parameters, $\alpha > 0, \beta > 0$, and $B(\alpha, \beta)$ is defined with the gamma function Γ:

$$B(\alpha, \beta) = \frac{\Gamma(\alpha)\Gamma(\beta)}{\Gamma(\alpha + \beta)} \tag{2}$$

2 Exponential

The probability density function of the exponential distribution is:

$$f(y) = \frac{1}{k} \exp(-y) \tag{3}$$

where $y = (x - \mu)/k$, μ is the location, and k is the scale, $k > 0$.

3 Johnson SB

The probability density function of the Johnson SB distribution is:

$$f(y, \alpha, \beta) = \frac{\beta}{k \cdot y(1-y)} \phi\left(\alpha + \beta \log \frac{y}{1-y}\right) \tag{4}$$

where $y = (x - \mu)/k$, μ is the location, k is the scale, α and β are the shape parameters, $\alpha > 0, \beta > 0$, and ϕ is the probability density function of the standard normal distribution:

$$\phi(x) = \frac{1}{\sqrt{2\pi}} \exp(-x^2/2) \tag{5}$$

4 Johnson SU

The probability density function of the Johnson SU distribution is:

$$f(y, \alpha, \beta) = \frac{\beta}{k\sqrt{y^2+1}} \phi\left(\alpha + \beta \log\left(y + \sqrt{y^2+1}\right)\right) \tag{6}$$

where $y = (x - \mu)/k$, μ is the location, k is the scale, α and β are the shape parameters, $\alpha > 0, \beta > 0$, and ϕ is the probability density function of the standard normal distribution (Eq. 5).

5 Log-Gamma

The probability density function of the log-gamma distribution is:

$$f(y, c) = \frac{\exp(c \cdot y - \exp(y))}{k \cdot \Gamma(c)} \tag{7}$$

where $y = (x-\mu)/k$, μ is the location, k is the scale, c is the shape parameter, $c > 0$, and Γ is the gamma function.

6 Mielke's Beta-Kappa

The probability density function of the Mielke's beta-kappa distribution is:

$$f(y, \lambda, s) = \frac{\lambda \cdot y^{\lambda-1}}{k \cdot (1 + y^s)^{1+\lambda/s}} \tag{8}$$

where $y = (x - \mu)/k$, μ is the location, k is the scale, λ and s are the shape parameters, $\lambda > 0$, $s > 0$.

7 Skew-normal

The probability density function of the skew-normal distribution is:

$$f(y, \alpha) = \frac{2}{k} \cdot \phi(y) \cdot \Phi(\alpha \cdot y) \tag{9}$$

where $y = (x - \mu)/k$, μ is the location, k is the scale, α is the skewness parameter, ϕ is the probability density function of the standard normal distribution (Eq. 5) and Φ is the cumulative distribution function of the normal distribution:

$$\Phi(x) = \int_{-\infty}^{x} \phi(u) du \tag{10}$$

8 Uniform

The probability density function of the uniform distribution is:

$$f(x) = \frac{1}{b - a} \tag{11}$$

where a and b are the minimum and maximum values of the support, $x \in [a, b]$.