Greek symbols, Statistical Notation, Mathematical Notation, Mathematical Functions

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Greek Symbols

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α	Alpha
β	Beta
γ, Γ	Gamma
δ, Δ	Delta
ε	Varepsilon

ζ	Zeta
η	Eta
θ, Θ	Theta
ϑ	Vartheta
ι	Iota
κ	Kappa
λ, Λ	Lambda
μ	Mu
ν	Nu
ξ, Ξ	Xi
o	o
π, Π	Pi
ϖ	Varpi
ρ	Rho
ϱ	Varrho
σ, Σ	Sigma
ς	Varsigma

τ	Tau
υ, Υ	Upsilon
ϕ, Φ	Phi
φ	Varphi
χ, X	Chi
ψ, Ψ	Psi
ω, Ω	Omega

Mathematical Symbols

$\leq$	Less than or equal to
$\geq$	Greater than or equal to
$\neq$	Not equal to
$\pm$	Plus or minus error
$\simeq, \approx$	Is approximately equal to

$\rightarrow$	Approaches
∞	Infinity
$\sum_i n_i$	Sum, $n_1 + n_2 + \cdots + n_p$
$\prod_i n_i$	Product, $n_1 \times n_2 \times \cdots \times n_p$
$\int_a^b dx$	Definite integral over a to b
$\ln, \log_e$	Natural logarithm
$\log_{10}$	Common logarithm, base 10
$n!$	factorial, $n(n-1)(n-2)...1$
$min\{a, b\}$	Minimum of a and b
$max\{a, b\}$	Maximum of a and b

Statistical Symbols

X	Random variable
x	Quantile, F^{-1}
μ_X	Mean of X
$E(X)$	Expectation of X
σ_X	Standard deviation of X
σ_X^2	Variance of X
σ_{XY}	Covariance between X and Y
$\rho_{X,Y}$	Correlation between X and Y
$\mathrm{m}(x)$	Median of quantiles
β_j	Regression coefficient
$s.e.(\beta_j)$	Standard error of regression coefficient
$\binom{n}{x}$	Binomial coefficient, "n choose x"
$L(\theta)$	Likelihood function of parameter θ
$\ell(\theta)$	Log-likelihood function of parameter θ, using ln

$P(A)$	Probability of event A
$\cup$	Union
$\cap$	Intersection

Probability Distributions

$\mathcal{U}(0,1)$	Standard uniform distribution
$\mathcal{N}(0,1)$	Standard normal distribution
$\mathcal{N}(\mu,\sigma^2)$	Normal distribution
$\mathcal{B}(n,p)$	Binomial distribution
$\mathcal{P}(\lambda)$	Poisson distribution
$\mathcal{LN}(\mu,\sigma^2)$	Log-normal distribution
$\mathcal{TRI}(a,b,c)$	Asymmetrical triangle distribution

Mathematical Functions

The following mathematical review sections are fundamental in applied statistics. Of particular importance is the development of maximum likelihood models for multiplicative (and additive) regression models.

Inequalities

$$(-\infty, a) = \{x < a\} \tag{1}$$
$$(a, \infty) = \{x > a\} \tag{2}$$
$$(a, b) = \{a < x < b\} \tag{3}$$
$$[a, b] = \{a \leq x \leq b\} \tag{4}$$
$$[a, b) = \{a \leq x < b\} \tag{5}$$
$$(a, b] = \{a < x \leq b\} \tag{6}$$

Laws of Exponents

$$x^n = x \times x \times \cdots \times x \times \cdots \qquad (n \text{ times}) \tag{7}$$

$$x^m x^n = x^{m+n} \tag{8}$$

$$(x^m)^n = x^{mn} \tag{9}$$

$$(xy)^n = x^n y^n \tag{10}$$

$$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n} \qquad y \neq 0 \tag{11}$$

$$\frac{x^m}{x^n} = x^{m-n} \qquad m > n, x \neq 0 \tag{12}$$

$$\frac{x^m}{x^n} = \frac{1}{x^{n-m}} \qquad n > m, x \neq 0 \tag{13}$$

$$\frac{x^m}{x^n} = 1 \qquad m = nx \neq 0 \tag{14}$$

$$x^0 = 1 \quad \text{since} \quad \frac{x^0}{x^0} = 1 \qquad m = n, x \neq 0 \tag{15}$$

$$x^{-n} = \frac{1}{x^n} \qquad n > 0, x \neq 0 \tag{16}$$

$$x^{1/n} = \sqrt[n]{x} \tag{17}$$

$$x^{m/n} = \sqrt[n]{x^m} \tag{18}$$

Laws of Radicals

$$\sqrt[n]{a} = b^n = a \tag{19}$$

$$(\sqrt[n]{x})^n = x \tag{20}$$

$$\sqrt[n]{x}\,\sqrt[n]{y} = \sqrt[n]{xy} \tag{21}$$

$$\frac{\sqrt[n]{x}}{\sqrt[n]{y}} = \sqrt[n]{\frac{x}{y}} \quad y \neq y \tag{22}$$

$$(\sqrt[n]{x^n})^n = x \quad x > 0, x < 0 (n \text{is odd}) \tag{23}$$

$$\sqrt[m]{\sqrt[n]{x}} = \sqrt[mn]{x} \tag{24}$$

Absolute Value

$$|ab| = |a||b| \tag{25}$$

$$\left|\frac{a}{b}\right| = \frac{|a|}{|b|} \tag{26}$$

Logarithms

$$a^{\log_a u} = u \tag{27}$$

$$\log_a 1 = 0 \tag{28}$$

$$\log_a a = 1 \tag{29}$$

$$\log_a(uw) = \log_a(u) + \log_a(w) \tag{30}$$

$$\log_a(u/w) = \log_a(u) - \log_a(w) \tag{31}$$

$$\log_a(u^c) = c\log_a(u) \tag{32}$$

$$\log_b(u) = \frac{\log_a(u)}{\log_a(b)} \tag{33}$$

Example:

$$\log_{10}(x) = \frac{\log_e(x)}{\log_e(10)} \tag{34}$$

$$\log_b(a) = \frac{1}{\log_a(b)} \tag{35}$$