Mathematical Notations

$:=$	Symbol indicating different notations for a single object	2
$\cup$	Table fusion	3
$a \in A$	a belongs to set A	4
$A \subset B$	A is included in B	5
$A \supset B$	A includes B	6
$A \cap B$	Intersection of sets A and B	7
$A \cup B$	Union of sets A and B	8
$A \backslash B$	Complement of set B in set A	9
$(A \cup B) \backslash (A \cap B)$	Symmetric difference of sets A and B	10
f_i	Frequency of a modality	11
$\lvert x \rvert$	Absolute value of number x	12
$x!$	Factorial of number x	13
$\binom{n}{p}$	Binomial coefficient: number of ways of picking p elements out of n	14
$\Gamma(\cdot)$	Gamma function	15
γ	Euler's constant	16
$\psi(\cdot)$	Digamma function	17
π	Number π	18
λ	Scalar number	19
$\mathcal{A}, \mathcal{B}, \mathcal{C}\ldots$	Matrices	20
$\mathcal{I}$	Identity matrix	21
$n \times p$	Indicates the size of a matrix	22
$\mathcal{A}^{\mathsf{T}}$	Transpose of matrix $\mathcal{A}$	23
$\mathcal{B}^{-1}$	Inverse of matrix $\mathcal{B}$	24
$\overline{\mathcal{C}}$	Conjugate of complex matrix $\mathcal{C}$	25
$x = (x_1, \ldots, x_n)^{\mathsf{T}}$	Column vector	26
x^{T}	Transpose of vector x	27
$\mathcal{A} \otimes \mathcal{B}$	Kronecker product of matrix $\mathcal{A}$ with matrix $\mathcal{B}$	28
$vec(\mathcal{A})$	Vector resulting from the stacking of columns of matrix $\mathcal{A}$	29
$vech(\mathcal{A})$	Vector resulting from the stacking of columns of matrix $\mathcal{A}$, but excluding elements above the diagonal	30

$\mathcal{A}^*$	Adjunct matrix (conjugate transpose) of matrix $\mathcal{A}$	31
$\mathcal{A}^{1/2}$	Square root of matrix $\mathcal{A}$	32
$\mathbb{1}_{[A]}(x)$	Equals 1 if $x \in A$ and 0 otherwise	33
$[a,b]$	Interval of values between a and b	34
$\det(\mathcal{A})$	Determinant of matrix $\mathcal{A}$	35
$\Phi(\cdot)$	Cumulative distribution function of a standard normal random variable $\mathcal{N}(0,1)$	36
$\dot{\mathcal{X}}$	Matrix given by centring the columns of matrix $\mathcal{X}$	37
$\mathbb{1}_n$	Vector $(1,\ldots,1)^\mathsf{T}$ of length n	38
X,Y	Non-random variables (descriptive statistics)	39
N	Population size	40
n	Sample size	41
$m_e := q_{1/2}$	Median	42
$PFC_X(\cdot)$	Value of the polygon of cumulative frequencies of X	43
μ_X	Expected value of random variable X, or population mean in descriptive statistics	44
q_p or x_p	Fractile (quantile) of order p of a variable	45
$q_{1/4}, q_{3/4}$	First and third quartiles (also noted q_1 and q_3)	46
$\sigma^2_{Pop}(x)$	Population variance (descriptive statistics)	47
$\sigma_{Pop}(x)$	Population standard error (descriptive statistics)	48
c_v	Population coefficient of variation (descriptive statistics)	49
γ_1	Skewness	50
β_2	Kurtosis	51
μ_3	Centred moment of order 3	52
μ_4	Centred moment of order 4	53
χ^2	Pearson's χ^2 statistic	54
Φ^2, V^2	Cramér's Φ^2 and V^2	55
τ, τ_b	Kendall's τ and τ_b	56
ρ	Theoretical Pearson coefficient of correlation	57
$\eta^2_{Y|X}$	Correlation ratio	58
X, Y, ϵ	Random variables	59
x_i, y_i, ϵ_i	Realizations of random variables X, Y, ϵ	60
$\mathbf{X}, \mathbf{Y}, \boldsymbol{\epsilon}$	Random vectors	61
$\mathbf{X}_n$	Sample (random)	62
x_n	Sample (observed)	63
$\mathbf{X}$	Random matrix	64
$\mathcal{L}$	Generic distribution of a random variable	65
$\mathcal{N}(0,1)$	Standard normal distribution	66
$\mathcal{N}(\mu, \sigma^2)$	Normal distribution with mean μ and variance σ^2	67
$\mathcal{U}(a,b)$	Uniform distribution over the interval $[a,b]$	68
$\mathcal{B}in(n,p)$	Binomial distribution with parameters n and p	69
$\mathcal{E}(\lambda)$	Exponential distribution with parameter λ	70

$\mathcal{P}(\lambda)$	Poisson distribution with parameter λ	71
$\mathcal{T}(n)$	Student distribution with n degrees of freedom	72
$\chi^2(n)$ or χ_n^2	χ^2 distribution with n degrees of freedom	73
$\mathcal{F}(n,m)$	Fisher distribution with n and m degrees of freedom	74
$f_X(\cdot)$	Probability density function of random variable X	75
$F_X(\cdot)$	Cumulative distribution function of random variable X	76
$F_X^{-1}(\cdot)$	Inverse cumulative distribution function of random variable X	77
μ	Expected value of a random variable	78
σ^2	Variance of a random variable	79
$\mathbb{E}(Y)$	Theoretical expectation of random variable Y	80
$\mathbb{V}\mathrm{ar}(Y)$	Theoretical variance of random variable Y	81
$\overline{X}_n$	Empirical mean $\frac{1}{n}\sum_{i=1}^n X_i$ of sample $\mathbf{X}_n = (X_1,\dots,X_n)^\mathsf{T}$, estimator of μ_X	82
$\overline{x}_n$	Realization of the empirical mean $\frac{1}{n}\sum_{i=1}^n X_i$ of sample $\mathbf{X}_n = (X_1,\dots,X_n)^\mathsf{T}$, estimate of μ_X	83
$\xrightarrow{P}$	Convergence in probability	84
$\hat{F}_n(\cdot) := \hat{F}_{\mathbf{X}_n}(\cdot)$	Empirical cumulative distribution function of sample $\mathbf{X}_n$	85
θ	Unknown parameter (the true unknown value of the parameter will sometimes be noted $\theta^\bullet$)	86
$\hat{\theta}(X_1,\dots,X_n)$ or $\hat{\theta}$	Estimator of unknown parameter θ based on the sample $\mathbf{X}_n = (X_1,\dots,X_n)^\mathsf{T}$	87
$\hat{\theta}(x_1,\dots,x_n)$ or $\hat{\theta}$	Estimate of unknown parameter θ based on the observed sample $\boldsymbol{x}_n = (x_1,\dots,x_n)^\mathsf{T}$	88
$\mathbb{B}(\hat{\theta}(X_1,\dots,X_n);\theta)$	Bias of estimator $\hat{\theta}(X_1,\dots,X_n)$ to estimate unknown parameter θ	89
$P[A]$	Probability of set A	90
$\mathcal{V}(\theta;X_1,\dots,X_n)$	Likelihood function of sample $\mathbf{X}_n$ evaluated at θ	91
$\boldsymbol{x}^* = (x_1^*,\dots,x_n^*)^\mathsf{T}$	Bootstrap sample generated from the observed sample $\boldsymbol{x}_n = (x_1,\dots,x_n)^\mathsf{T}$	92
$\hat{\sigma}$	Estimator of σ	93
$\hat{\sigma}$	Estimate of σ	94
p	Proportion	95
$\hat{p}$	Estimator of a proportion (or of a probability)	96
$\hat{p}$	Estimate of a proportion (or of a probability)	97
$\widehat{m_e}$	Estimator of a median	98
$\widehat{m_e}$	Estimate of a median	99
M	Number of iterations (of generated samples) in a Monte Carlo simulation	100
B	Number of generated bootstrap samples	101
$B(\cdot,\cdot),\ \Gamma(\cdot)$	Beta function, gamma function	102
$I_x'(\cdot,\cdot)$	Derivative of incomplete beta function	103

$I(\cdot)$	Modified Bessel function	104
$I_\alpha(\cdot)$	Modified Bessel functions	105
u_p	Quantile of order p of a $\mathcal{N}(0,1)$	106
t_p^n	Quantile of order p of a $\mathcal{T}(n)$	107
q_p^n	Quantile of order p of a $\chi^2(n)$	108
$f_p^{n,m}$	Quantile of order p of a $\mathcal{F}(n,m)$	109
$CI_{1-\alpha}(\theta)$	Random confidence interval at confidence level $1-\alpha$ for θ	110
$ci_{1-\alpha}(\theta)$	Realized confidence interval at confidence level $1-\alpha$ for θ	111
$1-\alpha$	Level of a confidence interval	112
$(x_{(1)},\ldots,x_{(n)})$	Observed sample, sorted from smallest to largest value	113
$\mathcal{H}_1$	Assertion of interest in hypothesis testing	114
$\mathcal{H}_0$	"Null" hypothesis, opposite of $\mathcal{H}_1$	115
α	Significance level or risk of the first kind in hypothesis testing	116
R	Random Pearson empirical coefficient of correlation	117
r	Realized Pearson empirical coefficient of correlation	118
β_0, β_1	Unknown coefficients of a simple linear regression model	119
$\hat{\beta}_0, \hat{\beta}_1$	Estimates of unknown coefficients of a simple linear regression model	120
$\hat{\epsilon}_i$	Observed residuals in a simple linear regression model	121
$\hat{y}_i$	Adjusted observed values in a simple linear regression model	122
R^2	Random coefficient of determination in regression	123
r^2	Realized coefficient of determination in regression	124
R$_a^2$	Random adjusted coefficient of determination in regression	125
r_a^2	Realized adjusted coefficient of determination in regression	126
$\hat{\text{Y}}^p$	Predictor of random variable Y for a new value of the explanatory variable X in regression	127
$PI_{1-\alpha}(\text{Y}_0, x_0)$	Prediction interval at level $1-\alpha$ for random variable Y$_0$ associated with a new value x_0 of the explanatory variable	128
$\boldsymbol{\beta} = (\beta_0,\ldots,\beta_p)^\mathsf{T}$	Vector of the $p+1$ unknown coefficients in a multiple linear regression model with p explanatory variables	129
$\hat{\boldsymbol{\beta}} = (\boldsymbol{\mathcal{X}}^\mathsf{T}\boldsymbol{\mathcal{X}})^{-1}\boldsymbol{\mathcal{X}}^\mathsf{T}\mathbf{Y}$	Estimator of the vector of unknown parameters $\boldsymbol{\beta}$ for the matrix $\boldsymbol{\mathcal{X}}$ of observed explanatory variables and for the observed vector of explained values in a muliple linear regression model	130
$\hat{\boldsymbol{\beta}}$	Estimate of $\boldsymbol{\beta}$	131
VIF	Variance inflation factor	132
AIC	An Information Criterion	133
BIC	Bayesian information criterion	134
h_{ii}	Leverage of ith observation in regression	135
t_i	Standardized residuals	136
t_i^*	Studentized residuals	137
$\hat{\sigma}_{(-i)}$	Estimate of σ excluding ith observation	138

UNCORRECTED PROOF