Index

α, type I error, 93–94, 100, 106 α_i , treatment effect, 109–110, 123, 135, 209 α parametric Y-intercept, see Y-intercept $(\alpha\beta)_{ii}$, interaction effect, 135, 241 a sample Y-intercept, see Y-intercept acceptance region, 92 accuracy of data, 6 alternative hypothesis, 90-91 analysis of variance assumptions of, 131-132 introduction and nomenclature, 123 model I, 122, 124 model II. 122-123 nomenclature, 123 partitioning of total sum of squares, 125-127 table, 128 two-way mixed model, 143 model I. 135-143 nonparametric methods in lieu of, 153 with unequal sample sizes, 127 ANOVA. See Analysis of variance a posteriori comparisons, 133-135 approximate t-test of equality of means assuming unequal variances, 115 area under curve, 61-64 assumptions of statistical tests, 101 attributes, 4 average, 25-26 b, statistical regression coefficient (slope), 211, 212, 215 β, parametric value for regression coefficient (slope), 213 β, type II error, 93-96, 106 β_i , treatment effect, 135 bar graph, 19 Bayes' theorem, 53-57 bimodal distribution, 29, 79 binomial distribution, 46-47

bivariate normal distribution, 195 scattergram, 195 box plots, 21 χ^2 , chi-square, 166, 169 $\chi^2_{a[v]}$, critical chi-square at probability level α , and degrees of freedom, 168 causation, 193, 210 central limit theorem, 75 central tendency measure of, 26 character variables, 4 chi-square distribution, 166, 169 chi-square test, 166 for goodness of fit, 166-169 degrees of freedom, 167 clumping. departure from Poisson distribution, 49 coefficient Kendall's, 202-203 Pearson's, 194, 196 Spearman's, 199-200 regression, see regression. collinearity, see multicollinearity comparison of a single observation with the mean of a sample, 116 means planned, 133 unplanned, 132 comparisons Paired, 117, 159 confidence interval for predicted value in regression analysis, 218 limits of an estimated mean, 86 continuous variables, 5 frequency distributions of, 57-63 correction Edward's, 184 Williams', 178 Yates', for continuity, 175

Index 261

correlation applications of, 199 matrix analysis, 235, 240, 244 and regression, contrasted, 209-210 significance tests in, 197-198 spurious, 193 critical region, 92 value, 104 cumulative normal curve, 57-63 curve area under, 64 curvilinear regression, 211, 221 df, degrees of freedom, 33 data accuracy of, 6 precision of, 6 datum vs. data, 4 degrees of freedom, 33 dependent variable, 6 descriptive statistics, 8 Design paired comparisons, 117, 159 determination, coefficient of, 212, 216 deviate standard normal, 63 difference between two means, 108 from the mean, sum of, 32 significance of, 110 between two variances, testing significance of, 115 discrete variables, 3, 45 distribution bimodal, 29, 79 binomial. 46 bivariate normal, 195 chi-square, 166, 169 clumped, 49 contagious, 49 continuous numeric variables, of, 57 discontinuous numeric variables, of, 44 frequency See frequency distribution kurtosis, 77, 114 leptokurtic, 77 normal, 59-60 platykurtic, 77 Poisson, 48 probability, 43 qualitative variable, of, 44 sample means, of, 73 skewness, 77, 114

Standard normal, 59, 63 Student's t-, 86-87, 103-104 distribution-free methods See nonparametric methods \in_{ij} , random deviation of the *j*th individual of group, 21, 109, 123 effects random group, 123 treatment, 123 equality of two means assuming unequal variances, 115 variances, assumption, 115, 132 equation multiple regression, algebraic computation, 236-240 multiple regression, sample and parametric, 235 regression (sample), 211-212 regression (parametric), 213 error rate, experimentwise, 132-133 standard, see Standard error type I, 94, 106 type II, 94-95, 106 estimation, point, 89 exact test, Fisher's, 178-183 exhaustiveness, 4 expected binomial frequencies, 46-48 normal frequencies, 60-63 Poisson frequencies, 46-52 value for Y, given X, 217, 218 experimentwise error rate, 132-133 $f_{\rm e}$, expected frequency, 167 f_o , observed frequency, 167 F, variance ratio, 125-126 Fmax-test, 115, 132 F-distribution, 126 Fisher's exact test, 178-183 Fmax test of homogeneity of variances, 115, 132 frequencies expected, 166-167 observed, 166-167 frequency distribution of continuous variables, 15-17 normal, 23 qualitative, 13-15 quantitative discontinuous, 13-15 g1, measure of skewness, 114 g2, measure of kurtosis, 114 y1, parametric measure of skewness, 114 y₂, parametric measure of kurtosis, 114

Cambridge University Press 978-0-521-14708-8 - Statistics for Anthropology: Second Edition Lorena Madrigal Index More information

262	Index	
	<i>G</i> -test	regression (explained), 215-217
	introduction and rationale, 176	total, 125–126
	for goodness of fit, single classification, 177	unexplained, 215–217
	of independence, 177	Mallow's Cp, <i>see</i> multiple regression
	Williams' correction, 178	Man–Whitney U-test, 148–153
	goodness of ht tests	Matrix, correlation, 240, 243, 244
	chi-square, 166–169	maximum likelihood, 84
	G-lesi, 170	Michemar test for a matched design, 183–184
	Konnogorov–Simmov test, 170–172	sample 26
	H statistic for Kruskal Wallis test	parametric 26
	with no ties 153	of Poisson distribution 50
	with ties 154	of a sample, comparison of a single observation
	H_0 null hypothesis 90	with 116-117
	H_1 alternative hypothesis 90	source see MS
	heteroscedasticity 115	means
	histogram 21	distribution of 73–77
	homogeneity	<i>t</i> -test of the difference between two 108–112
	of variances assumption in analysis of variance	measure of central tendency 26
	115. 132	median. 27–28
	homoscedasticity, 115, 132	mixed model
	hypothesis	two-way ANOVA, 143
	alternative, 90	mode, 28–29
	null, 90	Model I
	testing, 90	ANOVA, 122
		Model II
	independence	ANOVA, 123
	assumption in analysis of variance, 113,	multiple regression
	132	algebraic computation of equation, 236
	exact test of, see Fisher's exact test	backward elimination procedure, 242
	independent variable, 6	equation, 235
	inferential statistics, 8	forward selection procedure, 242
	interaction, 135, 241	F to enter and F to remove, 242
	synergy, 136	Mallow's Cp, 240–241
	interference, 136	parsimony, principle of, 240
		significance tests, 240
	Kendall's coefficient of rank correlation, 202–207	stepwise procedure, 242
	Kolmogorov–Smirnov one-sample test, 170–172	multicollinearity, 235–236
	Kruskal–Wallis test, 153–159	mutual exclusiveness, 4
	Kurtosis, 114	N nonvelotion size 9
	L likelihood ratio test 176	n, population size, 8
	L, likelihood fatio test, 170	<i>n</i> , sample size, 8
	lentolartic curve, 78	in lieu of ANOVA 146
	level significance 83-84 86	nower of 146
	likelihood ratio test see G test	see Kruskal-Wallis
	limits	see Mann_Whitney
	confidence see confidence limits	see Wilcoxon signed-ranks test
	linear regression See regression	normal
	logistic regression 251–254	curve
	logit. 252	areas of 61
	log-odds. 252	height of ordinate. 60
		deviates
	MS. mean square, 125	standard, 63
	among groups, 125–126	distribution

 $\textcircled{\sc c}$ in this web service Cambridge University Press

Index

263

normality tests of the assumption of, 102, 113, 132 null hypothesis, 90 observations, individual, 4 odds ratio, 185-188 one-tailed tests compared with two-tailed test, 100-101 p, probability, 105 p, binomial probability, 47 paired comparisons nonparametric tests, 159-163 t-test for, 117-119 parameters, 8 parametric mean, 8, 33 product-moment correlation coefficient, 193 regression coefficient, 212 variance, 22 percentiles, 71 pie charts, 19 platykurtic curve, 78 point estimation, 89 Poisson distribution, 48-53 calculation of expected frequencies, 50-51 clumping, 49 mean, 50 repulsion, 49 variance, 50 polygon, 21 population statistics, see parameters power of a test, 95-98 predictor variable, 209 probability distribution qualitative and discontinuous numeric variables, of, 44-46 continuous numeric variables, of, 57-63 random sampling, and, 43-44 product-moment correlation coefficient formula for 196 q, binomial probability, 47 qualitative frequency distribution, 13-15 quantitative frequency distribution, 15-17

r_s, Spearman's coefficient of correlation, 199–202 *r*; product-moment correlation coefficient, *see* product-moment correlation coefficient random sampling, 43
range, 30 mean

rank correlation Kendall's coefficient of, 202-207 ranking data, 147 region acceptance, 92 critical, 92 rejection, 92 regression analysis of variance, as, 215-217 assumptions, 214-215 coefficient parametric value for, 217 standard error of, 217 test of significance of, 217 contrasted with correlation, 19 curvilinear equation simple, 212 multiple, 236-240 introduction to, 210 lack-of-fit, 213-214, 219-221 linear logistic, 251-254 more than one value of Y per X, 213-214 multicollinearity, 235-236 multiple, 234-235 F to enter and F to remove, 242 Mallow's Cp, 240-241 model-building, 240-243 prediction of values of Y, 217 dummy independent variables, 247 residual analysis, 221-222 slope, 212 transformations in, 225-232 writing up results, 255 rejection region, 92 relative risk, 188-189 residuals, examination of, see regression response variable, 210 s, sample standard deviation, 33-37 s^2 , sample variance, 33–37 sb, standard error of regression coefficient, 217 $S_{\bar{v}}$ standard error of the mean, 75, 76, 86 SS, sum of squares, 31, 36 σ^2 , parametric variance sample mean, 26 representative, 9 size, 9 statistics, 26 standard deviation and variance, 33-37 sampling strategies, 8-9, 44 Scheffé test, 133-135 signed-ranks test, Wilcoxon's, 159-163

Cambridge University Press 978-0-521-14708-8 - Statistics for Anthropology: Second Edition Lorena Madrigal Index More information

267	Indov
204	IIIUEX

significance classical approach to, 83-43 levels, 94 statistical, 91 size, sample, 9 skewness, 77, 114 slope, see regression spearman's coefficient of rank correlation, 199-202 spurious correlations, 194 square, mean, 125-126 square root transformation, see transformations in regression squares least, 221 sums of (in ANOVA), 125-127 standard Deviate, 63 deviation, see s, standard deviation error of mean differences, 110 standardization, 63 standardized deviate, 63 statistical significance, see significance thinking, 42 statistics descriptive. 8 of dispersion, 29-38 of location, 26-29 stem-and-leaf display, 17 stepwise multiple regression analysis, see, regression, multiple, model-building. Student's t-distribution, 86-87, 103-104 sum of squares among groups, 124 explained, 212 interaction, 241 total, 124 unexplained, 212 summation sign synergism, 136 $t_{\alpha[v]}$, critical values of Student's distribution for v degrees of freedom, 87 T, critical value of rank sum of Wilcoxon's signed ranks test, 160 τ, Kendall's coefficient of rank correlation, 203

t-distribution, Student's, 86–87, 103–104 *t*-test for difference between a single specimen and a

sample, 116

difference between two means, 112 paired comparisons, 117 table two-by-two frequency, 172, 173 testing, hypothesis, see hypothesis testing tolerance, 236 total sum of squares, 124 transformations, see regression, transformations treatment effect, 7, 90, 97 two-by-two table, 172, 173 two-tailed tests, 100 two-way analysis of variance, see analysis of variance Type I error, 94 Type II error, 94–95 U-test, Mann-Whitney, 148-153 unbiased estimators, 33 variable continuous numeric, 5 dependent, 6 discontinuous numeric, 5 independent, 6 ordered, 4 qualitative, 4 ranked. 4 variance of a Poisson distribution, 50 parametric, 31-33 sample, 33-37 variance inflation factor, 236 variances tests of homogeneity of, 115, 132 variate. 4 Wilcoxon's signed-ranks test, 159-163 X axis, 18 χ^2 , sample statistic of chi-square distribution, see chi-square test

 χ^2 -test, see chi-square test \hat{Y} , predicted value of Y, 211–212 \bar{Y} , mean of a sample, 26

Y axis, 18 *Y*-intercept, 212 Yates' correction for continuity, 175

z scores, 98