

**Chapter 1 : The Concise Encyclopedia of Sociology - Google Books**

*The Concise Encyclopedia of Statistics presents the essential information about statistical tests, concepts, and analytical methods in language that is accessible to practitioners and students of the vast community using statistics in medicine, engineering, physical science, life science, social science, and business/economics.*

All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in other ways, and storage in data banks. Duplication of this publication or parts thereof is only permitted under the provisions of the German Copyright Law of September 9, , in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law. The use of registered names, trademarks, etc. Printed on acid free paper SPIN: Rather than aiming at a comprehensive coverage of our subject, we have concentrated on the most important topics, but explained those as deeply as space has allowed. The result is a compact work which we trust leaves no central topics out. Entries have a rigid structure to facilitate the finding of information. Each term introduced here includes a definition, history, mathematical details, limitations in using the terms followed by examples, references and relevant literature for further reading. The reference is arranged alphabetically to provide quick access to the fundamental tools of statistical methodology and biographies of famous statisticians, including some current ones who continue to contribute to the science of statistics, such as Sir David Cox, Bradley Efron and T. Anderson just to mention a few. The criteria for selecting these statisticians, whether living or absent, is of course rather personal and it is very possible that some of those famous persons deserving of an entry are absent. I apologize sincerely for any such unintentional omissions. The primary steps of writing this book were taken in . In the first French language version was published by Dunod publishing company in Paris. Later, in , the updated and longer version in French was published by Springer France and in a student edition of the French edition was published at Springer. In this encyclopedia, just as with the Oxford Dictionary of Statistical Terms, published for the International Statistical Institute in , for each term one or more references are given, in some cases to an early source, and in others to a more recent publication. While some care has been taken in the choice of references, the establishment of historical priorities is notoriously difficult and the historical assignments are not to be regarded as authoritative. For more information on terms not found in this encyclopedia short articles can be found in the following encyclopedias and dictionaries: William Kruskal and Judith M. Tanur The Free Press, Encyclopedia of Statistical Sciences, eds. Samuel Kotz, Norman L. The Encyclopedia of Biostatistics, eds. Peter Armitage and Ted Colton Chichester: John Wiley and Sons, The Encyclopedia of Environmetrics, eds. Paregoric John Wiley and Sons, The Encyclopedia of Statistics in Quality and Reliability, eds. Faltin John Wiley and Sons, Special care has been made in choosing suitable translations for terms in order to achieve sound meaning in both the English and French languages. If in some cases this has not happen, I apologize. I would be very grateful to readers for any comments regarding inaccuracies, corrections, and suggestions for the inclusion of new terms, or any matter that could improve the next edition. Please send your comments to Springer-Verlag. I wish to thank many people who helped me throughout these many years to bring this manuscript to its current form. Special thanks go to Gonna Serbinenko and Thanos Kondylis for their remarkable cooperation in translating some of terms from the French version to English. Working with Thanos, my former Ph. To my colleague Shahriar Huda whose helpful comments, criticisms, and corrections contributed greatly to this book. Accuracy should not be confused with the It is the complementary region to the rejecter term precision, which indicates the degree of tion region. This process can be iterative, meaning that it is repeated several times. It is generally a numerical process. In the field of computing, it refers to a process that is described in a way that can be used in a computer program. The principal goal of statistical software is to develop a programming language capable of incorporating statistical algorithms, so that these algorithms can then be presented in a form that is comprehensible to the user. The advantage of this approach is that the user understands the results produced by the algorithm and trusts the precision of the solutions. Specify the absolute value of the given number as its

opposite number: Computational Methods for Data Analysis. The algebra of Mohammed ben Musa, Rosen, F. Identify the algebraic sign of the given number. If the sign is negative, go to step 3. If the sign is positive, specify the absolute value of the number as the number itself: An alternative hypothesis is the hypothesis which differs from the hypothesis being tested. The alternative hypothesis is usually denoted by  $H_1$ . The alternative hypothesis can then take three different forms: The alternative hypothesis can also take three different forms during the hypothesis testing of parameters of two populations. The null hypothesis for this problem can be written as follows: The alternative hypothesis will therefore be: The alternative hypothesis could then be 2. If we want to compare  $k$  popula $H_0$ : We carry out a two-sided test to check The alternative hypothesis will then be forwhether the bolt diameter is too small or mulated as follows: The alternative hypothesis can be formu $H_1$ : This means that only one parameter needs to have a different value to those of the other 3. Hypothesis testing on a comparison of parametersin order to rejectthe null hypoththe means of two populations esis and accept the alternative hypothesis. An insurance company decided to equip its offices with microcomputers. It wants A 4 Analysis of Binary Data to buy these computers from two different companies so long as there is no significant difference in durability between the two brands. It therefore tests the time that passes before the first breakdown on a sample of microcomputers from each brand. According to the null hypothesis, the mean of the elapsed time before the first breakdown is the same for each brand: Since we do not know which mean will be the highest, we carry out a two-sided test. Therefore the alternative hypothesis will be: Testing Statistical Hypothesis, 3rd edn. Springer, New York Analysis of Binary Data The study of how the probability of success depends on expanatory variables and grouping of materials. In the latter case we note especially independence tests between attributes, and homogeneity tests. So the dependence of  $Y$  on the variables  $X_1, X_2, \dots$ . Models 1 and 2 are easier to interpret. Yet the last one has the advantage that the quantity to be explained takes all possible values of the linear models. It is also important to pay attention to the extrapolation of the model outside of the domain in which it is applied. It is possible that among the independent variables  $X_1, X_2, \dots$ . In this case, it is necessary to treat the nonbinary categorical variables in the following way: So  $Z_i$  takes the value 1 if  $Z$  belongs to the category represented by this index. The reference used in order to avoid the situation of collinearity will have for the purposes of comparison with other categories a parameter of zero. Properties of sufficiency and statistical tests. A , "â€” The analysis of categorical data involves Cox, D. Analysis of Binary the following methods: Analysis of Qualitative Data. A subsequent analysis, which consists of demic, New York discovering and studying relationships between the attributes if they exist ; Pearson, K.: On the theory of contingency and its relation to association and normal c An homogeneity test of some popcorrelation. The chi-square test, was proposed by Barlett, M. An analysis of residuals is used to test the validity of the statistical model and to control the assumptions made on the error term. It may be used also for outlier detection. Most of the methods used to analyze residuals are based on the works of Anscombe and Anscombe and Tukey In , Anscombe also presented an interesting discussion on the reasons for using graphical methods of analysis. Cook and Weisberg dedicated a complete book to the analysis of residuals. Draper and Smith also addressed this problem in a chapter of their work Applied Regression Analysis. Plotting the residuals as a function of time if the chronological order is known. Plotting the residuals as a function of the independent variables  $X_{ij}$ . Creating a Q"Q plot of the residuals. It conConsider a general model of multiple linear sistis of placing: The three figures below firm these hypotheses. Methods used to analyze residuals are main- 1. In this case, it is necessary to perform a transly graphical.

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*International Encyclopedia of Statistics, eds. William Kruskal and Judith M. Tanur (The Free Press, ). Encyclopedia of Statistical Sciences, eds. Samuel Kotz, Norman L.*

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