INTERNATIONAL STANDARD

ISO

5479

Statistical interpretation of data — Tests for departure from the normal distribution

Interprétation statistique des données — Tests pour les écarts à la distribution normale

Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 5479 was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 6, *Measurement methods and results*.

Annexes A and B of this International Standard are for information only.

Introduction

Many of the statistical methods recommended in International Standards, such as those described in ISO 2854[1], are based on the assumption that the random variable(s) to which these methods apply are independently distributed according to a normal distribution with one or both of its parameters unknown.

The following question therefore arises. Is the distribution that is represented by the sample sufficiently close to the normal distribution that the methods provided by these International Standards can be used reliably?

There is no simple yes or no answer to this question which is valid in all cases. For this reason a large number of "tests of normality" have been developed, each of which is more or less sensitive to a particular feature of the distribution under consideration; e.g. asymmetry or kurtosis.

Generally the test used is designed to correspond to a predetermined a priori risk that the hypothesis of normality is rejected even if it is true (error of the first kind). On the other hand, the probability that this hypothesis is not rejected when it is not true (error of the second kind) cannot be determined unless the alternative hypothesis (i.e. that which is opposed to the hypothesis of normality) can be precisely defined. This is not possible in general and, furthermore, it requires computational effort. For a distinct test, this risk is particularly large if the sample size is small.

Statistical interpretation of data — Tests for departure from the normal distribution

1 Scope

1.1 This International Standard gives guidance on methods and tests for use in deciding whether or not the hypothesis of a normal distribution should be rejected, assuming that the observations are independent.

1.2 Whenever there are doubts as to whether the observations are normally distributed, the use of a test for departure from the normal distribution may be useful or even necessary. In the case of robust methods, however (i.e. where the results are only altered very slightly when the real probability distribution of the observations is not a normal distribution), a test for departure from the normal distribution is not very helpful. This is the case, for example, when the mean of a single random sample of observations is to be checked against a given theoretical value using a t-test.

1.3 It is not strictly necessary to use such a test whenever one refers to statistical methods based on the hypothesis of normality. It is possible that there is no doubt at all as to the normal distribution of the observations, whether theoretical (e.g. physical) reasons are present which confirm the hypothesis or because this hypothesis is deemed to be acceptable according to prior information.

1.4 The tests for departure from the normal distribution selected in this International Standard are primarily intended for complete data, not grouped data. They are unsuitable for censored data.

1.5 The tests for departure from the normal distribution selected in this International Standard may be applied either to observed values or to functions of them, such as the logarithm or the square root.

1.6 Tests for departure from the normal distribution are very ineffective for samples of size less than eight. Accordingly, this International Standard is restricted to samples of eight or more.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3534-1:1993, *Statistics — Vocabulary and symbols — Part 1: Probability and general statistical terms.*