Chi Square Test

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Any statistical test that uses the chi square distribution can be called chi square test. It is applicable both for large and small samples-depending on the context.

> For example suppose a person wants to test the hypothesis that success rate in a particular English test is similar for indigenous and immigrant students.

If we take random sample of say size 80 students and measure both indigenous/immigrant as well as success/failure status of each of the student, the chi square test can be applied to test the hypothesis.

There are different types of chi square test each for different purpose. Some of the popular types are outlined below.

Tests for Different Purposes

1. *Chi square test for testing goodness of fit* is used to decide whether there is any difference between the observed (experimental) value and the expected (theoretical) value.

   For example given a sample, we may like to test if it has been drawn from a normal population. This can be tested using chi square goodness of fit procedure.

2. *Chi square test for independence of two attributes.* Suppose N observations are considered and classified according two characteristics say A and B. We may be interested to test whether the two characteristics are independent. In such a case, we can use Chi square test for independence of two attributes.

The example considered above testing for independence of success in the English test vis a vis immigrant status is a case fit for analysis using this test.

3. *Chi square test for single variance* is used to test a hypothesis on a specific value of the population variance [1]. Statistically speaking, we test the null hypothesis [2] H0: ? = ?0 against the research hypothesis [3] H1: ? # ?0 where ? is the population mean and ?0 is a specific value of the population variance that we would like to test for acceptance.

   In other words, this test enables us to test if the given sample has been drawn from a population with specific variance ?0. This is a small sample test to be used only if sample size is less than 30 in general.

Assumptions

The Chi square test for single variance [1] has an assumption that the population from which the sample has been is normal. This normality assumption need not hold for chi square goodness of fit test and test for independence of attributes.

However while implementing these two tests, one has to ensure that expected frequency in any cell is not less than 5. If it is so, then it has to be pooled with the preceding or succeeding cell so that expected frequency of the pooled cell is at least 5.

Non Parametric and Distribution Free

It has to be noted that the Chi square goodness of fit test and test for independence of attributes depend only on the set of observed and expected frequencies and degrees of freedom. These two tests do not need any assumption regarding distribution [4] of the parent population from which the samples are taken.

Since these tests do not involve any population parameters or characteristics, they are also termed as non parametric [5] or distribution free tests. An additional important fact on these two tests is they are sample size independent and can be used for any sample size as long as the assumption on minimum expected cell frequency is met.

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