How do I use the CHISQ.TEST function in Excel to test the goodness of fit of a data set to a specified distribution?

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The CHISQ.TEST function in Excel is a statistical tool used to test the goodness of fit of a data set to a specified distribution. It calculates the chi-square statistic and corresponding p-value, which can be compared to a critical value to determine the level of significance. To use this function, the data set should be arranged in a single column and the specified distribution should be known. The function then calculates the expected values for each category and compares them to the observed values, providing a measure of how well the data fits the specified distribution. This is a useful tool for evaluating the accuracy of a theoretical distribution in representing real-world data.

Returns the test for independence. CHISQ.TEST returns the value from the chi-squared (χ2) distribution for the statistic and the appropriate degrees of freedom. You can use χ2 tests to determine whether hypothesized results are verified by an experiment.

Syntax

CHISQ.TEST(actual_range,expected_range)

The CHISQ.TEST function syntax has the following arguments:

Actual_range Required. The range of data that contains observations to test against expected values.

Expected_range Required. The range of data that contains the ratio of the product of row totals and column totals to the grand total.

Remarks

If actual_range and expected_range have a different number of data points, CHISQ.TEST returns the #N/A error value.

The χ2 test first calculates a χ2 statistic using the formula:

$$\chi^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{\left(A_{ij} - E_{ij}\right)^2}{E_{ij}}$$

where:

Aij = actual frequency in the i-th row, j-th column

Eij = expected frequency in the i-th row, j-th column

r = number or rows

c = number of columns

A low value of $\chi 2$ is an indicator of independence. As can be seen from the formula, $\chi 2$ is always positive or 0, and is 0 only if Aij = Eij for every i,j.

CHISQ.TEST returns the probability that a value of the $\chi 2$ statistic at least as high as the value calculated by the above formula could have happened by chance under the assumption of independence. In computing this probability, CHISQ.TEST uses the $\chi 2$ distribution with an appropriate number of degrees of freedom, df. If r > 1 and c > 1, then df = (r - 1)(c - 1). If r = 1 and c > 1, then df = c - 1 or if r > 1 and c = 1, then df = r - 1. r = c= 1 is not allowed and #N/A is returned.

Use of CHISQ.TEST is most appropriate when Eij's are not too small. Some statisticians suggest that each Eij should be greater than or equal to 5.

Example

Copy the example data in the following table, and paste it in cell A1 of a new Excel worksheet. For formulas to show results, select them, press F2, and then press Enter. If you need to, you can adjust the column widths to see all the data.

Men (Actual)	**Women (Actual)**	**Description**
58	35	Agree
11	25	Neutral
10	23	Disagree
Men (Expected)	**Women (Expected)**	**Description**
45.35	47.65	Agree
17.56	18.44	Neutral
16.09	16.91	Disagree
Formula	**Description**	**Result**
=CHISQ.TEST(A2:B4,A6:B8)	The $\chi 2$ statistic for the data above is 16.16957 with 2 degrees of freedom	0.0003082