assignment Requirements for Chi-square program

Personal Software Process for Engineers

# Workshop Objectives

After this workshop, you will

* understand Program 11E requirements
* have completed Program 11E planning:
* conceptual design
* size estimate
* resource estimate
* defect estimate

# Program Requirements

Using PSP2.1, write Program 11E to calculate the degree to which a string of *n* real numbers is normally distributed.

Use the Simpson’s integration routine from Program 5A to calculate the values of the χ2 distribution.

Assume *n* > 20 and an even multiple of 5. (Note: You may assume that *n* = 50.)

Use Program 8A to sort the numbers into ascending order.

Test the program using the LOC/Method data in Table D14 of the text (p. 761).

Submit a test report that includes the test results and uses the format in Table D15 (p. 762).

|  |  |  |
| --- | --- | --- |
| Test | Expected Result | Actual Result |
| Table D14 |  |  |
| *Q* | 34.4 |  |
| 1 − *p* | 7.60\*10−5 |  |

# The Test Procedure

The 2 test for normality determines the likelihood that a data set is from a normal distribution. It is done by comparing the structure of the data set with that of an ideal normal distribution.

This is done by dividing the normal distribution into equal area segments and comparing the actual number of points from the data set being tested in each segment with the expected number for the ideal normal distribution.

The steps of the χ test are as follows.

1. Sort the data set of *n* real numbers into ascending order.
2. Normalize the data set.

* First, calculate the standard deviation, σ, for the data using *n* − 1.



* Then, transform each *xi* into a *zi*, where .

1. Divide the normal distribution into some number of segments *S*, where

* *n*/*S*  5
* *S* > 3
* *S*2  *n*

In this case, *S* = 10 satisfies this requirement.

1. Determine how many items of the ideal normal distribution would fall into each segment, *Ni*. Normally it is *n*/*S*; in this case, it is 5.
2. Determine how many from the normalized data set fall into each segment, *ki*.
3. Calculate the *Q* value for the segments.



1. Calculate the probability *p* of the  distribution for *S* − 1 degrees of freedom (*dof*) by integrating from 0 to *Q*.

Note: The above equation for  differs from Equation A7 (p. 518), by

* substituting *dof* for *n*
* substituting *Q* for *x*

1. Calculate the distribution tail as 1 − *p*.
2. Examine 1 − *p* to interpret the result.

* 1 − *p* < 0.05 is generally considered sufficient to reject a fit.
* 1 − *p* > 0.2 is generally considered sufficient to accept a fit.
* Intermediate values indicate intermediate degrees of fit.

*See Table A21of the text for details (p. 534).*

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