Tests of Homogeneity and Independence

Lecture 44
Sections 14.4 - 14.5

Robb T. Koether

Hampden-Sydney College

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Outline

Introduction

- We conclude Chapter 14 by learning how to conduct a test of homogeneity or a test of independence in the TI-83.
- As usual, the TI-83 will compute the test statistic and the p-value. We are responsible for all seven steps.
- We will see that the TI-83 will also compute the expected counts.

Example

- The following table shows final exam grades for two sections of Statistics taught by two different methods.
- Are the two populations homogeneous?

	A	B	C	D	F
Method I	5	7	36	17	7
Method II	7	11	18	7	5

The Test of Homogeneity

1. H_0: The populations are homogeneous.
   H_1: The populations are not homogeneous.
2. $\alpha = 0.05$.
3. $\chi^2 = \sum_{\text{all cells}} \frac{(O - E)^2}{E}$.
4. $\chi^2 = 7.2106$.
5. p-value $= 0.1252$.
6. Accept H_0.
7. The two populations are homogeneous.

TI-83 - Test of Homogeneity or Independence

- Now we will perform the test on the TI-83.
- One problem: The tables in these examples are not lists, so we can't use the lists in the TI-83.
- Instead, the tables are matrices.
- That's ok. The TI-83 can handle matrices.

TI-83 - Test of Homogeneity or Independence

- To enter the observed counts into a matrix.
  - Press `MATRIX`.
  - Select `EDIT`.
  - Use the arrow keys to select the matrix to edit, say `[A]`.
  - Press `ENTER` to edit that matrix.
  - Enter the number of rows and columns. (Press `ENTER` to advance.)
  - Enter the observed counts in the cells.
  - Press `2nd Quit` to exit the matrix editor.

TI-83 - Test of Homogeneity or Independence

- To perform the test of homogeneity.
  - Select `STATS > TESTS >` χ^2`-Test...`
  - Press `ENTER`.
  - Use the `MATRIX` button to enter the name of the matrix of observed counts.
  - Enter the name (e.g., `[E]`) of a matrix for the expected counts. These will be computed for you by the TI-83.
  - Select `Calculate`.
  - Press `ENTER`.

TI-83 - Test of Homogeneity or Independence

- The window displays
  - The title χ^2-Test.
  - The value of χ^2.
  - The *p*-value.
  - The number of degrees of freedom.
- To see the matrix of expected counts.
  - Press MATRIX.
  - Select matrix [E].
  - Press ENTER.

TI-83 - Example

- Work the previous example, using the TI-83.

Another Example

Article

City Hall turmoil: Richmond Times-Dispatch poll

- Is one's political affiliation independent of his opinion of Mayor Wilder?

	Excellent	Good	Fair	Poor	Not Sure
Dem	38	70	59	86	16
Rep	21	31	33	23	7
Ind	13	23	31	41	7

The Expected Counts

- The observed and expected counts.

	Excellent	Good	Fair	Poor	Not Sure
Dem	38 (38.8)	70 (66.8)	59 (66.3)	86 (80.9)	16 (16.2)
Rep	21 (16.6)	31 (28.6)	33 (28.3)	23 (34.6)	7 (6.9)
Ind	13 (16.6)	23 (28.6)	31 (28.3)	41 (34.6)	7 (6.9)

The Test Statistic

- The value of χ^2 is 10.62.
- In this example, $df = (3 - 1) \times (5 - 1) = 8$.
- The p-value is

$$\chi^2\texttt{cdf(10.62,E99,8)} = 0.2239.$$

- Accept H_0.
- We conclude from these data that one's opinion of Mayor Wilder is independent of one's political affiliation.

Summary

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- The TI-83 will perform tests of homogeneity and independence.
- The data must be entered as a matrix.
- The value of χ^2 and the *p*-value are reported.
- The expected counts are placed in another matrix.