Time Frame: 50 minutes

Subject Matter: Chi Square TELL ME

Objective: TSWBAT test a distribution for goodness of fit, using chi square.

Standards: DA – 3.8

 Materials: TI 83 Calculator and Worksheets

SHOW ME

Presentation of Information

Example 1

The Russel Reynold Association surveyed retired senior executives who had returned to work. The found that after returning to work, 38% were employed by another organization, 32% were self-employed, 23% were either freelancing or consulting, and 7% had formed their own companies. To see if these percentages are consistent with those of Allegheny County residents, a local researcher surveyed 300 retired executives who had returned to work and found that 122 were working for another company, 85 were self-employed, 76 were either freelancing or consulting, and 17 had formed their own companies. At $α=0.10$, test the claim that the percentage are the same for those people in Allegheny County.

Solution:

d.f. = 4 categories minus 1 = 3

Observed Frequency (O)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Employed | Self-employed | Freelancing/ Consulting | Own a Company |
| Observed | 122 | 85 | 76 | 17 |
| Expected | 114 | 96 | 69 | 21Expected Frequency(E) |

$0.38×300$
$$0.32×300$$

$$0.23×300$$

$$0.07×300$$

* State the hypotheses:

$H\_{0}:$ The retired executives who returned to work are distributed as follows:

* 38% were employed by another organization
* 32% were self-employed
* 23% were either freelancing or consulting
* 7% had formed their own companies

$H\_{1}:$ The distribution is not the same as stated in the null hypothesis.

* Find the critical value:

Use table G

* Compute the test value:

Observed Frequency (O)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Employed | Self-employed | Freelancing/ Consulting | Own a Company |
| Observed | 122 | 85 | 76 | 17 |
| Expected | 114 | 96 | 69 | 21Expected Frequency(E) |

$$χ^{2}=∑\frac{\left(O-E\right)^{2}}{E}$$

$χ^{2}=\frac{\left(122-114\right)^{2}}{114}$ + $\frac{\left(85-96\right)^{2}}{96}+\frac{\left(76-69\right)^{2}}{69}+\frac{\left(17-21\right)^{2}}{21}$

$χ^{2}=\frac{\left(8\right)^{2}}{114}$ + $\frac{\left(-11\right)^{2}}{96}+\frac{\left(7\right)^{2}}{69}+\frac{\left(-4\right)^{2}}{21}$

$χ^{2}=0.56$ + $1.26+0.71+0.76$

Compare this to the critical value

$$χ^{2}=3.29$$

* Make the decision:

Accept $H\_{0}$ since the computed value is less than the critical value.

* Summarize the result:

The retired executives who returned to work are distributed as follows:

* 38% were employed by another organization
* 32% were self-employed
* 23% were either freelancing or consulting
* 7% had formed their own companies

Classwork

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: April 13, 2011

The adviser of an ecology club at a large college believes that the group consists of 10% freshmen, 20% sophomores, 40% juniors, and 30% seniors. The membership for the club this year consisted of 14 freshmen, 19 sophomores, 51 juniors, and 16 seniors. At $α=0.10$, test their adviser’s conjecture.

Solution:

d.f. = 4 categories minus 1 = 3

Observed Frequency (O)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Freshmen | Sophomores | Juniors | Seniors |
| Observed | 14 | 19 | 51 | 16 |
| Expected | 10 | 20 | 40 | 30Expected Frequency(E) |

$0.10×100$
$$0.20×100$$

$$0.40×100$$

$$0.30×100$$

The total number of students is 100

* State the hypotheses:

$H\_{0}:$ The club consists of:

* 10% freshmen
* 20% sophomores
* 40% juniors
* 30% seniors

$H\_{1}:$ The distribution is not the same as stated in the null hypothesis.

* Find the critical value:

Use table G

* Compute the test value:

Observed Frequency (O)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency | Freshmen | Sophomores | Juniors | Seniors |
| Observed | 14 | 19 | 51 | 16 |
| Expected | 10 | 20 | 40 | 30Expected Frequency(E) |

$$χ^{2}=∑\frac{\left(O-E\right)^{2}}{E}$$

$χ^{2}=\frac{\left(14-10\right)^{2}}{10}$ + $\frac{\left(19-20\right)^{2}}{20}+\frac{\left(51-40\right)^{2}}{40}+\frac{\left(16-30\right)^{2}}{30}$

$χ^{2}=\frac{\left(4\right)^{2}}{10}$ + $\frac{\left(-1\right)^{2}}{20}+\frac{\left(11\right)^{2}}{40}+\frac{\left(-14\right)^{2}}{30}$

$χ^{2}=1.6$ + 0.05$ +3.03+6.53$

Compare this to the critical value

$χ^{2}=$ 11.21

* Make the decision:

Accept $H\_{1}$ since the computed value is greater than the critical value.

* Summarize the result:

The distribution is not the same as stated in the null hypothesis.