

Math 263: Solutions to Excel Assignment 7

1. **Decide if UA wins more often at home.** To do this, test whether the proportion of UA wins at home is significantly greater than the proportion of UA wins away. Write out your reasoning in detail, showing
- the hypotheses,
 - the calculation of the standard error,
 - the calculation of the test statistic,
 - the p -value,
 - the interpretation of the p -value,
 - your conclusion and its interpretation in terms of UA basketball.

Solution

All values came from the Excel spreadsheet. Values subscripted 1 are away values and values subscripted 2 are home values. There are $n_1 = 117$ games away and $n_2 = 117$ games at home.

Hypothesis (for proportions): We use the Z-value to test the difference in proportions.

$$H_0: p_1 = p_2$$

$$H_a: p_1 < p_2$$

We find $\hat{p}_{\text{pooled}} = 0.683$, so

$$z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}_{\text{pooled}}(1 - \hat{p}_{\text{pooled}})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = \frac{(0.579 - 0.786)}{\sqrt{0.683(1 - 0.683)\left(\frac{1}{126} + \frac{1}{126}\right)}} = -3.5.$$

The P -value is calculated in Excel as = NORMDIST(-3.5, 0, 1, TRUE) = 0.0002 = 0.02%.

The P -value gives the probability of seeing as large a difference in the proportion of wins at home versus away if Arizona has no home court advantage.

Since the P -value is so small (much less than 1%), we reject the null hypothesis; we have evidence that there is a home court advantage, significant at the 1% level.

2. **Decide if the margin of victory is greater at home or away.** To do this, test whether UA's margin of victory (or loss) at home is significantly greater than UA's margin of victory (or loss) away. Write out your reasoning in detail, showing
- the hypotheses,
 - the calculation of the test statistic,
 - the p -value,
 - the interpretation of the p -value
 - your conclusion and its interpretation in terms of UA basketball.

Solution

Again 1 is away and 2 is home. We use a T -test for the difference in scores. Again there are $n_1 = 99$ games away and $n_2 = 99$ games at home, so $df = 116$

$$H_0: \mu_1 = \mu_2$$

$$H_a: \mu_1 < \mu_2$$

Using values from the Excel, we have

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\frac{SE_1^2}{n_1} + \frac{SE_2^2}{n_2}}} = \frac{(2.881 - 10.190)}{\sqrt{\frac{13.245^2}{126} + \frac{11.849^2}{126}}} = -4.6.$$

The P -value is calculated in Excel as = TDIST(4.6, 125, 1) = 0.000005 = 0.0005%.

The P -value gives the probability of seeing as large a difference in the margin of victory at home versus away if Arizona has no home court advantage.

Since the P -value is so small (much less than 1%), we reject the null hypothesis; we have strong evidence that there is a home court advantage, significant at the 1% level.

3. **OPTIONAL.** (Not for extra points; just if you are interested.) **Decide if the margin of victory is greater at home or away using only the games in which UA won.** To do this, you will look at the margin of victory, or difference in scores, for only the games that UA won. Test whether UA's margin of victory at home is significantly greater than UA's margin of victory away. Write out your reasoning in detail, showing
- the null and alternate hypotheses,
 - the calculation of the test statistic,
 - the p -value,
 - the interpretation of the p -value
 - your conclusion and its interpretation in terms of UA basketball

Solution

First sort the data and copy and paste all the winning games into a new sheet. There are $n_1 = 57$ games won away and $n_2 = 76$ games won at home. Again 1 is away and 2 is home. We use a T -test for the difference in scores; here $df = 56$.

$$H_0: \mu_1 = \mu_2$$

$$H_a: \mu_1 < \mu_2$$

Using values from the Excel, we have

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\frac{SE_1^2}{n_1} + \frac{SE_2^2}{n_2}}} = \frac{(11.507 - 14.657)}{\sqrt{\frac{9.632^2}{73} + \frac{9.038^2}{99}}} = -2.2.$$

The P -value is calculated in Excel as = TDIST(2.2, 72, 1) = 0.016 = 1.6%.

The P -value gives the probability of seeing as large a difference in the margin of victory at home versus away if Arizona has no home court advantage.

Since the P -value is smaller than 5%, we reject the null hypothesis; we have evidence that there is a home court advantage, significant at the 5% level.