

**POL 502**  
**Lecture 6**  
**February 28<sup>th</sup>, 2005**

Most of the lecture will be a review of Lecture 5 and MINTAB. Only the new material is below,

**Limitations of the t-test**

Does not test theoretical validity.

Rejecting our null hypothesis does not mean that the theory is true.  
Means you have found support for hypothesis in data you have obtained.

At .05 level 1 in 20 random variables will have a significant effect.  
Possible your theory is in the wrong direction.  
Possible that you have chosen an unrepresentative sample.

Its an important part of the process to begin with a theory and then create hypotheses and then test them.

Theories and hypotheses should not be based on statistical results.

T-tests do not tell us relative importance of independent variables.  
Tell us likelihood that relationship exists in the population.

DRAW two graphs.

Slight slope, little error, huge t – stat.

Steep slope, huge error, small t – stat.

T-test not intended for the entire population, just a sample of it.

How can we tell which independent variable is most “important”?  
How about greatest impact?

The larger coefficient.

But independent variables may be measured on different scales.

So use standardized coefficients.

Beta Coefficient or Beta weight.

$$\hat{\beta}_1^* = \hat{\beta}_1 \left( \frac{SD_x}{SD_y} \right)$$

We can do this after our estimation or we can do it before by converting all of our data to z-scores.

For a bivariate regression, Beta Coefficient is the same as a correlation.

Lets construct confidence intervals for our estimates.

$$\hat{\beta}_1 \pm t_{.025}(SE_{\hat{\beta}_1})$$

$$\hat{\beta}_0 \pm t_{.025}(SE_{\hat{\beta}_0})$$

Use the t-distribution and n-2 degrees of freedom.

If we don't want to think of units of measurement of our independent variable, we can standardize our coefficients.

### **The t-test of the Simple Correlation Coefficient, r**

We learned last semester how to calculate r, the correlation coefficient.

$$r_{12} = \frac{\sum [(X_{1i} - \bar{X}_1)(X_{2i} - \bar{X}_2)]}{\sqrt{\sum (X_{1i} - \bar{X}_1)^2 \sum (X_{2i} - \bar{X}_2)^2}}$$

This value can range from -1 to +1.

Also, don't forget that  $r$  is  $\sqrt{R^2}$ .

So, we learned how to measure the relationship between two interval level variables using  $r$ , but we need to learn how to attach a test of significance to that. You may have already seen this test in MINITAB.

We convert  $r$  into a test statistic using:

$$t = \frac{r\sqrt{n-2}}{\sqrt{(1-r^2)}}$$

Where  $n$  is the size of the sample.

We use the  $t$  distribution and  $n-2$  degrees of freedom.

Example: with  $r=0.946$  and 28 observations, we have a critical value of 1.706 and can reject the null hypothesis with a test statistic of 14.88.

### **Homework:**

Chapter 5, exercises 2, 4, 14, 16.