

# Political Science 104

Lecture 15:  
Interpretation of Hypothesis Tests

## Hypothesis Testing in Regression

- In most cases we are testing whether a relationship is positive or negative, so we test the coefficients in a regression with  $H_0 = 0$ .
- Most statistical programs (including SPSS) will automatically perform a t test on each coefficient in the regression, using 0 as the null hypothesis.
- If we reject  $H_0 = 0$  for the coefficient on a variable we say that variable is *statistically significant* -- that is, we can reject the hypothesis that it has no effect.

## Hypothesis Test in a Regression

### Example #1

- We hypothesize that IMF loans cause more political instability.  $H_0$  for our regression slope = 0.  $H_A \neq 0$ .
- We calculate a regression line. The slope coefficient on IMF loans is 2, with a standard error of 1.
- Our test statistic is a t score. It is known as a *t-ratio* since it boils down to just the coefficient over the standard error:  $t = (2 - 0) / 1 = 2/1 = 2$
- With a level of significance = 5%, our critical values in a t distribution with 149 d.f. are  $\pm 1.98$ . ( $N = 150$ )
- Our test statistic falls outside this range. Thus, we **reject** the null hypothesis. IMF loans do seem to have a positive effect on political instability.

## Hypothesis Test in a Regression

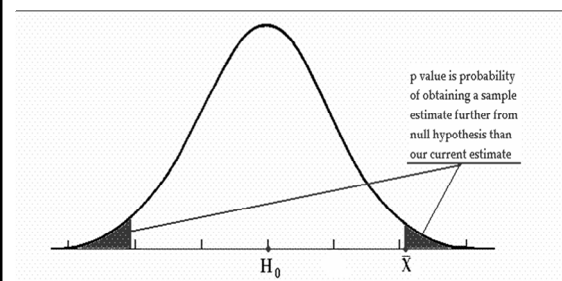
### Example #2

- We hypothesize that IMF loans cause more political instability.  $H_0$  for our regression slope = 0.  $H_A \neq 0$ .
- We calculate a regression line. The slope coefficient on IMF loans is 2, with a standard error of 3.
- Our t-ratio is  $2/3 = 0.67$ .
- With a level of significance = 5%, our critical values in a t distribution with 149 d.f. are  $\pm 1.98$ . ( $N = 150$ )
- Our test statistic falls within this range. Thus, we **fail to reject** the null hypothesis. We cannot rule out the possibility that IMF loans have no effect on political instability.

## p values

- Many times statistical software and journal articles will report a *p value* on a sample statistic.
- The p value tells you the probability of observing a sample statistic further from the null hypothesis than the current statistic if the null hypothesis were true.
- Hypothesis testing can be done by comparing the p value to the level of significance you want for your test. A p value of less than 0.05 usually means you reject the null hypothesis.

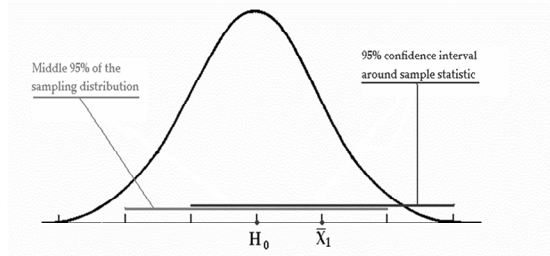
## Graphical example of a p value



## Confidence Intervals

- One thing related to hypothesis testing you should know about are *confidence intervals*.
- A confidence interval is a range that we feel is X% likely to cover the true population parameter.
- We construct a 95% CI by taking the critical values for a hypothesis test with a 5% level of significance, multiplying those values by the standard error, and adding/subtracting them from the test statistic.
- For example, a sample mean = 30, standard deviation = 2, and critical values =  $\pm 2$ , our 95% CI is [26, 34].
- Confidence intervals are very common in public opinion polls.

## Graphical Example of a Confidence Interval



Examples of Hypothesis Testing  
in SPSS

Presentation of Hypothesis Tests  
in Journal Articles