Hypothesis testing

- Let's add the following assumption:
  - Assume that u is independent of $x_1, x_2, \ldots, x_k$ and u is normally distributed with zero mean and variance σ^2: $u \sim \text{Normal}(0,\sigma^2)$
- To test the following hypothesis:

$$H_0: \beta_j = 0$$
$$H_1: \beta_j \neq 0$$

  – t statistic for $\hat{\beta}_j$: $t_{\hat{\beta}_j} = \dfrac{\hat{\beta}_j - \beta_j}{se(\hat{\beta}_j)} \sim t_{n-k-1}$

  – Where se is the standard error (remember that we don't know σ)
- If this value is greater than a critical t value, we can reject H_0.

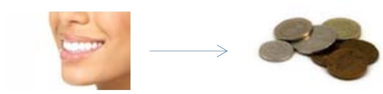
Hypothesis testing

- A hypothesis test makes an assumption about a "truth"
- Actually, we test the "null hypothesis"
  – We say "we reject/accept the null" (actually it is more common "fail to reject the null")
- What do we test? Probability that an observed value of the statistic has not occurred purely by chance
- Traditionally: significance levels are set at 1%, 5% or 10%

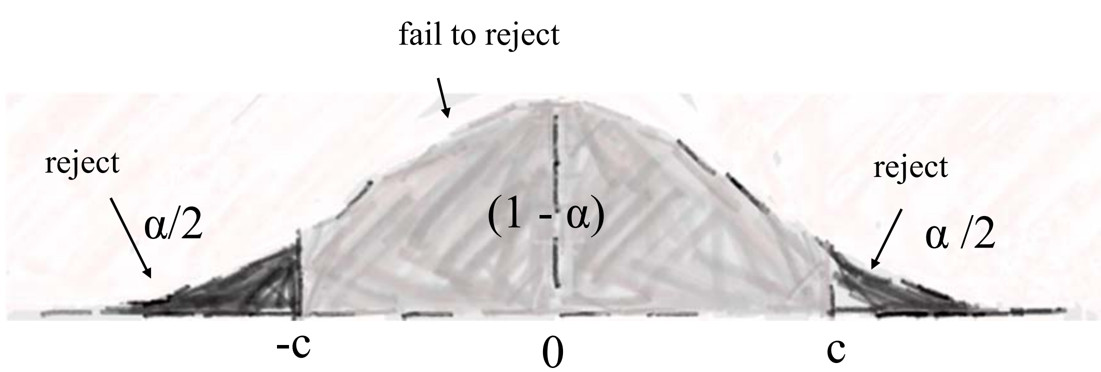
Hypothesis testing

- What's the significance level (alpha)?
- The *p*-value
  - Widely use
  - Many criticism
- Statistical vs. practical significance

- What do we get from this discussion?
  - Example



Hypothesis testing



- Let's see an example: Does high school size affect student performance?

Hypothesis testing

- An alternative method is seeing whether zero lies within the confidence interval:

$$\hat{\beta}_j \pm t_{\alpha/2} \times se\left(\hat{\beta}_j\right)$$

- If zero lies in this interval, we cannot reject H_0.

- In the review session (auxiliar) you can do some exercises, including tests of combination of parameters (e.g. $\beta_1 = \beta_2$) and *multiple* hypotheses test (e.g. $\beta_1 = 0$ *and* $\beta_2 = 0$)