

### Main Steps in Conducting a Hypothesis Test

1. Describe the population parameter under investigation.
2. Determine  $H_0$  and  $H_a$  based on the problem description.
3. Select  $\alpha = P(\text{Type I error})$  for the test.
4. State the form of the test statistic.
5. Collect data and compute the value of the test statistic.
6. Determine the P-value associated with the test statistic.
7. **IMPORTANT:** State the conclusion in the context of the problem and reiterate the  $\alpha$ -value used.

### Test for Zero Slope ( $H_0: \beta_1 = 0$ )

Based on sample data, we either reject  $H_0$  or fail to reject  $H_0$ .

Suppose  $H_0: \beta_1 = 0$  is rejected.

Interpretations

1.  $X$  is useful for predicting  $Y$  (i.e.  $\exists$  some relationship between  $X$  and  $Y$ ).
2. A more complex model may be more appropriate and it contains a linear component.

Suppose  $H_0: \beta_1 = 0$  is not rejected.

Interpretations

1.  $X$  by itself provides little or no information for predicting  $Y$ .
2. The true relationship between  $X$  and  $Y$  is not linear and may involve a quadratic, cubic, or other function of  $X$ .

In either case, a straight-line regression model may not adequately describe the relationship between  $X$  and  $Y$ , and a more complicated model is needed.