

Complete a test of the following hypothesis that directs our choice between the simple and multiple regressions for Sales of roses:

$$H_0: \beta_2 = \beta_3 = 0;$$

H_A : at least one, β_2 or β_3 , is not zero.

We found: $F_{\text{calc}} = 4.40$.

Complete this test at the 10% level of significance. Recall: $N_1 = 2$; $N_2 = 12$.

V. Extensions of Multiple Regression

A. Dummy Variables

1. Definition:

A **binary variable** that indicates a quality, condition, characteristic, etc. exists.

2. Examples:

- Cross-sectional data:

- Time-series data:

3. Uses of Dummy Variables

- a. Shifting the intercept:
 - Incorporate the *dummy variable* in your PRE, just as you would any other variable.
 - There are then *two regressions*:

3. Uses of Dummy Variables

- b. Shifting the slope (as well as intercept):
 - Incorporate the *dummy variable* in PRE.
 - Incorporate an *interaction term* in PRE.
Interaction Term: Multiply an independent variable by the dummy variable.
 - There are *two regressions*:

Draw this.

4. Interpretations

- Model:
$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \delta D_i + \gamma (X_{1i} D_i) + u_i$$
- The parameter δ :

4. Interpretations

- Model:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \delta D_i + \gamma (X_{1i} D_i) + u_i$$

- The parameter γ :

Interpretations – are the groups different?

- Are the intercepts different? **Statistically different?**
 - If $\delta = 0$:
 - Statistical test:
- Are the slopes different? **Statistically different?**
 - If $\gamma = 0$:
 - Statistical test:

F-Test: Are the PRFs for the two groups different?

- The hypothesis:

- Calculate the F-statistic:

$$F_{calc} = \frac{[ESS_{(2)} - ESS_{(1)}] / (K_{(2)} - K_{(1)})}{RSS_{(2)} / (n - K_{(2)} - 1)}$$
