

Technical Paper 27

Linear regression

- A. Test for examining a causal linear relationship between the dependent and independent variables.
- B. Linear regression is applicable to interval and ratio scale data.
- C. The fit of the resulting linear equation is evaluated by a type of ANOVA
- D. Assumptions
 1. Random samples
 2. Independent samples
 3. The relationship between the two variables is causal – the value of the independent variable determines (causes) the value of the dependent variable.
 4. The relationship between the two variables is linear.
 5. The x-variable is under the control of the observer and the X-values are assumed to be exact.
 6. For any value of X there is a theoretical population of y-values that are normally distributed.
 7. The variances of Y are equal.

$$\beta = \frac{\Sigma((X_i - \bar{X})(Y_i - \bar{Y}))}{\Sigma(X_i - \bar{X})^2}$$

$$\alpha = \bar{Y} - b\bar{X}$$

Evaluation ANOVA

$$SS_{Total} = \sum (Y_i - \bar{Y})^2$$

$$SS_{Regression} = \sum (\hat{Y} - \bar{Y})^2$$

$$SS_{Error} = \sum (Y_i - \hat{Y})^2$$

$$r^2 = \frac{SS_{Regression}}{SS_{Total}}$$