Lecture 8
Segment 3

Estimation of coefficients

Estimation of coefficients

- Still ORDINARY LEAST SQUARES estimation
  - But we will use matrix algebra

Estimation of coefficients

- The values of the coefficients (B) are estimated such that the model yields optimal predictions.
  - Minimize the residuals!
  - The sum of the squared (SS) residuals is minimized
  - SS.RESIDUAL = $\Sigma(\acute{Y} - Y)^2$
  - ORDINARY LEAST SQUARES estimation

Regression equation

- $\hat{Y} = B_0 + B_1X_1$ # $\hat{Y}$ is the predicted score on Y
- $Y - \hat{Y} = e$ # e is the prediction error (residual)

Regression equation, matrix form

- $\hat{Y} = BX$
  - $\hat{Y}$ is a [N x 1] vector (N = number of cases)
  - B is a [(1+k) x 1] vector (k = number of predictors)
  - X is a [N x (1+k)] matrix

Make X square and symmetric

- To do this, pre-multiply by the transpose of X, X'
- $X'\hat{Y} = X'XB$

To solve for B, get rid of X'X

- To do this, pre-multiply by the inverse, $(X'X)^{-1}$
- $(X'X)^{-1}X'\hat{Y} = (X'X)^{-1}X'XB$
- $(X'X)^{-1}X'X = I$
- $IB = B$

- $(X'X)^{-1}X'\hat{Y} = B$