

# MLR Errors and Diagnostics

- Model remains:  $y(i) = \beta(0) + \beta(1)x(1,i) + \beta(2)x(2,i) + \dots + \beta(p)x(p,i) + \varepsilon(i)$
- Discussion standard error (SE) of the coefficient
  - $\sigma(\hat{\beta})^2 = \sigma^2 / (SST(j) \times (1 - R(j)^2))$ , where
  - $\sigma^2$  = variance of  $\varepsilon$
  - $SST(j)$  = SOS Total  $x(j)$
  - $R(j)^2$  =  $R^2$  from  $x(j)$  regressed on other predictors
  - $VIF = 1 / (1 - R(j)^2)$  where  $(1 - R(j)^2)$  is called the tolerance
- 6 Classic Linear Modeling Assumption
  - Linearity
  - IID
  - No perfect multicollinearity
  - Zero expectation conditional mean
  - Homoskedasticity
  - Normality of Errors
- Diagnostics based on residuals
  - Resid vs fitted -Zero Condition Mean
  - Standardized Resid vs fitted – Constant error
  - QQ plots – normality
  - Histograms – skewness and transformation
  - VIF – Colinearity
  - Leverage of points & Cook's distance
    - Investigate outliers
- Transforms