Issues/Problems

Wednesday, September 1, 2021   6:25 PM

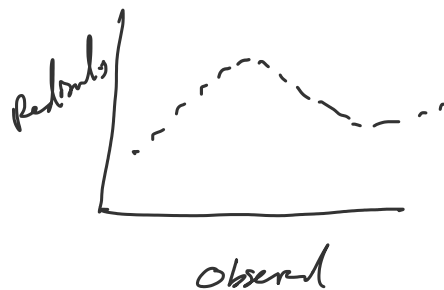- Problems

1. Non-Linearity $Y \Leftrightarrow X$
   $\hookrightarrow$ Residual Plot $\Rightarrow$ Non-Linear Relationship

Residuals | Fitted

Residual | fitted
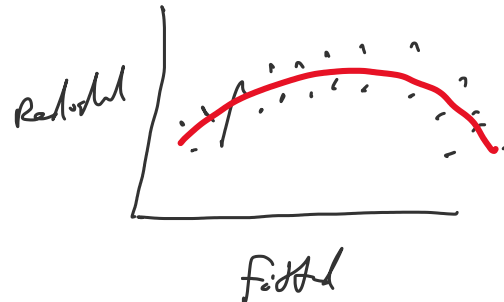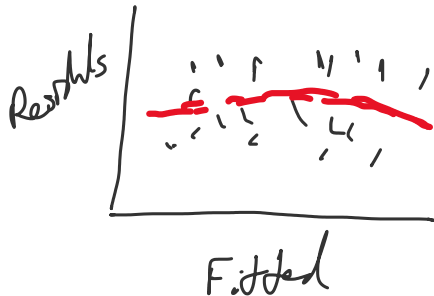
2. Correlation of Errors
   $\hookrightarrow$ Error terms show structure w.r.t observations (X_s / Y_s)

Residuals | Observed

$cor(\varepsilon_i, \varepsilon_j)$ high

3. Non-Constant Variance σ^2 of ε
   $\hookrightarrow$ Heteroskedasticity

Residuals | Fitted
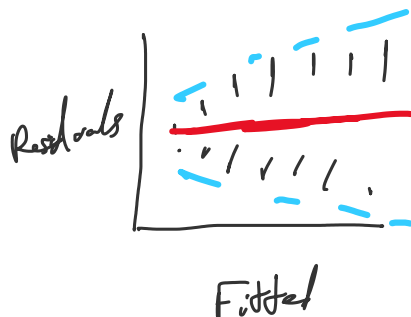
4. Outliers
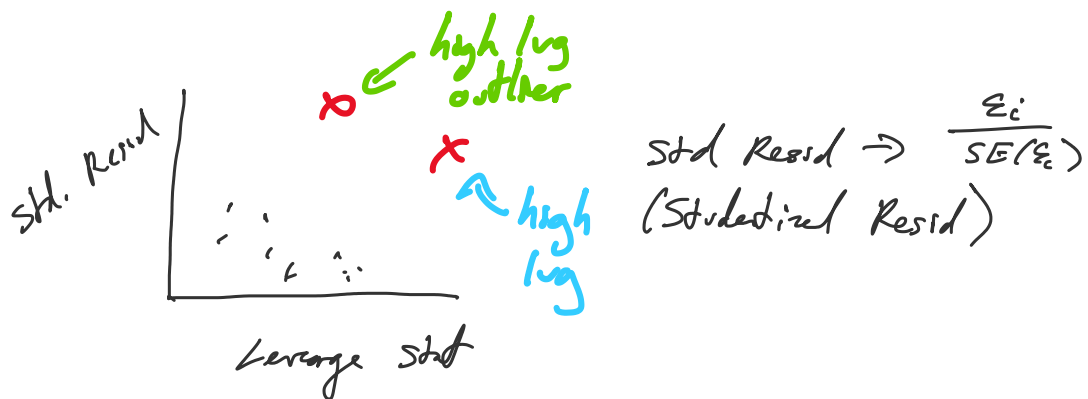   ↳ y_i no $\hat{y}_i$ is very different ⟹ Residual Plot

5. High leverage points
   ↳ x_i no $\bar{x}$

   Leverage statistic: $h_i = \frac{1}{n} + \dfrac{(x_i - \bar{x})^2}{\sum\limits_{i'=1}^{n} (x_{i'} - \bar{x})^2}$

   average leverage: $\dfrac{p+1}{n}$, $\dfrac{1}{n} \le h_i \le 1$

Std Resid ⟹ $\dfrac{\varepsilon_i}{SE(\varepsilon_i)}$
(Studentized Resid)

   # Cook's Distance

6. Collinearity
   ↳ Invertible OLS solution

   $$VIF(\hat{\beta}_j) = \frac{1}{1 - R^2_{x_j | x_{-j}}}$$

   $R^2_{x_j | x_{-j}}$ ⟹ R^2 from regression of x_j onto all
   other x_j's ⟹ $R^2 \sim 1$