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Question

How do regression diagnostics fit into analysis?

Steps in Regression

- For any model
  1. Run regression
  2. Check for departures from CLR assumptions
  3. Attempt to fix those problems
- Additionally, compare between models based on purpose, fit, and diagnostics

OLS assumptions

1. Linearity $y = X\beta + \varepsilon$
2. Iid sample y_i, x_i') iid sample
3. No perfect collinearity X has full rank
4. Zero conditional mean $E(\varepsilon|X) =$)
5. Homoskedasticity $Var(\varepsilon|X) = \sigma^2 I_N$
6. Normality $\varepsilon|X \sim N(0, \sigma^2 I_N)$

- 1-4: unbiased and consistent β
- 1-5: asymptotic inference, BLUE
- 1-6: small sample inference

OLS Problems

1. Perfect collinearity: Cannot estimate OLS
2. Non-linearity: Biased β
3. Omitted variable bias: Biased β.
4. Correlated errors: Wrong SEs
5. Heteroskedasticity: Wrong SEs
6. Non-normality: Wrong SEs - p-values.
7. Outliers: Depends on where they come from