

POLS/CS&SS 503:  
Advanced Quantitative Political Methodology

# RESIDUALS IN OLS: NON-NORMALITY, HETEROSKEDASTICITY

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# Overview



# Non-normal errors

Suppose that errors  $\epsilon$  have  $E(\epsilon) = 0$ , but not normal distribution

- $\mathbf{b}$  still unbiased
- $V(\mathbf{b})$  incorrect in small samples
- Still BLUE, but not MVUE

# How to diagnose non-normal errors?

## Graphical methods

- Plot studentized residuals against theoretical  $t$ -quantiles.
  - Studentized residuals (approximately standardized to have std dev of 1)

$$E_i^* \approx \frac{E_i}{S_E}$$

- Density plot
- Box-plot

# SLID

- Example in Fox
- Survey of Labour Income and Dynamics (Canada)
- 3,997 employed individuals between 16–65 residing in Ontario