Section for Applied Statistics and Data Analysis

TA: Cong Mu

Office Hour: Wednesday 10:00AM - 12:00PM

November 1, 2019

Overview

1. Some Statistics
   - Checking the Structure of the Model
   - Review Q-Q Plot
2. Some Programming
   - Examples in Faraway

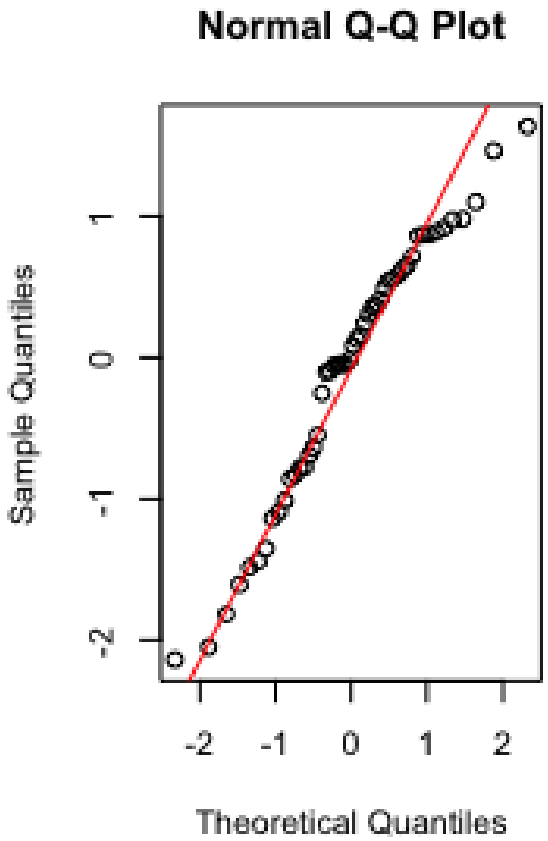
Diagnostics - Overview

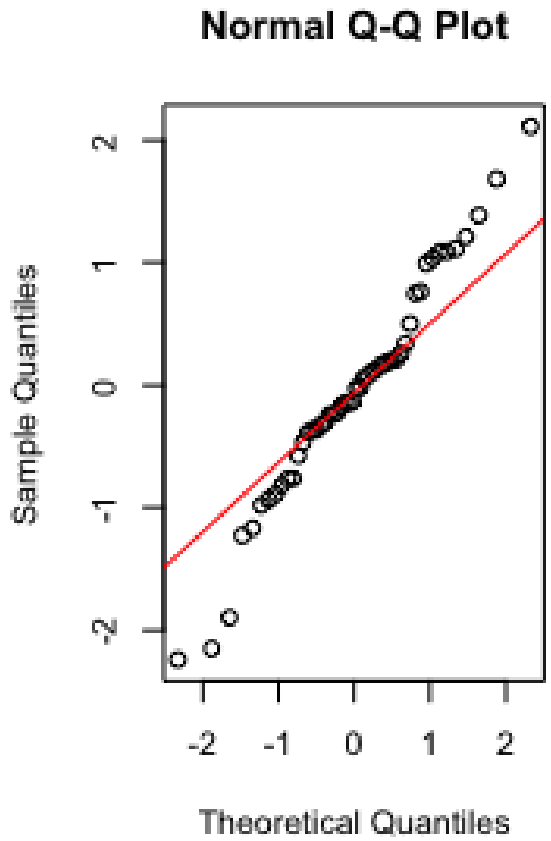
- Recall
$$\epsilon \sim \mathcal{N}\left(0, \sigma^2 \mathrm{I}\right).$$
- Checking Error Assumptions
  - Constant Variance
  - Normality
  - Correlated Errors
- Finding Unusual Observations
  - Leverage
  - Outliers
  - Influential Observations
- Checking the Structure of the Model

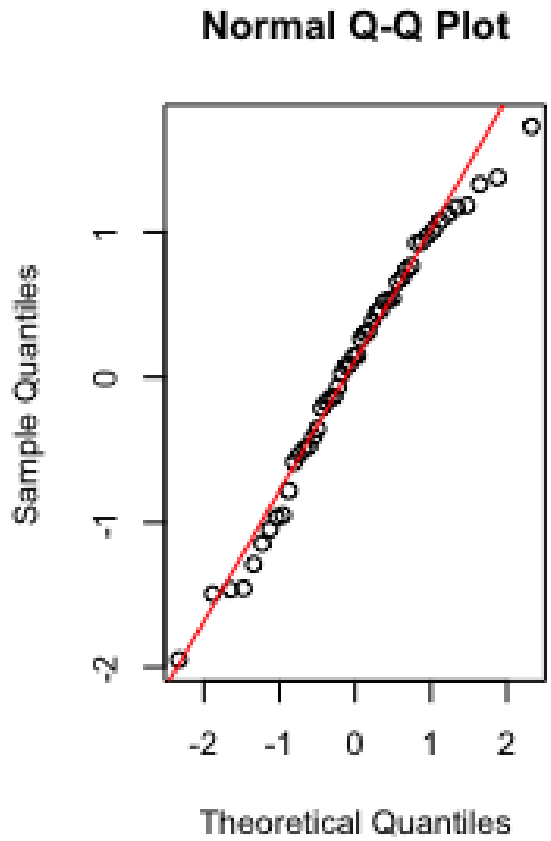
Checking the Structure of the Model

- **Partial regression or added variable plots**
  - Regress y on all x except x_i and get residuals $\widehat{\delta}$
  - Regress x_i on all x except x_i and get residuals $\widehat{\gamma}$
  - Plot $\widehat{\delta}$ against $\widehat{\gamma}$
- **Partial residual plots** (`termplot` in R)
  - Plot $x_i \widehat{\beta}_i + \widehat{\epsilon}$ against x_i

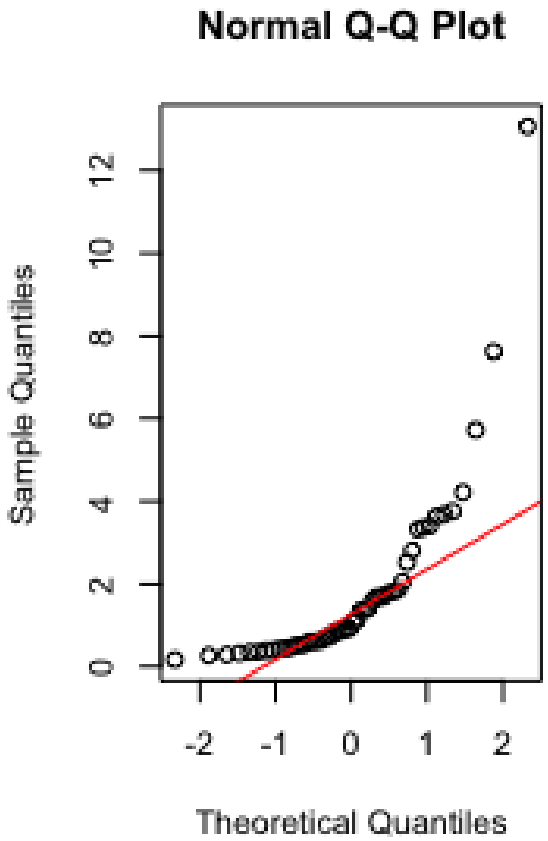
Example - Normal

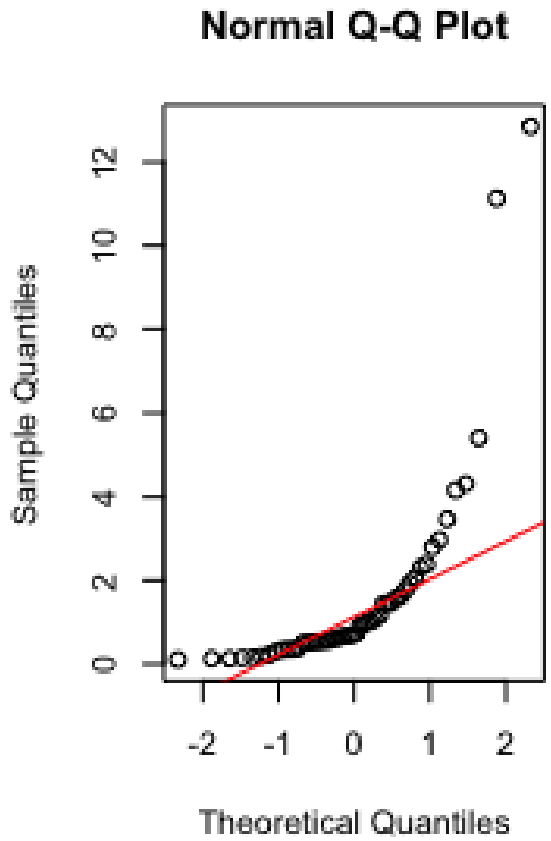


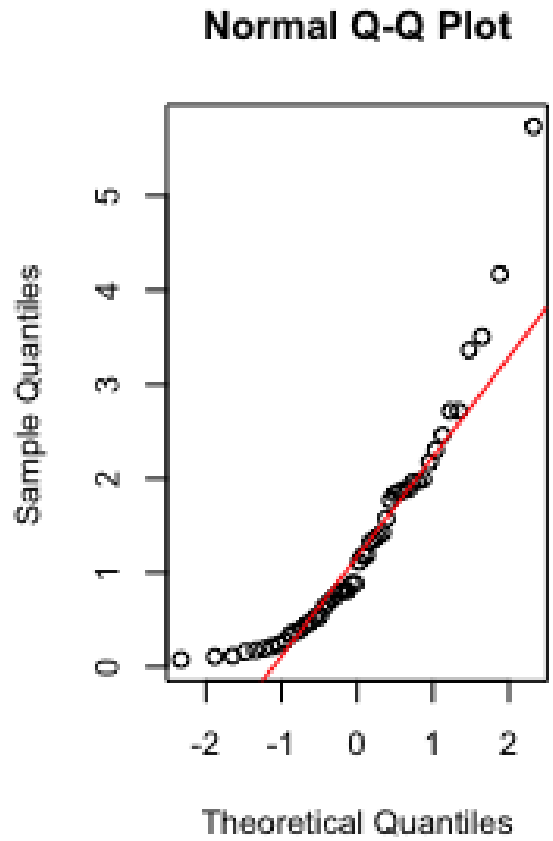




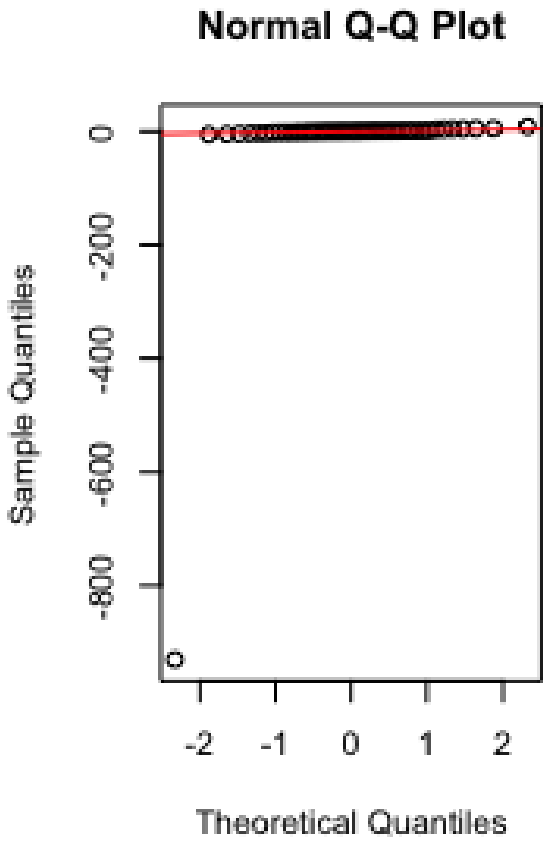
Example - Lognormal (a skewed distribution)

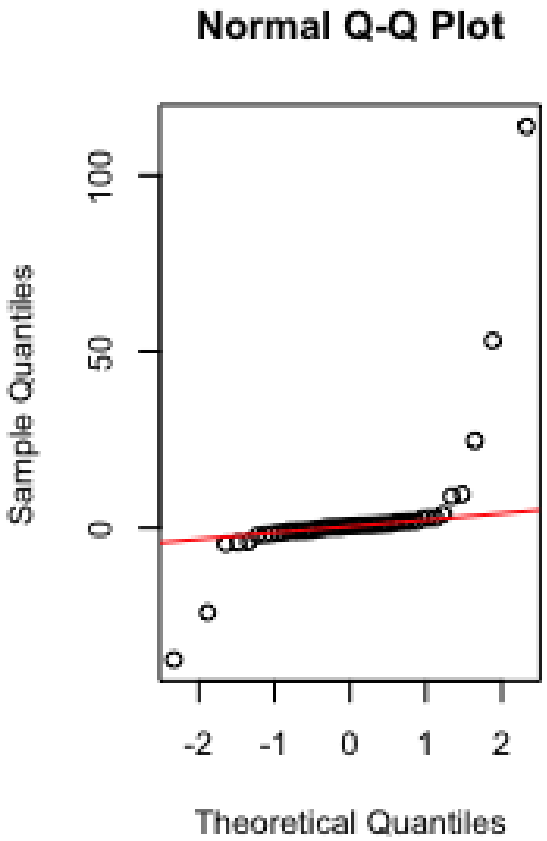


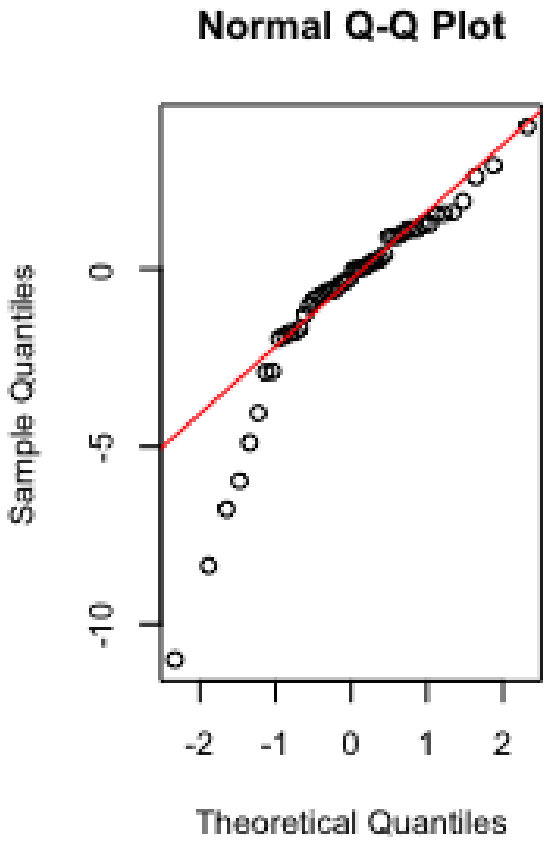




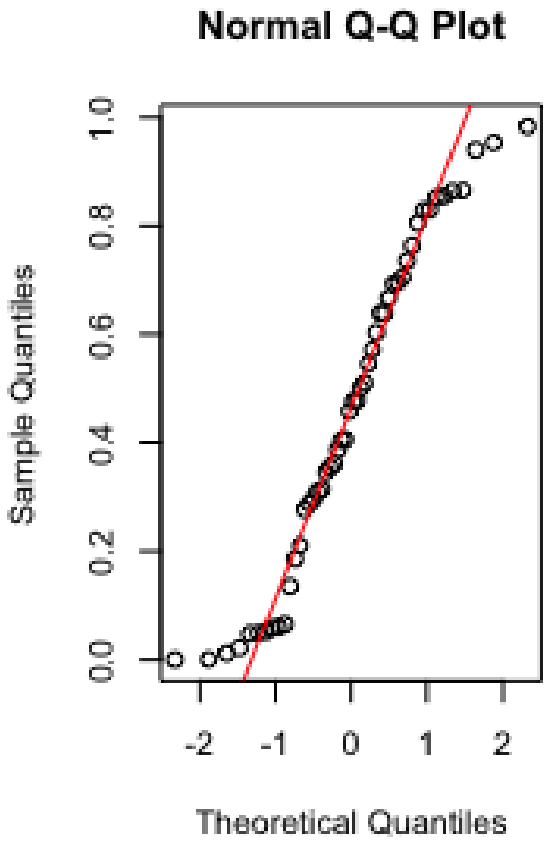
Example - Cauchy (a long-tailed distribution)

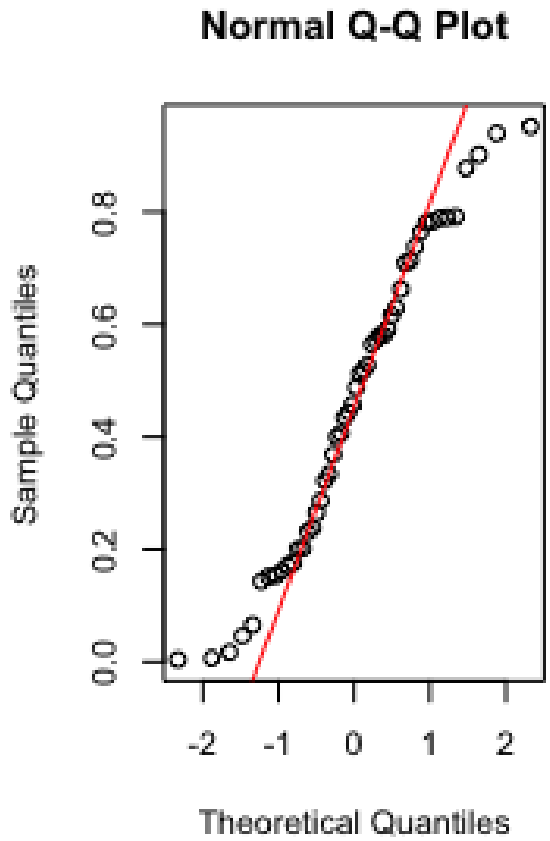


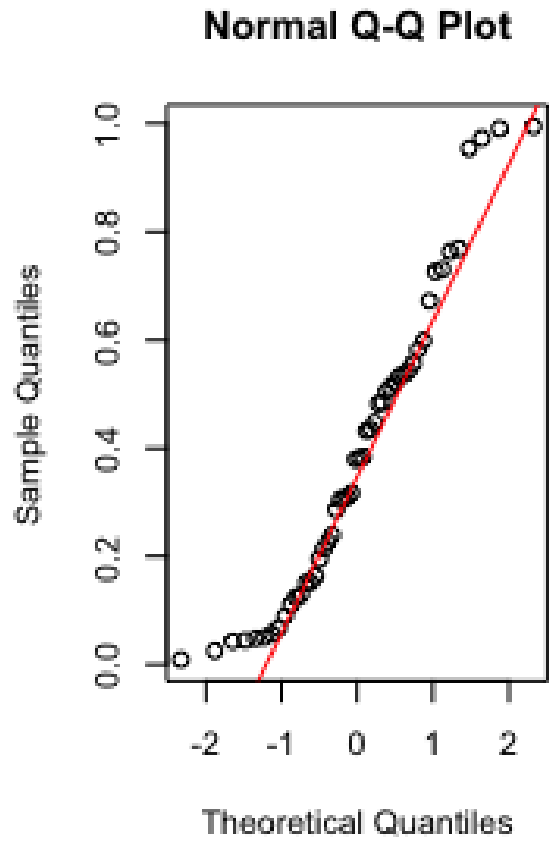




Example - Uniform (a short-tailed distribution)







Examples in Faraway Chapter 6

- **Example:** `savings` dataset

Thanks for listening!