

Normal Distribution

Andrey Chinnov, Sebastian Honermann, Carlos Zydorek

Case Studies
"Data Analytics"

Outline

① Introduction

- ▶ Normality as a requirement for statistical methods
- ▶ Data Set Overview

② Normality Testing

- ▶ Graphical Methods for Normality Testing
 - ★ Q-Q-Plots
 - ★ Chi-Square Plot
- ▶ Quantitative Methods for Normality Testing
 - ★ Shapiro-Wilk Test
 - ★ Pearson's Chi-Squared Test
 - ★ Kolmogorov-Smirnov Test

③ Transformation to Normality

- ▶ Box-Cox Transformation
- ▶ Transformation Results Testing

④ Summary

Normality as a requirement for statistical methods

Data Set Overview

Outline

① Introduction

- ▶ Normality as a requirement for statistical methods
- ▶ Data Set Overview

② Normality Testing

- ▶ Graphical Methods for Normality Testing
 - ★ Q-Q-Plots
 - ★ Chi-Square Plot
- ▶ Quantitative Methods for Normality Testing
 - ★ Shapiro-Wilk Test
 - ★ Pearson's Chi-Squared Test
 - ★ Kolmogorov-Smirnov Test

③ Transformation to Normality

- ▶ Box-Cox Transformation
- ▶ Transformation Results Testing

④ Summary

Graphical Methods for Normality Testing

Q-Q-Plots

Graphical Methods for Normality Testing

Chi-Square Plot

Quantitative Methods for Normality Testing

Shapiro-Wilk Test

Quantitative Methods for Normality Testing

Pearson's Chi-Squared Test

Quantitative Methods for Normality Testing

Kolmogorov-Smirnov Test

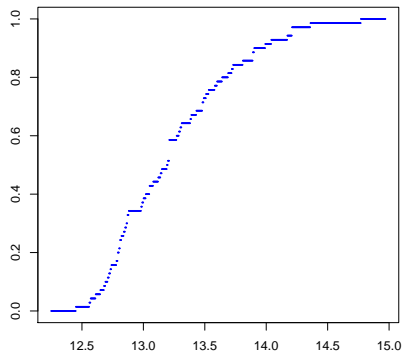
Let $x = (x_1, x_2, \dots, x_n)$ be a sample of a given size n .

Definition

$F_n = \frac{1}{n} \sum_{i=1}^n \mathbb{1}_{\{x_i \leq x\}}$ - empirical

c. d. f. , where $\forall x \in \mathbb{R}$

$$\mathbb{1}_{\{x_i \leq x\}}(x) = \begin{cases} 1 & \text{if } x_i \leq x \\ 0 & \text{otherwise.} \end{cases}$$



Glass Type 1, Natrium (Na)

Outline

① Introduction

- ▶ Normality as a requirement for statistical methods
- ▶ Data Set Overview

② Normality Testing

- ▶ Graphical Methods for Normality Testing
 - ★ Q-Q-Plots
 - ★ Chi-Square Plot
- ▶ Quantitative Methods for Normality Testing
 - ★ Shapiro-Wilk Test
 - ★ Pearson's Chi-Squared Test
 - ★ Kolmogorov-Smirnov Test

③ Transformation to Normality

- ▶ Box-Cox Transformation
- ▶ Transformation Results Testing

④ Summary

Box-Cox Transformation

Transformation Results Testing

Outline

① Introduction

- ▶ Normality as a requirement for statistical methods
- ▶ Data Set Overview

② Normality Testing

- ▶ Graphical Methods for Normality Testing
 - ★ Q-Q-Plots
 - ★ Chi-Square Plot
- ▶ Quantitative Methods for Normality Testing
 - ★ Shapiro-Wilk Test
 - ★ Pearson's Chi-Squared Test
 - ★ Kolmogorov-Smirnov Test

③ Transformation to Normality

- ▶ Box-Cox Transformation
- ▶ Transformation Results Testing

④ Summary

Summary