# Simple Linear Regression

## Model conditions


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# Topics

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- List the conditions for simple linear regression

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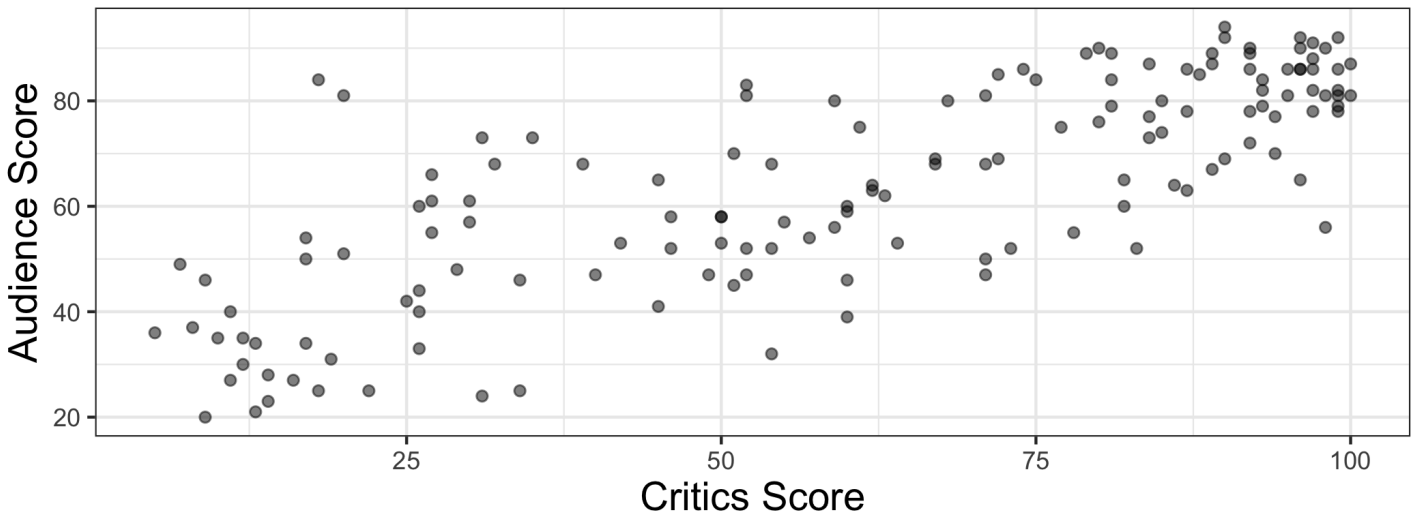
- Use plots of the residuals to assess the conditions

# Movie ratings data

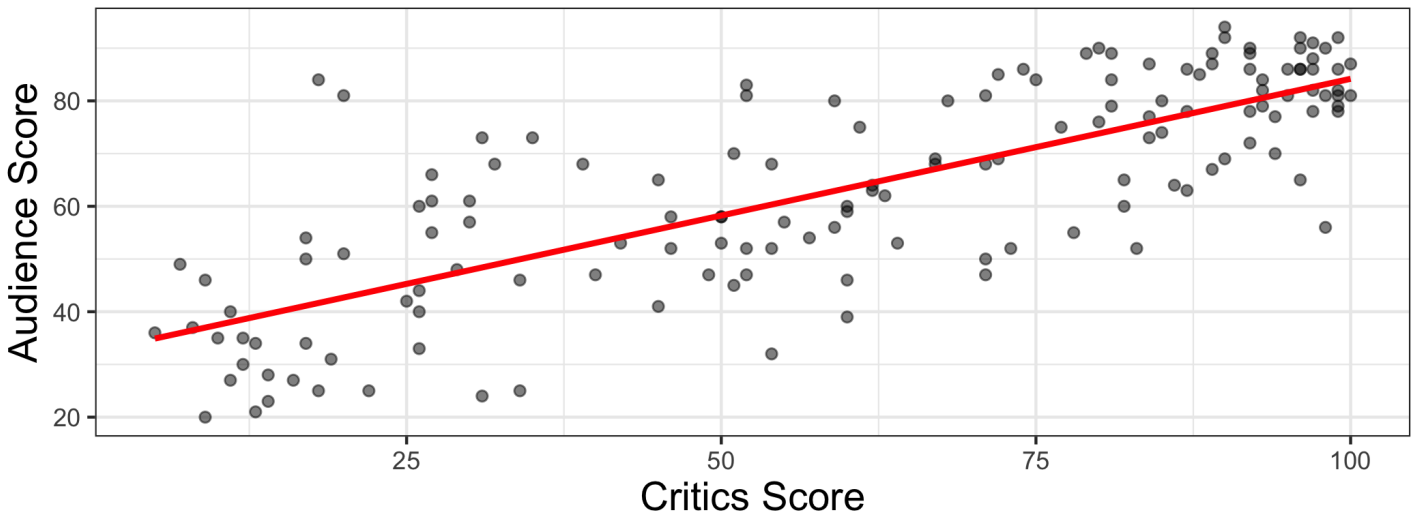
The data set contains the "Tomatometer" score (**`critics`**) and audience score (**`audience`**) for 146 movies rated on rottentomatoes.com.



# The model

$$\hat{\text{audience}} = 32.316 + 0.519 \times \text{critics}$$

| term | estimate | std.error | statistic | p.value |
|---|---|---|---|---|
| (Intercept) | 32.316 | 2.343 | 13.795 | 0 |
| critics | 0.519 | 0.035 | 15.028 | 0 |



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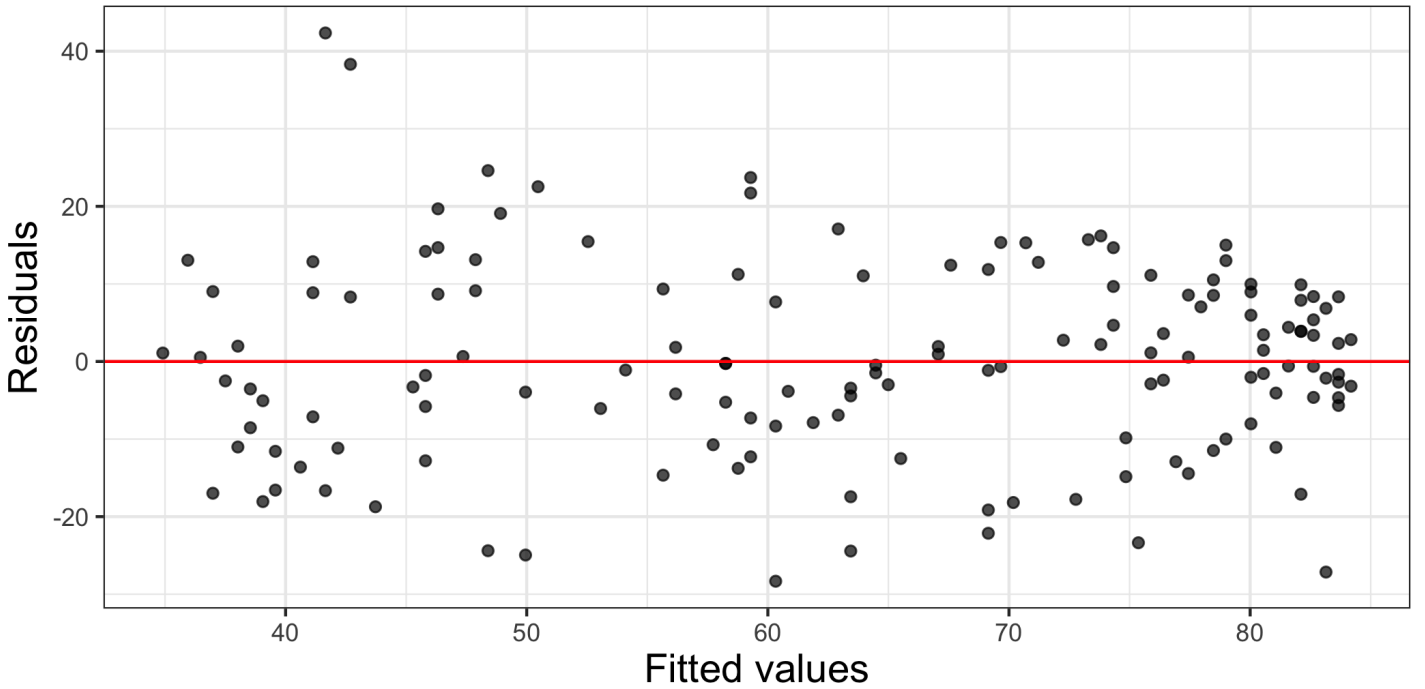
3. **Normality:** The errors follow a normal distribution.

4. **Independence:** The errors are independent from each other.

$$\text{residual} = y - \hat{y}$$

# Residuals vs. fitted values



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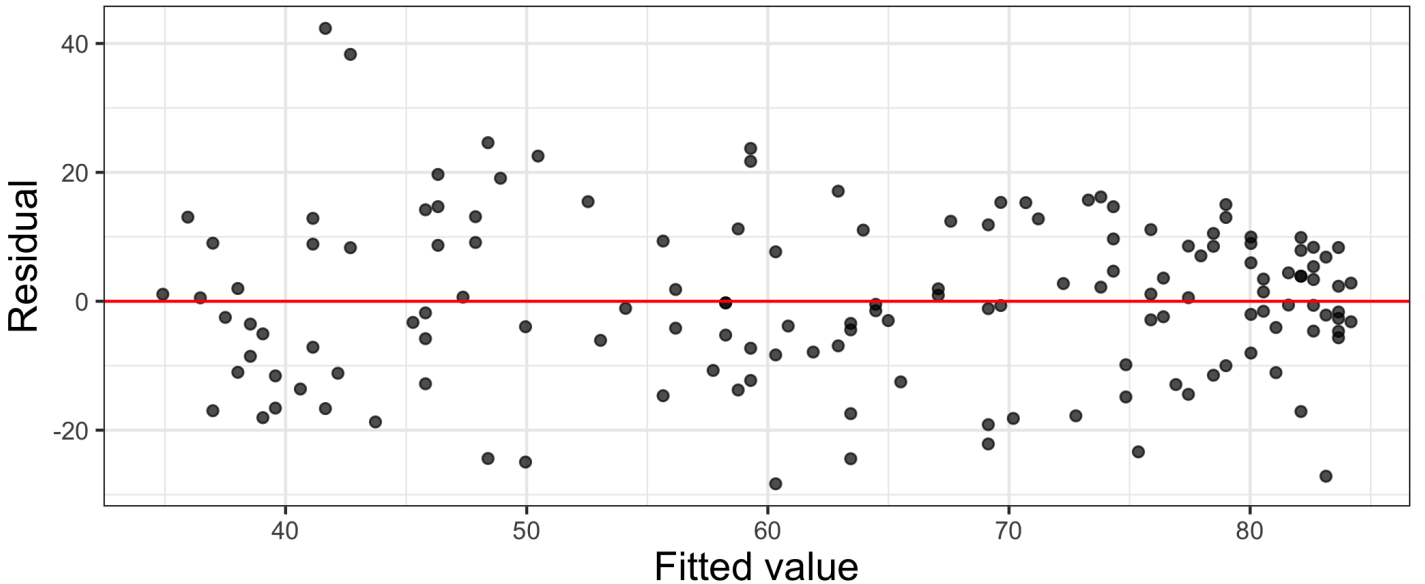

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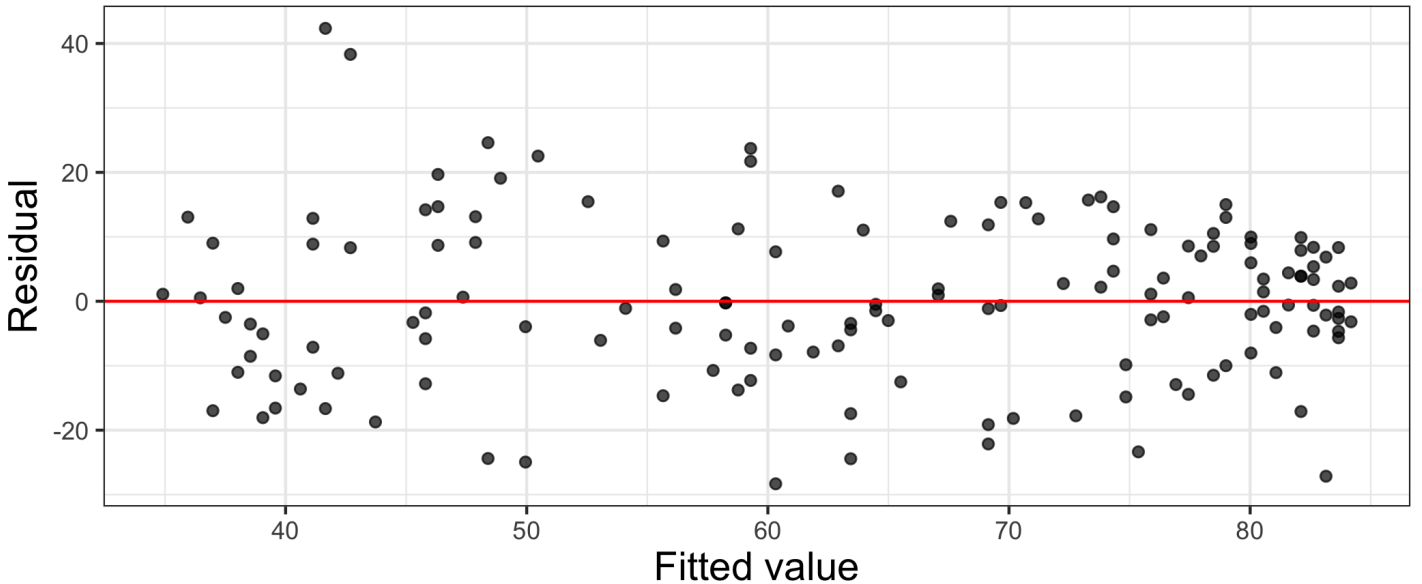


✅ There is no distinguishable pattern or structure. The residuals are randomly scattered.

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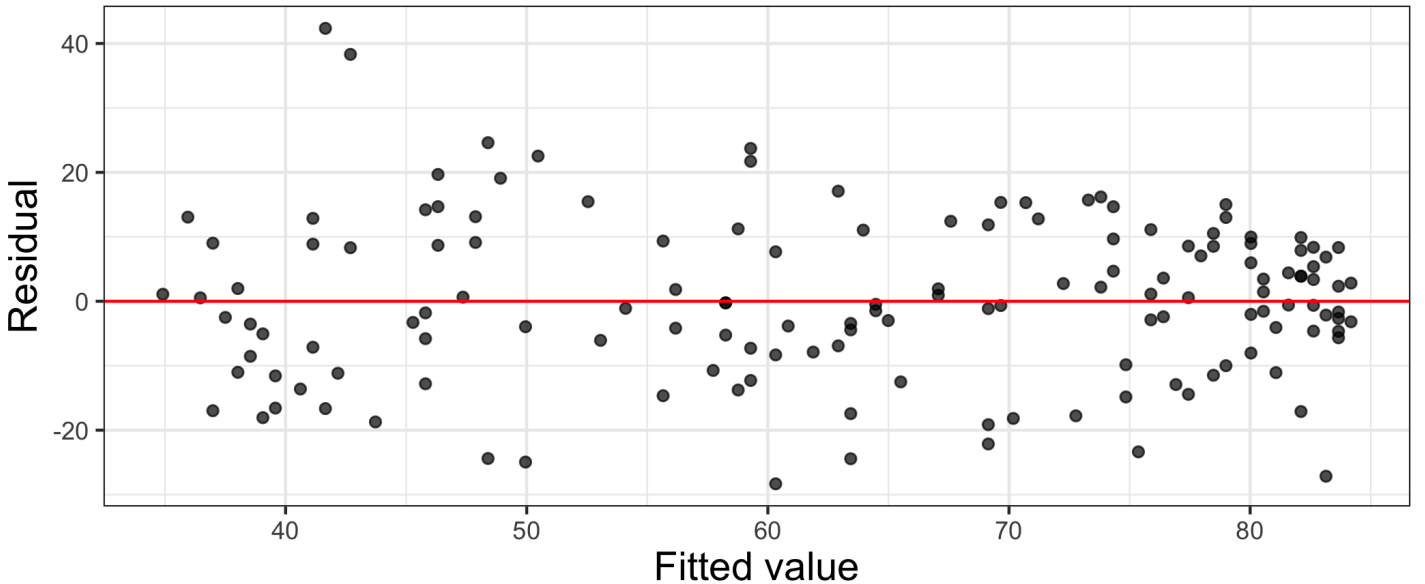

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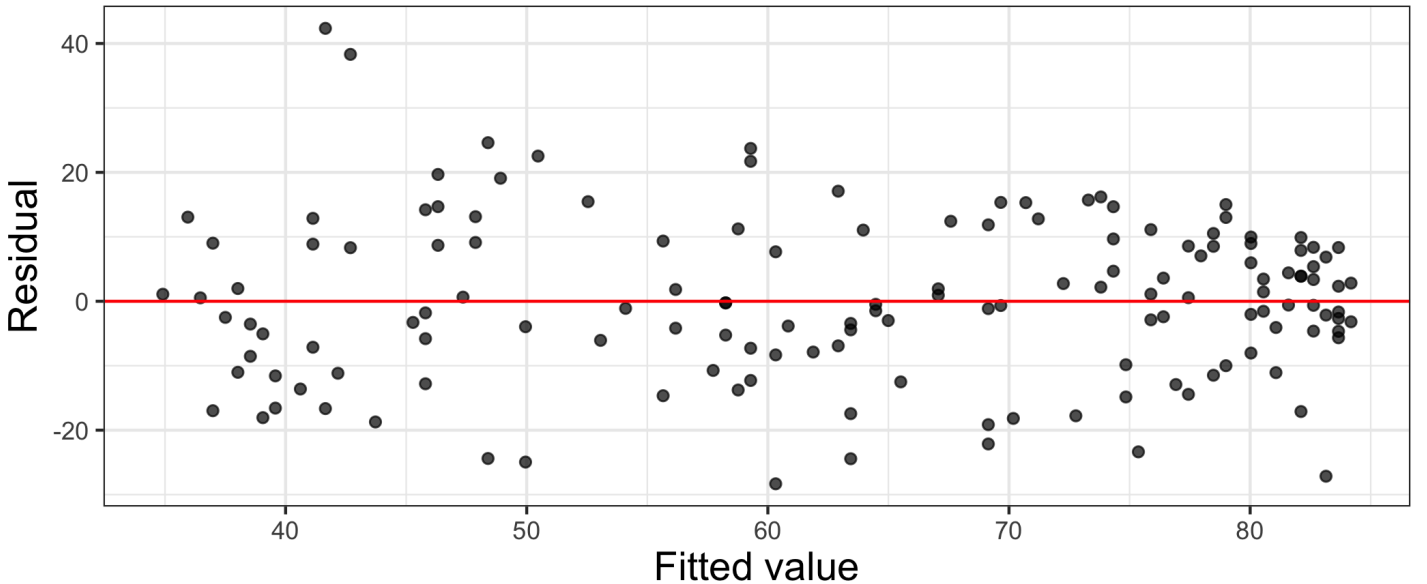
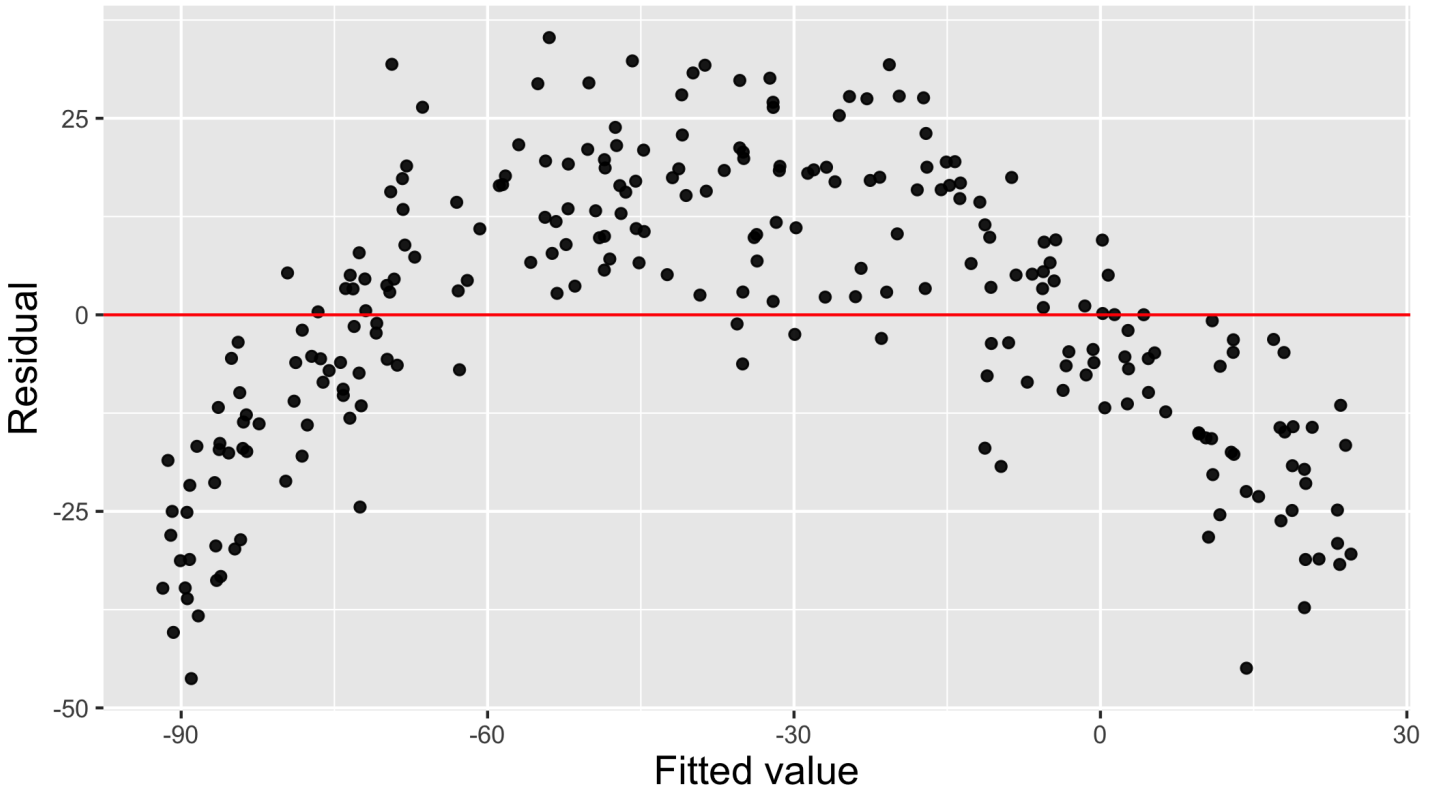
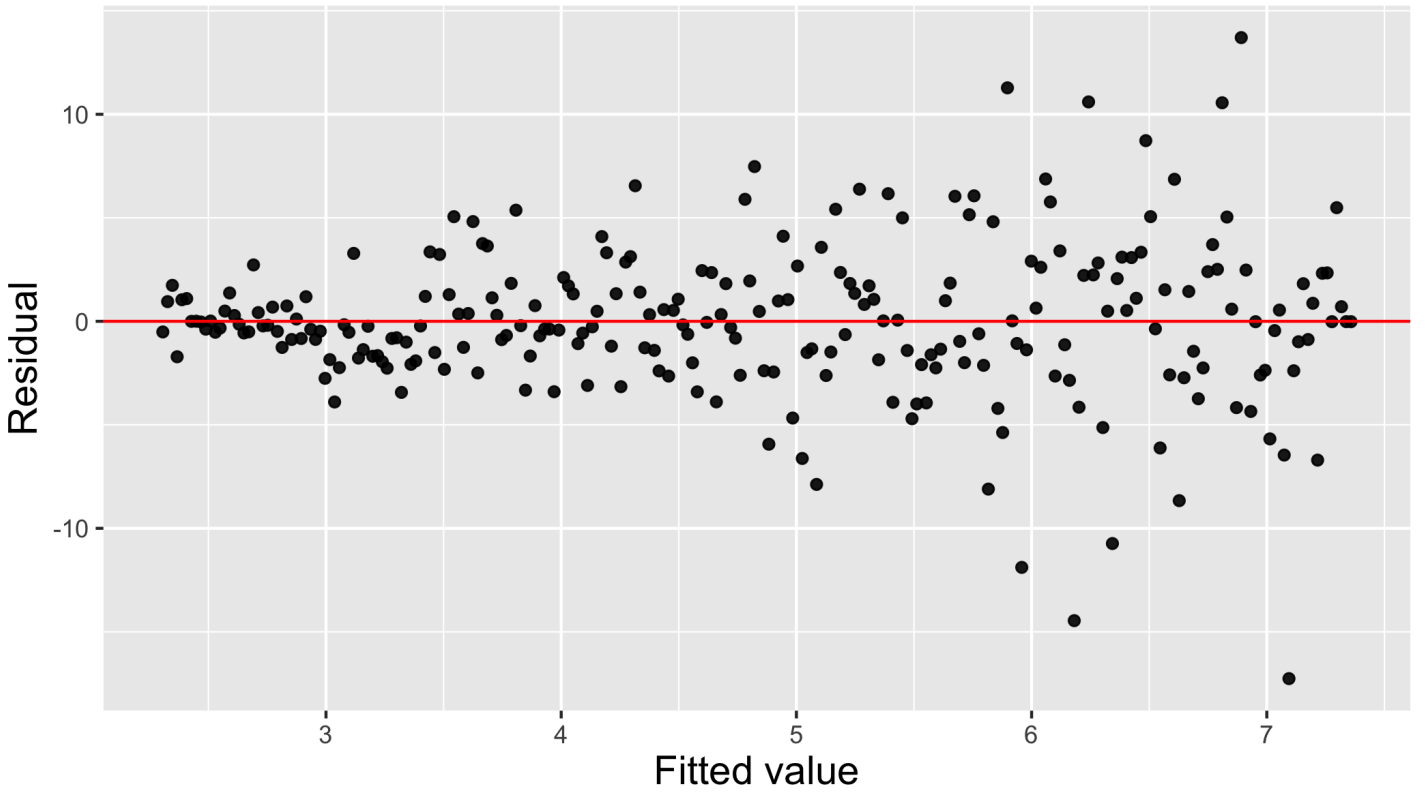



✅ The vertical spread of the residuals is relatively constant across the plot.

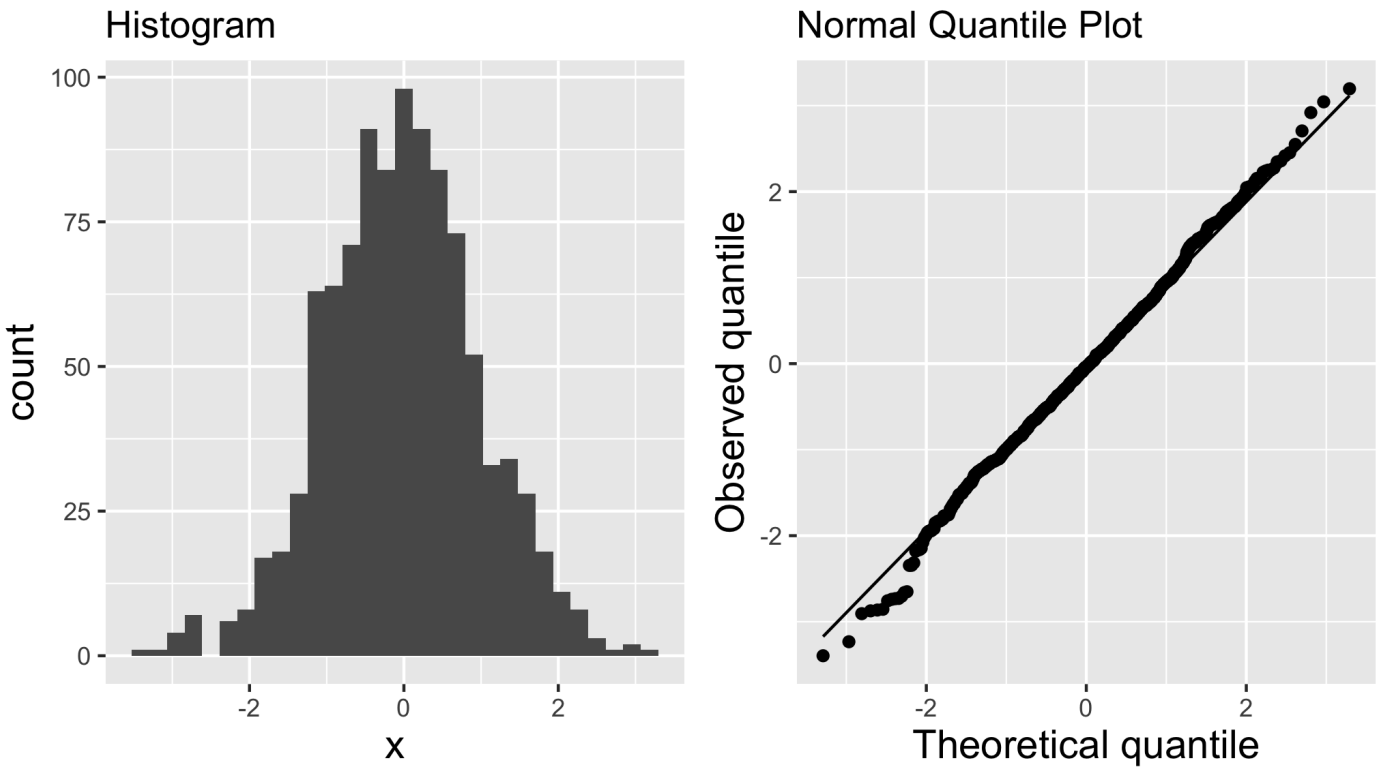
# Violation: distinguishable pattern



# Violation: non-constant variance



# Normal quantile plot



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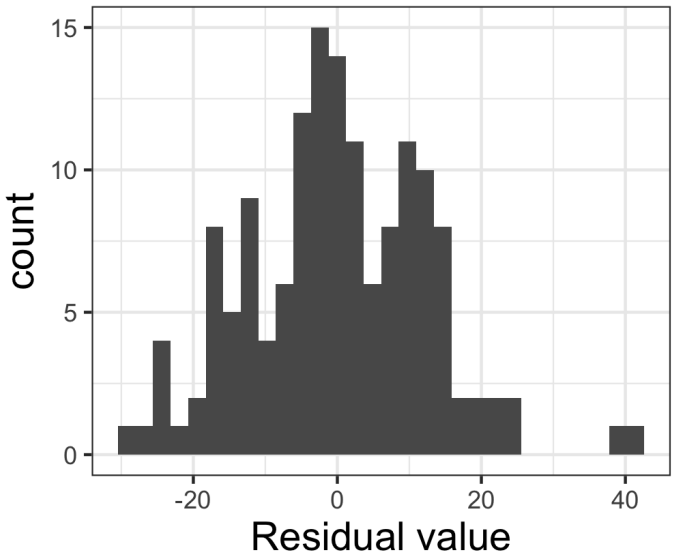


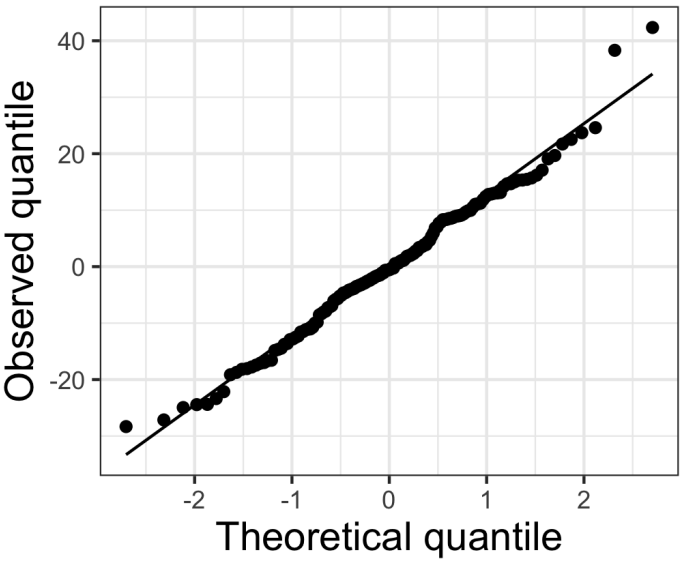

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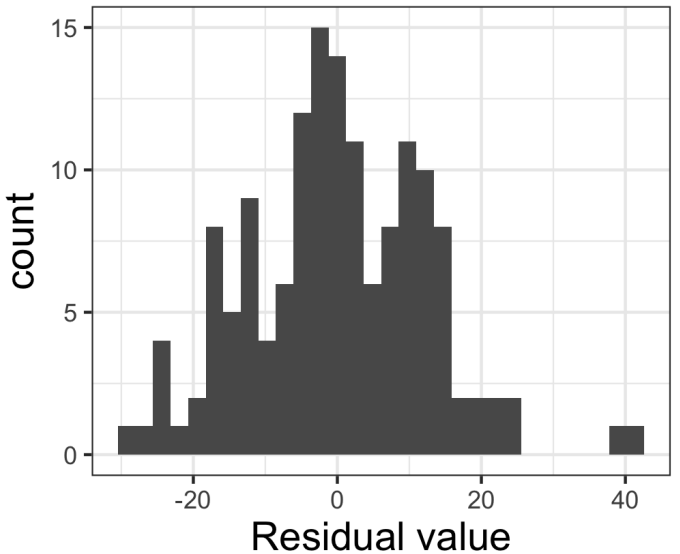


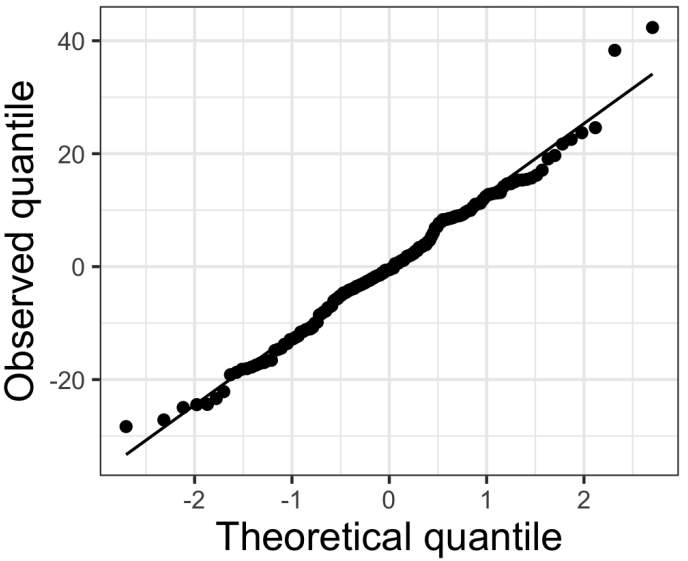


✅ Points follow a straight diagonal line on the normal quantile plot.

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- If the data were collected in a particular order, examine a scatterplot of the residuals versus order in which the data were collected.

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As you assess the model conditions, ask if any observed deviation from the model conditions are so great that

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✅ If not, the conditions are sufficiently met and we can proceed with the current model.

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  - Normality
  - Independence

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- Listed the conditions for simple linear regression:
  - **Linearity**
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- Used plots of the residuals to check the conditions.