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Key Concepts from Statistical Data Analysis

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1 Simple Linear Regression

Simple linear regression refers to the fitting of a straight line (with a slope and intercept) that partially determines a random variable Y from a deterministic variable X. `stuff`

1.1 Mathematics

1.1.1 Estimation

The formulas for the least squares estimates of the slope (β_1) and intercept (β_0) for the regression of a response/dependent/observed variable Y on a predictor/independent/controlled variable X may be derived using calculus taking partial derivatives, no knowledge of the distribution of the response Y (or equivalently the error term ϵ) is necessary. As such, you may always fit a least squares line to any given data.

- $Y = \beta_0 + \beta_1 x + \epsilon$ - model equation

- $\hat{\beta_1} = \dfrac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sum(x_i - \bar{x})^2} = \dfrac{\sum x_i y_i - \frac{\sum x_i \, \sum y_i}{n}}{\sum x_i^2 - \frac{(\sum x_i)^2}{n}}$ - Least Squares Estimate of the Slope

- $\hat{\beta_0} = \bar{y} - \hat{\beta_1}\bar{x}$ - Least Squares Estimate of the Intercept

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