M358K: December 4th, 2023.

Simple Linear Regression.

Def'n.

$$Y = \beta_0 + \beta_1 x + \varepsilon$$

is called the simple linear regression model (SLR)

w/ β_0 ... the intercept parameter

β_1 ... the slope parameter

ε ... the error such that

$\varepsilon \sim \text{Normal}(\text{mean}=0, \text{var}=\sigma^2)$ for every x

Note: We have three parameters: β_0, β_1, σ

Goal: Design a recipe to estimate the parameters β_0 and β_1 using a data set:

$$(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$$

$$\hat{\beta}_1 = \rho_{x,y} \cdot \frac{s_y}{s_x}$$

Since $(\bar{x}, \bar{y})$ is always on the least-squares line,

$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \cdot \bar{x}$$