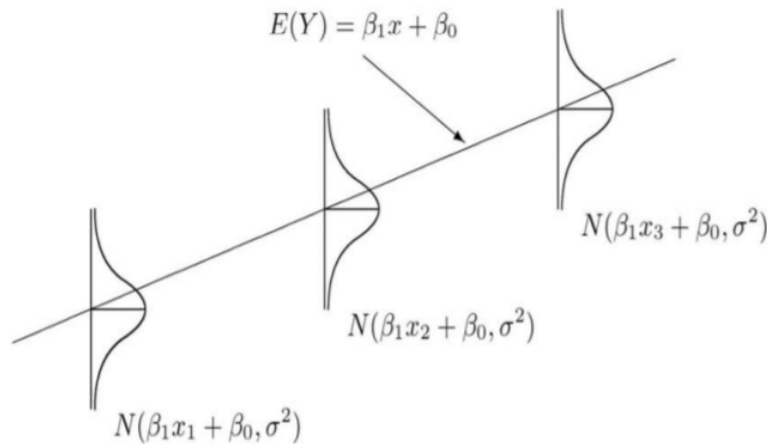


### 3.3.5: Estimating $\sigma$ , the standard error of the residuals



The simple linear regression model ( $Y = \beta_0 + \beta_1 X + \varepsilon$ ) includes a random variable  $\varepsilon$  representing the residual which follows a Normal Distribution with an expected value of 0 and a standard deviation  $\sigma$  which is independent of the value of  $X$ . The estimate of  $\sigma$  is called the sample standard error of the residuals and is represented by the symbol  $s_e$ . We can use the fact that the Mean Square Error (MSE) from the ANOVA table represents the estimated variance of the residuals errors:

$$S_e = \sqrt{\text{MSE}} = \sqrt{\frac{\text{SSE}}{n-2}}$$

#### ✓ Example: Rainfall and sales of sunglasses

For the rainfall data, the standard error of the residuals is determined as:

$$s_e = \sqrt{12.859} = 3.586$$

Keep in mind that this is the standard deviation of the residual errors and should not be confused with the standard deviation of  $Y$ .

3.3.5: Estimating  $\sigma$ , the standard error of the residuals is shared under a CC BY-SA license and was authored, remixed, and/or curated by LibreTexts.

- 14.5: Estimating  $\sigma$ , the standard error of the residuals by Maurice A. Geraghty is licensed CC BY-SA 4.0. Original source: <http://nebula2.deanza.edu/~mo/holisticInference.html>.