⑥

<u>Notation</u>

$$SSQR = e_1^2 + e_2^2 + .. + e_{10}^2$$

$$= \sum_{i=1}^{10} e_i^2$$

<u>Summation</u>

$$x_1 + x_2 + x_3 = \sum_{i=1}^{3} x_i$$

$$x_1 + x_2 + \ldots + x_N = \sum_{i=1}^{N} x_i$$

$$\hat{y}_i = E(y_i) = b_0 + b_1 x_i$$

$$= \sum_{i=1}^{10} e_i^2 = \sum_{i=1}^{10} [y_i - E(y_i)]^2$$

$$= \sum_{i=1}^{10} [y_i - b_0 - b_1 x_i]^2$$

Least Squares Criterion: SSQR is <u>minimal</u>:

- Finding minimum of SSQR is done by derivative with respect to unknown parameters b_0 and b_1

- $$\frac{\partial SSQR}{\partial b_0} = (-1)2 \sum_{i=1}^{10} [y_i - b_0 - b_1 x_i]$$

$$= -2 \sum_{i=1}^{10} [y_i - b_0 - b_1 x_i]$$

$$= -2 \left[\sum_{i=1}^{10} y_i - \underbrace{\boxed{\sum_{i=1}^{10} b_0}}_{10 \cdot b_0} - \sum_{i=1}^{10} b_1 x_i \right]$$

$$= -2 \left[\sum_{i=1}^{N=10} y_i - N b_0 - \sum_{i=1}^{N=10} b_1 x_i \right]$$