Minimize L : Use $y_i = b_0 + b_1 x_i + e_i$

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

$$\frac{\partial L}{\partial b_0} = \sum_{i=1}^{N} 2 \cdot \left[y_i - b_0 - b_1 x_i \right] \cdot (1)$$

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

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

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

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

Determine b_0 and b_1 where $\frac{\partial L}{\partial b_0} = 0$ and $\frac{\partial L}{\partial b_1} = 0$

$$\frac{\partial L}{\partial b_0} = -2 \left[\overbrace{\cancel{\#}\, y. - N b_0 - b_1 x.}^{=0} \right] = 0$$

$$\frac{\partial L}{\partial b_1} = -2 \left[\overbrace{(xy). - b_0 x. - b_1 (x^2).}^{=0} \right] = 0$$