Multiple Linear Regression

- $SSQR = \sum_{i=1}^{N} e_i^2$; $e_i = y_i - b_0 - b_1 x_{1i} - b_2 x_{2i}$

- Goal: Find estimates $\hat{b_0}, \hat{b_1}, \hat{b_2}$ such that SSQR is minimal $\Rightarrow$ Least Squares

$$\Rightarrow \frac{\partial SSQR}{\partial b_0} ; \frac{\partial SSQR}{\partial b_1} ; \frac{\partial SSQR}{\partial b_2}$$

$$= 0 \qquad = 0 \qquad = 0$$

- Matrix-Vector Notation:

Define three vectors y, e and b

vector $y = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_N \end{bmatrix} = \begin{bmatrix} 471 \\ 463 \\ \vdots \\ 541 \end{bmatrix}$ } Observations of response variable

vector $e = \begin{bmatrix} e_1 \\ e_2 \\ \vdots \\ e_N \end{bmatrix}$; vector $b = \begin{bmatrix} b_0 \\ b_1 \\ b_2 \end{bmatrix}$ → intercept, → slope in x_1, → slope in x_2