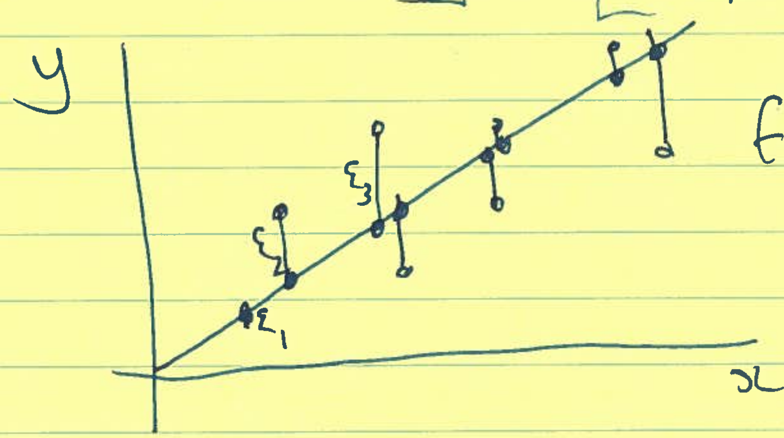
Notes for 8/12/20

* $y_i = \cancel{\beta}\, x_{i0}\beta_0 + x_{i1}\beta_1 + \cdots x_{ip}\beta_p + \varepsilon_i$

$$\underset{\sim}{y} = \begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{pmatrix} \quad X = \begin{bmatrix} x_{10} & \cdots & x_{1p} \\ x_{20} & \cdots & x_{2p} \\ \vdots & & \\ x_{n0} & \cdots & x_{np} \end{bmatrix} \quad \underset{\sim}{\beta} = \begin{pmatrix} \beta_0 \\ \vdots \\ \beta_p \end{pmatrix}$$

* $\underset{\sim}{y} = X\underset{\sim}{\beta} + \underset{\sim}{\varepsilon}$ $\qquad \underset{\sim}{\varepsilon} = \begin{pmatrix} \varepsilon_1 \\ \vdots \\ \varepsilon_n \end{pmatrix}$

$$\begin{bmatrix} x_{10} & \cdots & x_{1p} \\ x_{20} & \cdots & x_{2p} \\ \vdots & & \vdots \\ x_{n0} & \cdots & x_{np} \end{bmatrix} \begin{bmatrix} \beta_0 \\ \vdots \\ \beta_p \end{bmatrix} = \begin{bmatrix} x_{10}\beta_0 + \cdots x_{1p}\beta_p \\ \vdots \\ x_{n0}\beta_0 + \cdots + x_{np}\beta_p \end{bmatrix}$$



fitted values

$\therefore (X^T X)\hat{\beta} = X^T y$

If $X^T X$ is invertible:

$$\underline{\underline{\hat{\beta} = (X^T X)^{-1} X^T y}}$$