1.2 Data in Matrix Form

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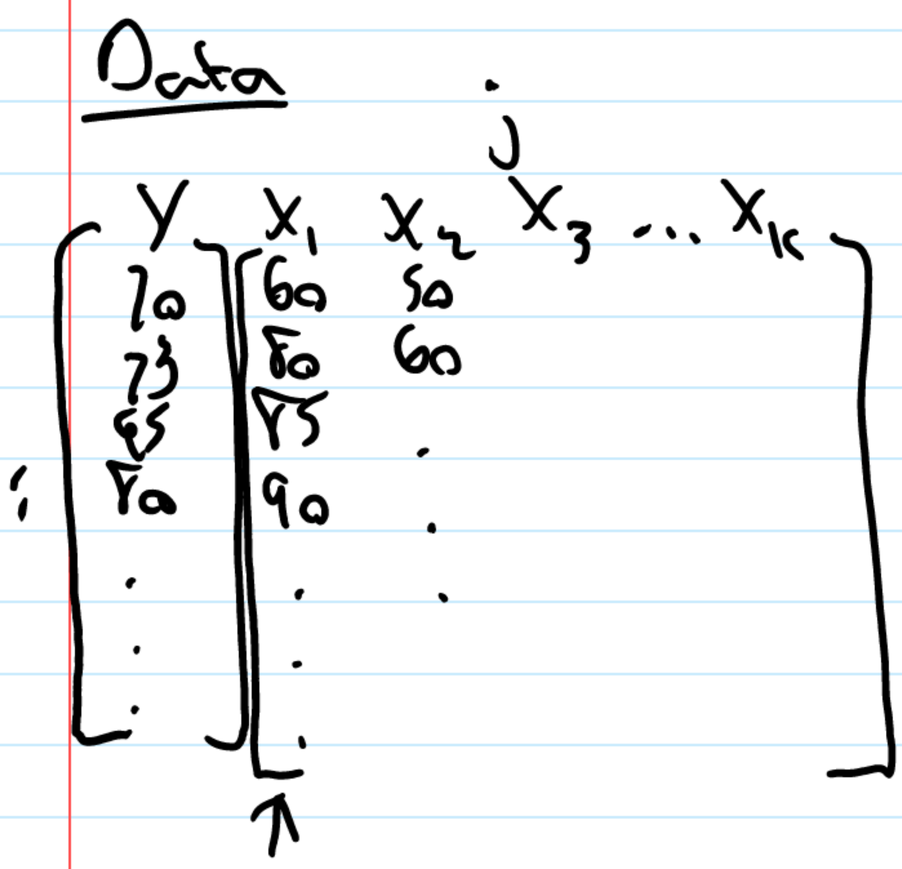

$X_0 = 1$ For all

Y X

$E(Y_i|X_i) = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \dots$

$Y_i = E(Y_i|X_i) + \varepsilon_i$

Predictable

$E(Y|X) = X\beta$

↳ vector of unknowns

↳ x matrix

$Y = X\beta + \varepsilon$

↳ residual matrix

$$\begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_n \end{bmatrix} = \begin{bmatrix} 1 & X_{11} & X_{12} & \dots \\ 1 & X_{21} & \cdot & \\ 1 & \cdot & \cdot & \\ 1 & \cdot & \cdot & \\ 1 & X_{n1} & \cdot & \end{bmatrix} \begin{bmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \\ \vdots \\ \beta_k \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_n \end{bmatrix}$$

$i \in 1, 2, \dots n$

$Y = X\beta + \varepsilon$

$Y_1 = 1 \cdot \beta_0 + X_{11}\beta_1 + X_{12}\beta_2 + \dots X_{1k}\beta_k + \varepsilon_1$

$\dots Y_n = \dots + \varepsilon_n$