The Bivariate Model

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Regression

These slides aim to describe the elements of OLS regression - they attempt to connect the data structure to the matrix algebra that underlies the estimation of the coefficients.

Regression in any form is based on the conditional expectation of y - the expected value of \$Yy is conditional on some Xs, but we don't know the actual conditions or effects of those Xs. So we can write the regression like this:

$$E[y|X_1, ..., X_k] = \beta_0 + \beta_1 X_1 + ... + \beta_k X_k$$

Estimating equation

Let y be a linear function of the Xs and the unknowns, β, so the following produces a straight line:

$$y_i = \beta_0 + \beta_1 X_1 + \epsilon$$

and ϵ are the errors or disturbances.

Linear predictions

The predicted points that form the line are $\widehat{y_i}$

$$\widehat{y_i} = \widehat{\beta_0} + \widehat{\beta_1} X_{1,i}$$

$\widehat{y_i}$ is the sum of the βs multiplied by each value of the appropriate X_i, for $i = 1 ... N$.

$\widehat{y_i}$ is referred to as the "linear prediction" or as $x\hat{\beta}$.