Interpret the LS coefficients

- $\hat{\beta}_j$ measures the average change of Y per unit change of X_j, with all other predictors held fixed.
- Seemingly contradictory results from SLR and MLR: SLR suggests that "age" has a significant negative effect on housing price, while MLR suggests the opposite.

Partial Regression Coefficients

Consider a multiple linear regression model

$$Y = \beta_0 + \beta_1 X_1 + \cdots + \beta_k X_k + \cdots + \beta_p X_p + \text{err}.$$

The LS estimate $\hat{\beta}_k$ describes the partial correlation between Y and X_k **adjusted for the other predictors**.

The LS estimate $\hat{\beta}_k$ can be obtained as follows (see Algorithm 3.1 from ESL):

1. Y^*: residual from regressing Y onto all other predictors except X_k
2. X_k^*: residual from regressing X_k onto all other predictors except X_k
3. Regress Y^* onto X_k^*