

# Damages Update

## Simple vs. Multiple Variable Regression

- Simple regression involves one Y (dependent variable) and one X (independent variable)
  - $Y_i = \beta_0 + \beta_1 X_i + u_i, i = 1, \dots, n$
- Multiple regression involves more than one X (i.e., multiple independent variables)
  - $Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + u_i, i = 1, \dots, n$
  - $Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + u_i, i = 1, \dots, n$
  - *Etc.*

## Regression Analyses Of Interest

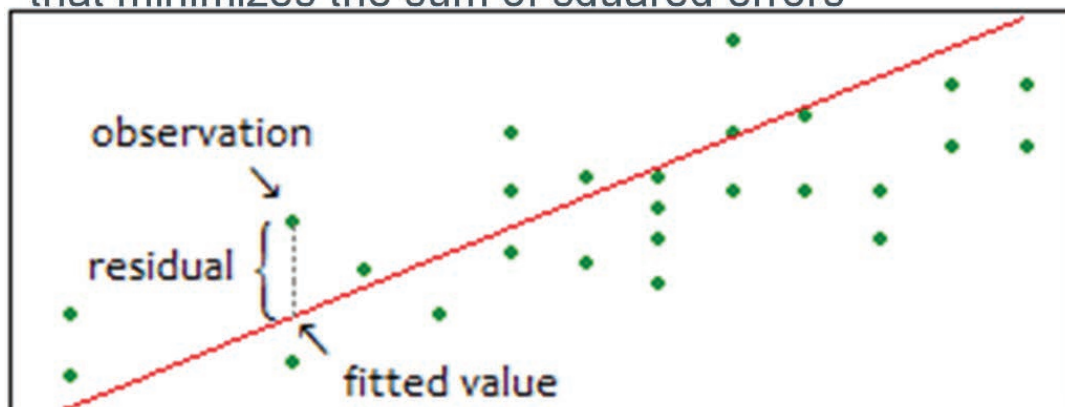
- Simple vs. multiple variable models
- Hedonic pricing model
- Structural break test



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## Ordinary Least Squares (“OLS”)

- Consider simple linear regression:  
$$Y_i = \beta_0 + \beta_1 X_i + u_i, i = 1, \dots, n$$
- OLS involves us putting the regression line in the place that minimizes the sum of squared errors



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# Ordinary Least Squares (“OLS”)

In Math-Speak....

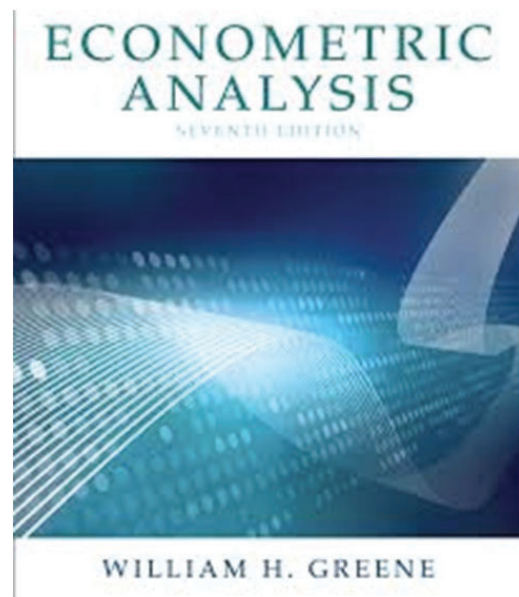
When we use OLS to estimate the unknown parameters  $\beta_0$  and  $\beta_1$ , we are picking  $b_0$  and  $b_1$  such that they solve the following calculus problem:

$$\min_{b_0, b_1} \sum_{i=1}^n [Y_i - (b_0 + b_1 X_i)]^2$$

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## Why Use Regression?

- Per the classic text by NYU’s William Greene:
  - Explore relationships among variables
  - Way to get yes-or-no answer to the question: Is there a significant relationship here?
  - Making predictions



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"Damages Update"