

IMG CREDIT: [ALEX RIEGERT-WATERS](#)

## 1.2

NONE

## HW 3

DR. MARIO

*IMG CREDIT: [ALEX RIEGERT-WATERS](#)*

# Simple Linear Regression Model

- Model:

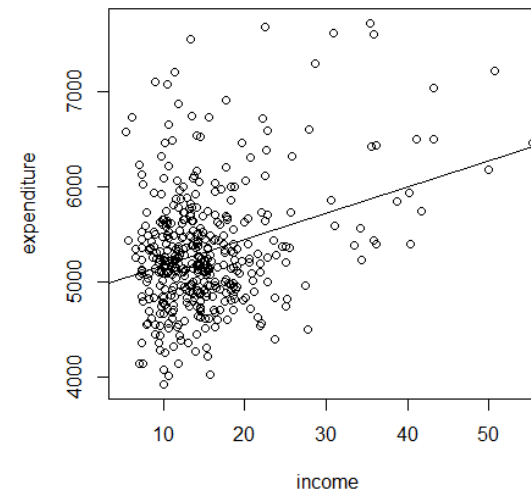
$$Y = \beta_0 + \beta_1 X + \epsilon$$

- Will Not Fit Perfectly, But is It Reasonable
- Goal of Model could be **Description** or **Inference**

# Condition About Model Form

- **Linearity:** *Assume that  $Y$  varies as a linear function of  $X$*
- *Advice: Always supplement your simple linear regressions with a scatterplot showing your audience the line fitted to the raw data*

```
library(AER) #Package for Applied Econometrics Textbook
data("CASchools") #Puts dataset into Global Environment
mod1=lm(expenditure~income, data=CASchools)
plot(expenditure~income,data=CASchools)
abline(mod1)
```



# Conditions About Distribution of Errors

- **Zero Mean:** *The distribution of errors is centered at 0*
- **Uniform Spread:** *The variance of  $Y$  is the same for each  $X$  (Homoscedasticity)*
- **Independence:** *No relationships exist between errors*

# Conditions Necessary for Inference

- **Normality:** *Assume that the errors follow a normal distribution*
- **Randomness:** *Simple random sample that is representative of the population we are trying to study*

# Restatement of Model

$$Y = \beta_0 + \beta_1 X + \epsilon$$

$$\epsilon \stackrel{iid}{\sim} \text{Normal}(0, \sigma_\epsilon)$$

*iid = "Independent and Identically Distributed"*

# Standard Error of Regression

- The Parameter  $\sigma_{\epsilon}$  Represents Standard Deviation of the Errors Around the Linear Regression Line
- **Standard Error of Regression  $\hat{\sigma}_{\epsilon}$**  : Represents the “Typical” Error

$$\hat{\sigma}_{\epsilon} = \sqrt{\frac{\sum(y - \hat{y})^2}{n - 2}} = \sqrt{\frac{SSE}{n - 2}} = \sqrt{\frac{SSE}{\text{degrees of freedom}}}$$

- **Degrees of Freedom:** Sample Size Minus Number of Parameters
- Recall Formula for Standard Deviation (Divide by  $n-1$ )

# Thank You

*Make Reasonable Decisions*

