Ordinary Least Squares (OLS) Regression

Model

Consider the following linear model: $$ y_i = \beta_0 + \beta_1 x_i + \epsilon_i $$ where y_i is the dependent variable, x_i is the independent variable, and ϵ_i is the error term.

> `$$` 表示要插入數學公式，再透過按enter換行，提示copilot要的是數學公式。

The model has several assumptions on the error term ϵ_i:

- $\mathbb{E}[\epsilon_i] = 0$
- $\mathbb{E}[\epsilon_i | x_i] = 0$
- $\mathbb{E}[\epsilon_i^2 | x_i] = \sigma^2$
- ϵ_i is independent of x_i
- ϵ_i is independent of ϵ_j for $i \neq j$
- ϵ_i is normally distributed

> *再空一格提示copilot要的是列點。教師要自行判斷何時要停止列點。

Estimation in R

We use the `lm()` function to estimate the model. The first argument is the formula, and the second argument is the data frame.

```
# estimate the model
model = lm(y ~ x, data = data)
```