

I: OLS

A dummy variable takes on only the values 0 and 1. It is used for categorical data, such as an individual's gender. Let d_1 and d_2 be vectors of 1s and 0s, with the i^{th} element of d_1 equaling 1 and that of d_2 equaling 0 if the person is a man, and the reverse if the person is a woman.

Suppose that there are n_1 men and n_2 women in the sample. Consider the three regressions:

$$(1) \quad y = \mu + \alpha_1 d_1 + \alpha_2 d_2 + e$$

$$(2) \quad y = \alpha_1 d_1 + \alpha_2 d_2 + e$$

$$(3) \quad y = \mu + \phi d_1 + e$$

(a - 3 points) Compare regressions 2 and 3. Is one more general than the other? Explain the relationship between the parameters in 2 and 3.

(b - 3 points) Can all three regressions be estimated by OLS?

II: Processes

(a - 6 points) Let Y_t be the $MA(2)$ process:

$$Y_t = (1 + 2.4L + 0.8L^2)\epsilon_t \tag{1}$$

where $E(\epsilon_t \epsilon_\tau) = \begin{cases} 1 & \text{for } t = \tau, \\ 0 & \text{otherwise } t \neq \tau \end{cases}$

Is Y_t covariance stationary? if so, calculate its autocovariance.

(b - 8 points) Let Y_t be the $AR(2)$ process:

$$(1 - 1.1L + 0.18L^2)Y_t = \epsilon_t \tag{2}$$

where $E(\epsilon_t \epsilon_\tau) = \begin{cases} 1 & \text{for } t = \tau, \\ 0 & \text{otherwise } t \neq \tau \end{cases}$

Is Y_t covariance stationary? if so, calculate its autocovariance.