



where  $E[\epsilon_t] = 0$  and  $Var(y_t) = \sigma^2$

- a. Find  $\beta_1^{OLS}$ .
- b. Is it consistent?

Suppose now that

$$\epsilon_t = \rho\epsilon_{t-1} + u_t$$

- c. Find  $\beta_1^{OLS}$  under the new assumptions.
- d. Is it consistent?
- e. Discuss why your answer makes sense.

**A2: Finding the Covariance Matrix for the Disturbance**

Suppose you have the following model:

$$\begin{aligned}y_t &= x_t\beta + \epsilon_t \\ \epsilon_t &= \rho\epsilon_{t-1} + u_t - \lambda u_{t-1}\end{aligned}$$

- a. What is the variance covariance matrix for the disturbance?
- b. What parameter is estimated by the regression of the OLS residuals on their lagged values?
- c. Explain how you would estimate the model.