ECON4570/6560 : Problem Set 4

Due by 11:59pm on Nov 30, 2024.

1. Consider observations (Y_{it}, X_{it}) from the linear panel data model

$$Y_{it} = X_{it}\beta_1 + \alpha_i + \lambda_i t + u_{it},$$

where $t = 1, \cdots, T$; $i = 1, \cdots, n$; and $\alpha_i + \lambda_i t$ is an unobserved individual specific time trend that potentially correlated with X_{it}. How would you estimate β_1 consistently? Please write down your procedure in details.

2. Suppose we have the following AR(2) process

$$y_t = 0.3y_{t-1} + 0.1y_{t-2} + \varepsilon_t,$$

where $\varepsilon_t \backsim WN(0, 1)$

   (a) Determine whether y_t is weakly stationary? Please justify your answer.
   (b) Compute $E(y_t)$, $Var(y_t)$ and $Cov(y_t, y_{t-k})$ for $k = 1, 2$.
   (c) Compute the ACF ρ_k for $k = 1, 2$.
   (d) Compute the PACF a_{kk} for $k = 1, 2$.

3. Suppose we have the following AR(1) process

$$y_t = 2 + y_{t-1} + \varepsilon_t,$$

where $\varepsilon_t \backsim WN(0, 1)$ for all t, $y_0 \backsim WN(0, 1)$ and is independent of ε_t for all t,

   (a) Compute $E(y_t)$, $Var(y_t)$ and $Cov(y_t, y_{t-k})$ for $k = 1, 2$.
   (b) Compute the ACF ρ_k for $k = 1, 2$.
   (c) Compute the PACF a_{kk} for $k = 1, 2$.