

Homework 1
(Due Sept 16th, 2022)

1. Calculate the variance of the process $y_t = y_{t-1} + \varepsilon_t$ where $\varepsilon_t \xrightarrow{iid} (0, \sigma^2)$. Hence, show that it is not stationary.

2. Part 1: For each of the following, determine whether $\{y_t\}$ represents a stable process.

a. $y_t - 1.2y_{t-1} + .2y_{t-2} = 0$

b. $y_t - 1.2y_{t-1} - 1.2y_{t-2} = 0$

Part 2: Write each of the above equations using lag operators. Determine the characteristic roots of the inverse characteristic equation.

3. Consider the second-order autoregressive process $y_t = a_0 + a_2y_{t-2} + \varepsilon_t$, where $|a_2| < 1$.

- a. Find: i. $E_{t-2}y_t$ ii. $E_{t-1}y_t$ iii. $E_t y_{t+2}$
iv. $\text{Cov}(y_t, y_{t-1})$ v. $\text{Cov}(y_t, y_{t-2})$
vi. the partial autocorrelations ϕ_{11} and ϕ_{22}

b. Find the impulse response function. Given y_{t-2} , trace out the effects on an ε_t shock on the $\{y_t\}$ sequence.