

2. Consider the following AR(2) model:

$$Y_t = 0.9Y_{t-1} - 0.1Y_{t-2} + e_t$$

Is this model stationary? Show all your work.

→ AR(p) process is stationary if and only if each of the roots of the AR characteristic equation is > 1 .

$$1 - \phi_1 x - \phi_2 x^2 = 0$$

$$x = \frac{\phi_1 + \sqrt{\phi_1^2 + 4\phi_2}}{-2\phi_2}, \quad x = \frac{\phi_1 - \sqrt{\phi_1^2 + 4\phi_2}}{-2\phi_2}$$

So, AR(2) is stationary iff

$$\phi_1 + \phi_2 < 1 \quad \& \quad \phi_1 - \phi_2 < 1 \quad \& \quad |\phi_2| < 1$$

$$\phi_1 = 0.9 \quad \phi_2 = -0.1$$

$$\phi_1 + \phi_2 = 0.8 < 1$$

$$\phi_2 - \phi_1 = -1 < 1$$

$$|\phi_2| = 0.1 < 1$$

∴ So Stationary