Spectral density:

$$w(\alpha) = \sum_{-\infty}^{\infty} \rho^{|j|} z^j = -1 + \frac{1}{1-\rho z} + \frac{1}{1-\rho z^{-1}} =$$

$$= -1 + \frac{1}{1-\rho e^{i\alpha}} + \frac{1}{1-\rho e^{-i\alpha}} = \frac{1-\rho^2}{1-2\rho\cos\alpha+\rho^2}$$

Yule series

$$u_t + \alpha_1 u_{t-1} + \alpha_2 u_{t-2} = \varepsilon_t$$

Yule-Walker:
$$\rho_1 + \alpha_1 + \alpha_2 \rho_1 = 0$$
$$\rho_2 + \alpha_1 \rho_1 + \alpha_2 = 0$$

$$\rho_1 = -\frac{\alpha_1}{1+\alpha_2}, \quad \rho_2 = -\alpha_2 + \frac{\alpha_1^2}{1+\alpha_2}$$

$$\alpha_1 = -\frac{\rho_1(1-\rho_2)}{1-\rho_1^2}, \quad \alpha_2 = -\frac{\rho_2-\rho_1^2}{1-\rho_1^2}$$

Solution of $x^2 + \alpha_1 x + \alpha_2 = 0$

μ, ν

$$\rho_j = A\mu^j + B\nu^j$$
$$\rho_0 = 1 = A + B$$
$$\rho_1 = A\mu + B\nu$$