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2. Consider the following MA model:

$$Y_t = e_t + 0.8e_{t-1} + 0.9e_{t-2}.$$

Suppose that the variance of the white noise process terms is $\sigma_e^2 = 1$.

(a) What is the order q of this model? Give the values of each its θ parameters.

$q = 2$, $\theta_1 = -0.8$, $\theta_2 = -0.9$

(b). Using the results we have obtained in this week's video, give the values of the mean function, auto covariance function and autocorrelation function for this model. (Hint: Remember to include each possible case: all the different values that k might take on)

mean: $E(Y_t) = E(e_t) + 0.8E(e_{t-1}) + 0.9E(e_{t-2}) = 0$.

autocovariance:

For $k=0$: $\sigma_e^2(1+\theta_1^2+\theta_2^2) = (1+0.64+0.81) = 2.45$

$k \pm 1$: $\sigma_e^2(-\theta_1 + \theta_1\theta_2) = (0.8 + 0.72) = 1.52$

$k \pm 2$: $\sigma_e^2(-\theta_2) = 0.9$

otherwise: 0.

autocorrelation:

$$\rho_k = \begin{cases} 1 & \text{for } k=0 \Rightarrow 1 \\ (-\theta_1 + \theta_1\theta_2)/(1+\theta_1^2+\theta_2^2) & \text{for } k=1 \Rightarrow (0.8+0.72)/(1+0.64+0.81) \\ & = 1.52/2.45 = 0.6204 \\ -\theta_2/(1+\theta_1^2+\theta_2^2) & \text{for } k=2 \Rightarrow 0.9/(1+0.64+0.81) \\ & = 0.9/2.45 = 0.3673 \\ 0 & \text{for } k>2. \end{cases}$$

(c) Sketch

look

Y_t

(ii)

Y_t

(iii)

terms is

of each

t's video.
function
t: Remember
values

)/(1+0.64+0.31)
= 0.620
64+0.31)

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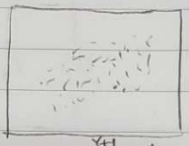
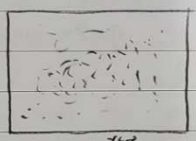
(c) Sketch what you think each of the following plots might look like, and explain your reasoning for each:

(i) Y_t vs Y_{t-1}



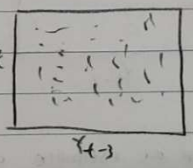
positive correlation because when k=1, autocorrelation is 0.620

(ii) Y_t vs Y_{t-2}



positive correlation but weaker, because when k=2, autocorrelation is 0.364

(iii) Y_t vs Y_{t-3}



no correlation, because when k>2, autocorrelation is 0.