**Tutorial set #3**

**Question 1:**

Write the Yule-Walker equations for every model of the following, where :



To find the Yule-Walker equations for the model, we multiply both sides of the equation by and take expectations:

dividing both sides by , we get:

These equations are called Yule-Walker equations, we can use them in finding autocorrelation and partial autocorrelation coefficients of the model.

multiply both sides of the equation by and take expectations:

dividing both sides by , we get:

1. Find for the models in (1) and (2).

For model (1):

we found the following ACF:

Thus:

Applying the recurrence relation for finding the PACF:

we can show that:

**For model 2:**

we found the following ACF:

Thus:

Applying the recurrence relation for finding the PACF:

Thus, we notice that we need to find :

Hence:

we can show that:

**Question 2:**

Assume , and let the observed series be defined as

Where the parameter can take either the value or .

1. Find the autocorrelation function of the series for both cases, compare them.
2. Is the process stationary in both cases?
3. For simplification, assume that the mean of the process equal zero, and the variance is equal to one, and that you obtained the observed series for , and that you have obtained a credible estimates for the coefficients of the ACF , can you tell which process generated the data (i.e. which value or to be used in the model to model the data?)

For the model where :

now for k=1:

for k=2:

Hence, the ACF has the form:

For the model where :

for k=1:

for k=2:

Hence, the ACF has the form:

Thus we notice that both process has the same ACF!

**Question 3:** Write the following models using the backshift operator B:

1. :

**Question 4:**

Express the following models in terms of the process and :

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Same as above