

ARIMA and Q-statistic

5/5 points (100.00%)

Quiz, 5 questions

 **Congratulations! You passed!**[Next Item](#)1 / 1
points

1.
Find the order of the ARIMA process

$$X_t = 0.4X_{t-1} - 0.2X_{t-2} + 0.15X_{t-3} + Z_t + 0.5Z_{t-1} - 0.3Z_{t-2}.$$

☐ ARIMA(2,1,3)☐ ARIMA(3,1,2)☒ ARIMA(3,0,2)**Correct**

Correct! No differencing needed.

☐ ARIMA(2,0,3)1 / 1
points

2.
Rewrite the process $(1 + 0.2B)\nabla X_t = (1 - 0.3B)Z_t$.



$$(1 - 0.8B - 0.2B^2)X_t = (1 - 0.3B)Z_t$$

**Correct**

Correct!

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$$X_t = 0.8X_{t-1} + 0.2X_{t-2} + Z_t - 0.3Z_{t-1}$$

**Correct**

Correct!

$$(1 - 0.8B - 0.2B^2)X_t = X_t - 0.8X_{t-1} - 0.2X_{t-2} \text{ and} \\ (1 - 0.3B)Z_t = Z_t - 0.3Z_{t-1}.$$



$$X_t = -0.2X_{t-1} + Z_t - 0.3Z_t$$

**Un-selected is correct**1 / 1
points

3.

Find the order of the ARIMA process.

$$X_t = 3X_{t-2} - 2X_{t-3} + Z_t + 5Z_{t-1}$$



ARIMA(1,0,3)

**Un-selected is correct**

ARIMA(2,1,1)

**Correct**

Correct!

Since $1 - 3 * 1^2 + 2 * 1^3 = 0$, we obtain that $1 - B$ divides $1 - 3B^2 + 2B^3$. Long division would give us $1 - 3B^2 + 2B^3 = (1 + B - 2B^2)(1 - B)$. Here $(1 + B - 2B^2)$ could be taken as AR polynomial. Note that the factor $(1 - B)$ would make the process nonstationary.





ARIMA(1,2,1)

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Correct!

$1 - 3B^2 + 2B^3$ can be factorized as $(1 + 2B)(1 - B)^2$, where we have 1 AR terms (degree of the AR polynomial $1 + 2B$), and two differencing $(1 - B)^2$. Note that process is nonstationary. Why is that?



ARIMA(3,0,1)

Correct

Correct!

Even though there are 2 AR terms, the order is 3 since we have $-2X_{t-3}$. And there is 1 MA term. Note that the process is not invertible since the root of the polynomial $1 + 5B$ lies inside the unit circle. How about stationarity?

1 / 1
points

4.

We have some time series whose Q-statistic at lag=4 is calculated, and corresponding p-value is found: p-value=0.34. What does it mean?



We do not have enough evidence to reject the null hypothesis that there is no autocorrelation until lag 4.

**Correct**

Correct!

The null hypothesis is $H_0 : \rho_1 = \rho_2 = \rho_3 = \rho_4 = 0$. Since 0.34 is not smaller than any reasonable significance level, we cannot reject the null hypothesis.



We do not have enough evidence to reject the null hypothesis that there is no autocorrelation at lag 4.

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1 / 1

:points

5/5 points (100.00%)

Quiz, 5 questions

5.

We have some time series whose Q-statistic at lag=10 is calculated, and corresponding p-value is found: $p\text{-value}=0.00034$. What does it mean?



There is a significant autocorrelation at at least one lag until lag 10.

**Correct**

Correct!

A low p-value is an evidence against the null hypothesis.



We do have sufficient evidence to reject that all autocorrelation coefficients until lag 10 is zero.

**Correct**

Correct!

A low p-value is an evidence against the null hypothesis.



There is a low probability of significant autocorrelation until lag 10.

**Un-selected is correct**