#### ARIMA and Q-statistic

LATEST SUBMISSION GRADE

86.66%

1.

Question 1

Find the order of the ARIMA process

Xt​=0.4Xt−1​−0.2Xt−2​+0.15Xt−3​+Zt​+0.5Zt−1​−0.3Zt−2​.

1 / 1 point

ARIMA(2,1,3)

ARIMA(3,0,2)

ARIMA(3,1,2)

ARIMA(2,0,3)

Correct

Correct! No differencing needed.

2.

Question 2

Rewrite the process (1+0.2B)∇Xt​=(1−0.3B)Zt​.

1 / 1 point

(1−0.8B−0.2B2)Xt​=(1−0.3B)Zt​

Correct

Correct!

∇=1−B, and thus (1+0.2B)∇=(1+0.2B)(1−B)=1−0.8B−0.2B2.

Xt​=0.8Xt−1​+0.2Xt−2​+Zt​−0.3Zt−1​

Correct

Correct!

(1−0.8B−0.2B2)Xt​=Xt​−0.8Xt−1​−0.2Xt−2​ and (1−0.3B)Zt​=Zt​−0.3Zt−1​.

Xt​=−0.2Xt−1​+Zt​−0.3Zt​

3.

Question 3

Find the order of the ARIMA process.

Xt​=3Xt−2​−2Xt−3​+Zt​+5Zt−1​

1 / 1 point

ARIMA(2,1,1)

Correct

Correct!

Since 1−3∗12+2∗13=0, we obtain that 1−B divides 1−3B2+2B3. Long division would give us 1−3B2+2B3=(1+B−2B2)(1−B). Here (1+B−2B2) could be taken as AR polynomial. Note that the factor (1−B) would make the process nonstationary.

ARIMA(1,2,1)

Correct

Correct!

1−3B2+2B3 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 −2Xt−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?

ARIMA(1,0,3)

4.

Question 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?

1 / 1 point

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

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 H0​:ρ1​=ρ2​=ρ3​=ρ4​=0. Since 0.34 is not smaller than any reasonable significance level, we cannot reject the null hypothesis.

5.

Question 5

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

0.333 / 1 point

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

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.

This should not be selected

p-value if the probability of obtained data given that the null hypothesis is correct. A low p-value is an evidence against the null hypothesis.