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Department of Economics

Examination paper for FIN3006 – Applied time series econometrics.

Examination date: 05.10.2020

Examination time (from-to): 5.10, 09:00 -12.10, 10:00.

Permitted examination support material: All support material is allowed

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OTHER INFORMATION

If a question is unclear/vague – make your own assumptions and specify in your answer the premises you have made. *Only reach out to academic contact in case of errors or insufficiencies in the question set*.

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Weighting: The grade is based on an overall assessment, so the points are only indicative.

ABOUT SUBMISSION

- **Your answer will be submitted automatically when the examination time expires and the test closes**, if you have answered at least one question. This will happen even if you do not click “Submit and return to dashboard” on the last page of the question set. You can reopen and edit your answer as long as the test is open. If no questions are answered by the time the examination time expires, your answer will not be submitted.
- **Withdrawing from the exam:** If you wish to submit a blank test/withdraw from the exam, go to the menu in the top right-hand corner and click “Submit blank”. This cannot be undone, even if the test is still open.
- **Accessing your answer post-submission:** You will find your answer in *Archive* when the examination time has expired.

1 unconditional mean

Consider the following model estimated for a time series

$$y_t = 0.3 + 0.5\, y_{t-1} - 0.4\, e_{t-1} + e_t$$

where e_t is a zero mean error process.
What is the (unconditional) mean of the series, y_t ?

Select one alternative:

- 0.0
- 0.4
- 0.3
- 0.6

Maximum marks: 5

2

MA(3)

Consider the following MA(3) process

$$y_t = 0.1 + 0.4u_{t-1} + 0.2u_{t-2} - 0.1u_{t-3} + u_t$$

What is the optimal forecast for y_t, 3 steps into the future (i.e., for time t+2 if all information until time t–1 is available), if you have the following data?

$u_{t-1} = 0.3$; $u_{t-2} = -0.6$; $u_{t-3} = -0.3$

Select one alternative:

- 0.4
- 0.0
- –0.1
- 0.07

Maximum marks: 5

3

AR(3)

Which of the following sets of characteristics would usually best describe an autoregressive process of order 3 (i.e., an AR(3))?

Select one alternative:

- A slowly decaying acf, and a pacf with 3 significant spikes
- An acf and a pacf with 3 significant spikes.
- A slowly decaying pacf and an acf with 3 significant spikes.
- A slowly decaying acf and pacf

Maximum marks: 5

4 Variance MA(1)

Three characteristics of a weakly stationary process are

(I) $E(y_t) = \mu$
(II) $E(y_t - \mu)(y_t - \mu) = \sigma^2 < \infty$
(III) $E(y_{t1} - \mu)(y_{t2} - \mu) = \gamma_{t2-t1} \quad \forall t_1, t_2.$

What do the mathematical expressions I, II, and III imply?

Select one alternative:

- Constant mean, constant variance, and constant autocovariance structure, respectively.
- Constant variance, constant mean, and constant autocovariance, respectively.
- Constant mean, constant autocorrelation, and constant autocovariance, respectively
- Constant autocovariance structure, constant mean, and constant variance, respectively.

Maximum marks: 5

5 Variance of MA(2)

Consider the following MA(2) process
$y_t = \varepsilon + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2}$
where the errors follow a standard normal distribution. What is the variance of y_t?

Select one alternative:

- $\sigma^2 + \theta_1^2 \sigma^2 + \theta_2^2 \sigma^2$
- All of the above
- $1 + \theta_1^2 + \theta_2^2$
- $E(\varepsilon_t^2 + \theta_1^2 \varepsilon_{t-1}^2 + \theta_2^2 \varepsilon_{t-2}^2)$

Maximum marks: 5

6

ARMA properties

Which of the following statements are TRUE?

i. An MA(q) can be expressed as an AR(infinity) if it is invertible
ii. An AR(p) can be written as an MA(infinity) if it is stationary
iii. The (unconditional) mean of an ARMA process will depend only on the intercept and on the AR coefficients and not on the MA coefficients
iv. A random walk series will have zero pacf except at lag 1.

Select one alternative:

- (i), (ii), and (iii) only
- (i) and (iii) only
- (i), (ii), (iii), and (iv).
- (ii) and (iv) only.

Maximum marks: 5

7

AR(2) 2forecast

Consider the following AR(2) model. What is the optimal 2-step-ahead forecast for y if all information available is up to and including time *t*, if the values of *y* at time *t*, *t*-1 and *t*-2 are –0.3, 0.4 and –0.1, respectively, and the value of u at time *t*-1 is 0.3?

$y_t = –0.1 + 0.75y_{t-1} – 0.125y_{t-2} + u_t$

Answer with two decimals.

[ ] .

Maximum marks: 5

8

AR(2) 3forecast

What is the optimal three-step-ahead forecast from the AR(2) model given in the previous question? Answer with 2 decimals. [ ] .

Maximum marks: 5

9

100forecast

Suppose you had to guess at the most likely value of a one hundred-step-ahead forecast for the AR(2) model given above---what would your forecast be? [ ] .

Maximum marks: 5

10 ACF & PACF

Download the dataset from here: midterm_h20.xls
Report the 3 first autocorrelations (lags 1-3), rounding off to 2 decimals.
Fill in your answer here:

Report the 3 first partial autocorrelations (lags 1-3), rounding off to 2 decimals.
Fill in your answer here:

Maximum marks: 10

11 ARMA

Suggest the model from the following list that best characterises the process investigated in the previous question:
Select one alternative:

- An ARMA(1,1)
- An AR(2)
- An MA(2).
- An AR(1)

Maximum marks: 5

12

Explain ARMA

Explain the reasons for your answer to the previous question, using a maximum of 120 words.

Fill in your answer here

Words: 0/119

Maximum marks: 15

13

estimation principles

Discuss, without using mathematics and illustrations, unbiasedness, efficiency, and consistency. Use maximum 150 words.

Fill in your answer here

Format

Words: 0/150

Maximum marks: 25