Started on	Tuesday, 30 July 2024, 11:18 AM
State	Finished
Completed on	Wednesday, 31 July 2024, 10:16 PM
Time taken	1 day 10 hours
Marks	22/22
Grade	**10** out of 10 (**100**%)

Question 1

Correct

Mark 4 out of 4

Let's shortly recap what type of data we are talking about. What is a time series?

- [x] a. A sample from a stochastic process
- [ ] b. A family $(X_t)_t$ of independent variables indexed by some ordered index set
- [x] c. Set of pairs (x, t) where t refers to a point in time
- [x] d. A set of sequential data points

Your answer is correct.

Correct

Marks for this submission: 4/4.

Question 2

Correct

Mark 4 out of 4

Time series analysis now is concerned with gaining insights into time series. What is so special about the models from time series analysis that we discussed, in particular the ARIMA model, compared to other classical regression techniques that simply regress the mapping $t \mapsto x$?

- [ ] a. Regression cannot be applied to time series, since complex local effects are prevalent.
- [ ] b. Random shocks, i.e., random shifts of singular points, can be modelled.
- [ ] c. ARIMA can model seasonal effects.
- [x] d. ARIMA can model how samples influence later values in the series.

Your answer is correct.

Correct

Marks for this submission: 4/4.

Question 3

Correct

Mark 1 out of 1

The ARIMA model consists of four different parts:

- **Model** parts modeling
  - (linear) dependency on previous values: the **autoregression model (AR)**
  - (linear) dependency on previous shocks: the **moving average model (MA)**
- **Preprocessing** parts eliminating
  - (polynomial) **trends**: differentiation via the **integral model (I)**
  - **seasonal effects**, i.e., a full ARIMA model but on values X_{t-sk} for some season span s instead of any X_{t-k}.

In the lecture we saw that all of the different model parts can be represented as one (lengthy) formula using the backshift operator notation $B(x_t) := x_{t-1}$ as follows. Assign the above model parts to the respective parts in the formula.

$$\underbrace{(1-\phi(B))(1-B)^d(1-\Phi(B^s))(1-B^s)^{d'}}\, X_t = a_0 + \underbrace{(1-\psi(B))(1-\Psi(B^s))}\, \varepsilon_t$$

AR | I | seas. AR | seas. I | M

Your answer is correct.

Correct

Marks for this submission: 1/1.

Question 4

Correct

Mark 5 out of 5

We saw that there are several models (Autoregression Model (AR), Moving Average model (MA)) and preprocessing steps (Integration Model (I), seasonal part (seas.)) that allow together to model even very complex time series quite accurately.

In the following some typical assumptions are provided. What assumptions belong to which of the models?

Assumptions by Model

Assumption	AR	MA	I	seas.
The process is stationary.	yes	yes	no	no
Makov property holds.	yes	yes	no	yes
Approx. linear dependency between X_t and previous shocks	no	yes	no	no
Finite differentiation makes $(X_t)_t$ stationary.	no	no	yes	no
$X_t \in \mathbb{R}$	yes	yes	yes	yes

Correct

Marks for this submission: 5/5.

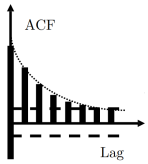
Question 5

Correct

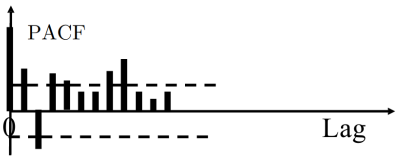
Mark 4 out of 4

As we have seen in the lecture, it is quite important to have a closer look at concrete plots of the data and its statistics, in order to (1) validate assumptions and (2) identify possible parameters for the ARIMA model.
Which of the graphics reveals which finding?

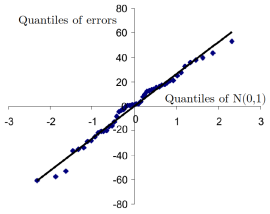
A datum approx. depends on up to the 8th previous shock.



A datum does depend on previous data points.



A datum does depend on approx. up to 8th previous datum.



The shocks are normally distributed.

Your answer is correct.

Correct

Marks for this submission: 4/4.

Question 6

Correct

Mark 4 out of 4

ARIMA is a very powerful modeling tool for time series. However, it has its limitations. Which of the following types of time series data can it *not* model with high accuracy compared to other approaches resp. without further preprocessing?

- [x] a. ARIMA cannot tell how likely a time series continuation is for a given process. For this, a full model of the joint distribution is necessary, like a dynamic Bayesian network.
- [x] b. ARIMA cannot model time series with more than one value per time step. For this, extensions like Vector ARIMA are needed.
- [x] c. ARIMA cannot model dependencies on future X_t.
- [ ] d. ARIMA cannot accurately model polynomial trends.
- [ ] e. ARIMA cannot model processes with high permutation entropy.

Your answer is correct.

Correct

Marks for this submission: 4/4.

◄ 11. Quiz - Dimensionality Reduction

Jump to...

EXAM #1 ►