



Time Series Analysis

Fall 2017

Andreas Jakobsson



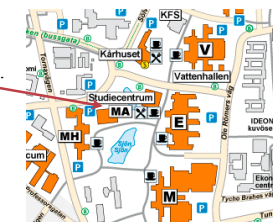
Time series analysis

Administration

- Course program
- Course webpage
<http://www.maths.lu.se/kursomsida/fmsn45masm17/>
- Registration
Sign up, check, add social security number.
- Book
2nd Edition. Available online and from studiecetrum.

Course material

- General material:
- [Course program](#)
 - All the below slides, as well as the pdf and matlab files, etc can be downloaded here.
 - An errata for the textbook is available [here](#).
 - [Scalable learning videos](#). Course code: BSNBR-14014.
- Lecture notes and schedule:
- Week 1:
 - L1: Introduction and overview. Multivariate random variables. (slides 1, 2)
 - L2: Multivariate random variables. Stochastic processes. (slides 3, 4, 5)
 - Reading instructions: Ch. 1, 2, 3, 1-3.3
 - Textbook problems: 2.1-2.3, 3.1-3.4
 - Mini project: [\[pdf, data\]](#)
 - Week 2:
 - L3: Stochastic processes. (slides 1, 2, 3)
 - L4: Stochastic processes. Identification. (slides 4, 5)
 - Reading instructions: Ch. 3, 4, 1-4.2
 - Textbook problems: 3.5-3.10, 3.12-3.15
 - Mini project: [\[pdf, data\]](#)



Time series analysis

Administration

Teaching staff

Prof. Andreas Jakobsson, MH:217, aj@maths.lth.se
Office hours: Mon, Wedn 11-12 (until 20/12)

Ted Kronvall, MH:224, ted@maths.lth.se
Office hours: Thur 10-12 (until 20/12)

Filip Elvander, MH:138, filipelv@maths.lth.se
Office hours: Tues 9-10 (until 20/12)

Maria Juhlin, MH:138B, juhlin@maths.lth.se

Zite He, Carlos Fransisco Mendoza, Henning Zakrisson

Tutorial exercises

The tutorials will be held on Thursdays and Fridays; see schedule.



Time series analysis

Administration

Regular problems

Regular textbook problems from the course book.

Mini projects

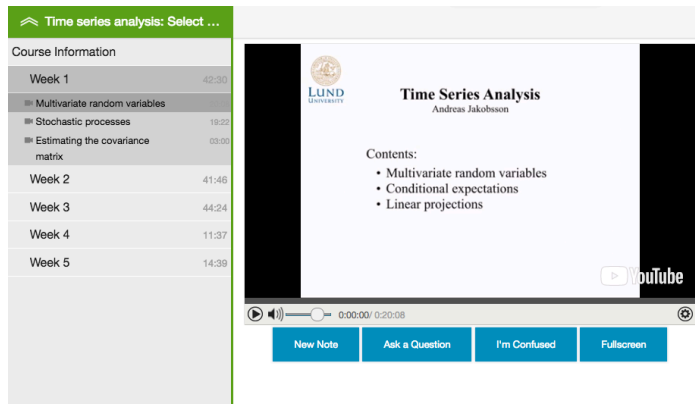
There are three mini-projects to prepare you for the computer exercises. These are *voluntary*.

Computer exercises

The course examination consist of 3 **mandatory** computer exercises. They take a **long** time; come **well** prepared. Sign up on the webpage. If you are not done, try to get graded at a later exercise.

Computer exercise 0 is *voluntary* and review stochastic processes.

Administration



<https://www.scalable-learning.com>

course code: BSNBR-14014

Administration

Examination

The examination consist of the **computer exercises**, a **take-home exam** and a **project**.

Project examination will take place on **20/12 (10-12)** or on **12/1 (13-16)**.

A detailed **project report** and **presentation material** should be handed in **no later** than at the start of the presentation.

The take-home is available at 12.00 on 8/1, and is due **15/1, at 13.15**.

	Max	Pass	LTH	NF
Computer exercises	P/F	P	3 45	G 45
Take-home exam	30	15	4 60	VG 70
Project presentation	P/F	P	5 75	
Project report	60	30		

Administration

CEQ

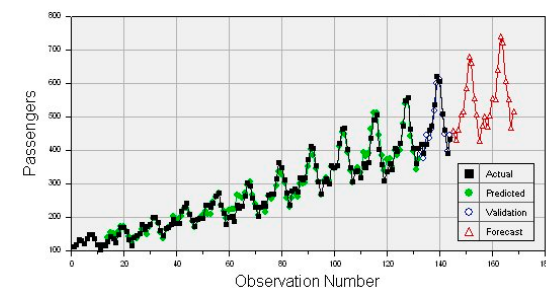
After the course, you will be asked to provide an evaluation of the course (via email). *Please do this!!!*

Looking at the earlier evaluations:

- The course is deemed rewarding and relevant.
- The course is uniformly consider **demanding**.
- The labs are seen as very helpful for the project, but many comment on that they take a lot of time. Come well prepared.
- The project is challenging - it take a **lot** of time, but is also quite rewarding.

Course representative

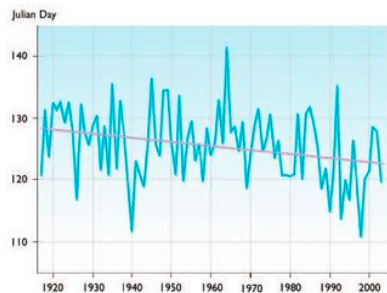
Your representative to give feedback to me on the course.



Number of airline passengers



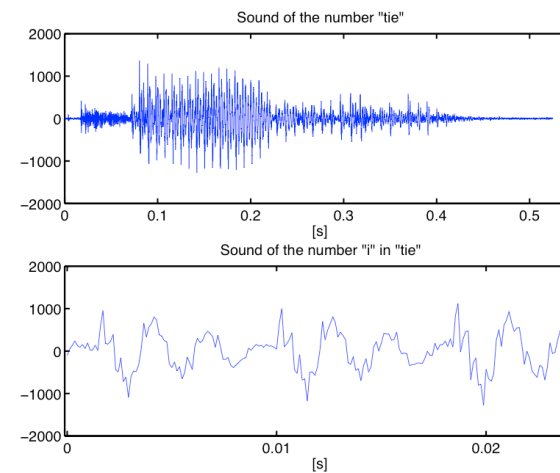
Time series analysis



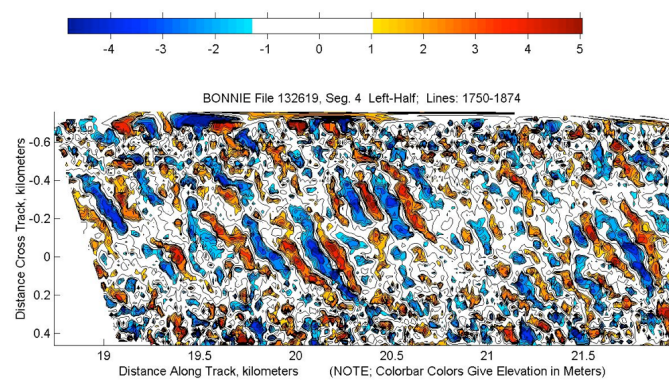
Average ice breakup date of the Tanara River



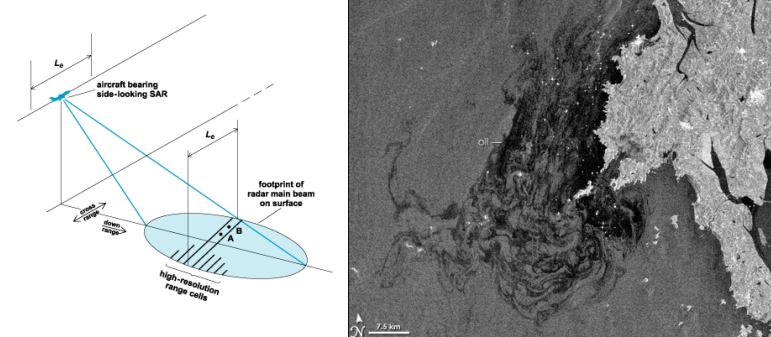
Time series analysis



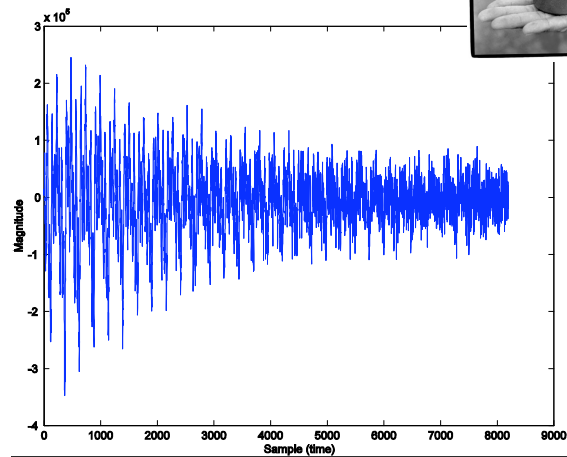
Time series analysis



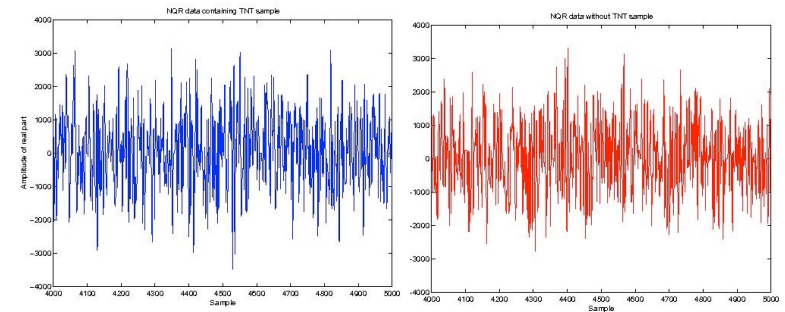
Time series analysis



SAR image of oil spill covering the costal waters of the Yellow Sea, South Korea, Dec. 11, 2007



NQR signal from 180 g TNT (2000 measurements \approx 8.5 h).



NQR signal from 180 g TNT (4 measurements).

Course content

This course treats:

- Modelling of linear stochastic systems
- Pre-treatment of measurements
- Prediction, filtering and reconstruction
- Parameter estimation
- Model selection and validation
- Recursive techniques
- Spectral estimation

What to do next:

- Stationary and non-stationary spectral estimation (VT1).
- Non-linear time series analysis (HT1+2).
- Financial statistics (HT2).
- Valuation of derivative assets (HT1).
- **Loads of cool thesis projects!!**

This week

We will cover

- Multivariate random variables. Stochastic processes.
- Reading instructions: Ch. 1, 2, 3.1-3.3
- Problems: 2.1-2.3, 3.1-3.4
- Three video lectures!

MY HOBBY: EXTRAPOLATING

