Analysis of Time Series 1MS014, 10c

Welcome to the course in time series analysis (10c). Course information, supplementary material etc. will be accessed through *Studentportalen*:

http://studentportalen.uu.se/

This time, the course will only be given as a distance course, so there are no traditional lectures in class!

Course literature:
Robert H. Shumway & David S. Stoffer:
Time Series Analysis and its Applications – With R Examples. 4th edition.
Springer, 2017. Chap 1-6. (Available as e-book.)

Teaching:
All the teaching this time is via Studentportalen. Following the pace of the lectures (see the plan of teaching below), I will post

1. The slides that I would have used in traditional lectures.

2. Comments and derivations connected to each slide. This is what I would have written on the board in traditional lectures.

3. In connection with some of the lectures, I will post videos where I go through parts of the lectures. This will be in connection with practical moments (searching for the best model, etcetera).

Teacher:
Rolf Larsson (rolf.larsson@math.uu.se)

Examination:
We do not know yet if we are allowed to have a written exam on the course, or if it will be a home exam. In either case, the following holds:
Exam June 2. Permitted aids: The course book and a pocket calculator.
Alternatively, if you don't have a hard copy of the course book, you can use printed pages from it and/or a formula sheet with front and back page that you have written by yourself, by hand or by computer. *No electronic device with internet connection is allowed.*
Project presentation, written (and oral if possible). *Compulsory.*
Six hand-in assignments, not compulsory but will give bonus points on the written exam.

Please turn page!

Project:
Choose your own time series and analyse it with the methods given in the course. Hand in a short written presentation of your analysis *no later than May 20.* If possible, you are also supposed to present your project orally to the other students. *Compulsory.*

Hand-in assignments:
Six hand-in assignments will be given. These are not compulsory, but they will give bonus points on the written exam. The character of the assignments will be partly "exam like", but they will also contain some more practical data modelling.
Each assignment will give at most 10p. This gives a maximum of 60p on the assignments. You can obtain bonus points at the final exam (which as usual can give at most 40p, where 18p is pass) according to the following:

- 50-60p on the home assignments gives 3 bonus points

- 30-49p on the home assignments gives 2 bonus points

- 10-29p on the home assignments gives 1 bonus point

Time plan:

#	Handed out	Handed in
1	27/3	3/4
2	3/4	17/4
3	17/4	24/4
4	24/4	4/5
5	4/5	11/5
6	11/5	18/5

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Plan of teaching:

#	Date	Agenda	Chapter
L1	24/3	Introduction, Time Series Models, Measures of Dependence	1.1-1.4
L2	25/3	Stationarity, Correlation, Vector-Valued Serie, Differencing	1.5-1.6, 2
L3	27/3	AR and MA models, *Hand-in 1 out*	3.1
L4	30/3	ARMA models, Difference Equations	3.2
L5	31/3	ACF and PACF of ARMA models	3.3
L6	3/4	Forecasting, *Hand-in 1 in, Hand-in 2 out*	3.4
L7	14/4	Estimation	3.5
L8	15/4	Integrated Models, Building ARMA Models	3.6-3.7
L9	16/4	Seasonal ARIMA Models	3.9
	17/4	*Hand-in 2 in, Hand-in 3 out*	
L10	21/4	Periodicity, The Spectral Density (SD)	2.2, 4.1-2
L11	23/4	The Periodogram, SD estimation	4.3-5
L12	24/4	Cross Spectra, Linear Filters, Wavelets	4.6-7
	24/4	*Hand-in 3 in, Hand-in 4 out*	
L13	27/4	Long Memory and Fractional Models, Threshold models	5.1, 5.4
L14	28/4	Unit Root Testing	5.2
	4/5	*Hand-in 4 in, Hand-in 5 out*	
L15	5/5	GARCH Models	5.3
L16	8/5	Transfer Functions, Multivariate ARMAX Models	5.5-6
L17	11/5	State Space Models, Forecasting, ML Estimation	6.1-3
	11/5	*Hand-in 5 in, Hand-in 6 out*	
L18	13/5	Switching Models, Stochastic Volatility	6.9, 6.11
	18/5	*Hand-in 6 in*	
	20/5	*Projects in*	
	26/5	Maybe project presentation	
	27/5	Maybe project presentation	

Recommended problems in the course book:
1.4, 1.6, 1.7, 1.8, 1.9, 1.13, 1.14, 1.15, 1.16, 1.17
2.6, 2.7
3.1, 3.2, 3.3, 3.4, 3.6, 3.8, 3.15, 3.16, 3.24, 3.27, 3.28, 3.29, 3.38, 3.39
4.4, 4.5, 4.6, 4.12, 4.17, 4.18, 4.25(a), 4.28, 4.30, 4.31
5.5
6.1 (a)-(b), 6.2