

Analysis of Time Series 1MS014, 10c

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

<http://studium.uu.se/>

Course literature:

Robert H. Shumway & David S. Stoffer:

Time Series Analysis and its Applications – With R Examples. 5th edition.
Springer, 2025. Chap 1-6. (Available as e-book.)

The 4th edition of the book is also quite ok to use, and this one will in fact be my main reference.

Teaching:

18 lectures with theory (L1-L18)

5 problem solving sessions (P1-P5)

2 student presentation sessions (S1-S2)

Teacher:

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

Examination:

Written exam May 26. Permitted aids: The course book and a pocket calculator.

Alternatively, if you don't have a hard copy of the course book, you can bring 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 is allowed.*

Project presentation, written and oral. *Compulsory.*

Two hand-in assignments, not compulsory, but if you pass they will give one bonus point each on the written exam. It is allowed to work in pairs.

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 15*. You are also supposed to present your project orally to the other students. It is allowed to work in pairs. *Compulsory.*

Please turn page!

Hand-in assignments:

Two 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.

Time plan:

#	Handed out	Handed in
1	9/4	22/4
2	12/5	19/5

Plan of teaching:

#	Date	Agenda	Chapter
L1	24/3	Introduction, Time Series Models, Measures of Dependence	1.1-1.3
L2	26/3	Stationarity, Correlation, Vector-Valued Series, Differencing	1.4-1.6, 2
L3	27/3	AR and MA models	3.1
L4	28/3	ARMA models, Difference Equations	3.1-3.2
L5	31/3	Difference Equations, ACF and PACF of ARMA models	3.2-3
P1	2/4	Problem solving	
L6	4/4	Forecasting	3.4
L7	7/4	Estimation	3.5
L8	8/4	Integrated Models, Building ARMA Models	3.6-3.7
L9	9/4	Seasonal ARIMA Models	3.9
P2	11/4	Problem solving	
L10	22/4	Periodicity, The Spectral Density (SD)	2.3, 4.1-2
L11	23/4	The Periodogram, SD estimation	4.3-5
L12	25/4	Cross Spectra, Linear Filters, Wavelets	4.6-7
L13	29/4	Long Memory and Fractional Models, Threshold Models	5.1, 5.4
P3	6/5	Problem solving	
L14	8/5	Unit Root Testing	5.2
L15	9/5	GARCH Models	5.3
L16	12/5	Transfer Functions, Multivariate ARMAX Models	5.5-6
L17	14/5	State Space Models, Forecasting, ML Estimation	6.1-3
L18	15/5	Switching Models, Stochastic Volatility	6.9-11
P4	16/5	Problem solving	
S1	20/5	Student presentation	
S2	21/5	Student presentation	
P5	22/5	Old exams	

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