Department of Statistics & Operation Research
King Saud University
Second Semester 1446/1447

Stat 336– Time Series Analysis

Instructor

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Catalog Description

Week	Subjects
1	Meeting students, Course goals, expected knowledge after completing the course, explain methods of evaluating the student's performance
2	Introduction-examples of time series data- goals of time series analysis- measuring forecasting errors-choosing the appropriate method for forecasting- types of change in time series
3	Covariance function-autocorrelation function (importance – estimation)- form of the ACF for some cases (non-stationary series , oscillating series, seasonal series)- partial autocorrelation function- estimating the PACF
4	Time series operators (backshift operator, difference operator), using the difference operator for non-stationary series in the mean- variance stabilizing transformations-Box-Cox transformations
5	Stochastic time series models- meaning of linearity in regression models and in time series models-white noise process- stationarity of W.N. process- general linear process- invertibility formula- white noise formula-autoregressive processes (AR)- autoregressive process of order one (stationarity condition, ACF, PACF)
6	AR(2) (stationarity conditions, ACF, PACF)- general AR(p)- moving average processes (MA)- MA(1) (invertibility condition, ACF, PACF)
7	MA(2) (invertibility condition, ACF, PACF)- general MA(q)- ARMA(p,q) models- ARMA(1,1) model (stationarity condition, invertibility condition ACF, PACF)- integrated ARIMA(p,d,q) models
Week 7	**First Midterm exam (date to be agreed upon with students)**
8	Parameter estimation- moments method - estimating white noise variance- least squares method
9	Forecasting – minimum mean square error forecast- forecasting for AR(1), MA(1) , some results for the general ARMA(p,q), forecast error variance- constructing confidence limits for the forecasts-updating the forecasts
10	Box-Jenkins methodology- design and construction of forecasting model- model identification- choosing difference order- choosing model order- checking model validity- diagnostics- residual analysis- criteria for choosing the best model (AIC, BIC)- analysis of higher (lower) order models
11	Seasonal models- seasonal autoregressive models- moving average models- mixed seasonal models-multiplicative seasonal models
12	Applications of time series analysis in the lab. Handing over the data analysis project
Week 12	**Second Midterm exam (date to be agreed upon with students)**
13	Applications of time series analysis in the lab
14	Applications of time series analysis in the lab. Last date to hand over the project.

Textbooks

1- **Time Series Analysis, by J. Cryer and k. Chan (2008). Springer**
2- **The Analysis of Time Series, by C. Chatfield (2003). Chapman and Hall.**

Grading

Midterm I 20%

Midterm II	20%
Homework and data analysis reports	20%
Final Exam	40%

Homework and exam policy

Collaboration on homework assignments is encouraged. You may consult outside reference materials, other students, the instructor, or anyone else. There is one restriction: you must write, type, or otherwise record your answers yourself, alone, so that your homework reflects your understanding. No late homework or make-up exams without prior approval; penalties may apply. For the data analysis exam, every student should work separately, any two reports the look alike will be dismissed.