

# Applied Linear Models I

FALL 2017

## Syllabus

- Lecture 1 – Introduction to the framework of Regression Analysis

*Data, samples, variables and graphs.*

- Lecture 2 – Simple Linear Regression I

*Fitting the Linear curve.*

- Lecture 3 – Simple Linear Regression II

*Ordinary Least Squares (OLS) and Goodness of Fit measures (Pearson  $r$  and  $R^2$ ).*

- Lecture 4 – Statistical Inference in a Simple Linear Regression I

*Model assumptions and properties of OLS estimates, ANOVA.*

- Lecture 5 – Statistical Inference in a Simple Linear Regression II

*Hypothesis Testing and Confidence intervals for regression coefficients.*

- Lecture 6 – Statistical Inference in a Simple Linear Regression III

*Confidence intervals, prediction intervals and Regression through the origin.*

- Lecture 7 – Model Diagnostics in a Simple Linear Regression

*Residual Analysis (graphs, constant variance, correlation).*

- Lecture 8 – Multiple Regression I

*Two independent variables (OLS estimates, Goodness of Fit, Inference).*

- Lecture 9 – Multiple Regression II

*General Multivariate case (OLS estimates, Goodness of Fit with  $\text{adj } R^2$ , Inference, ANOVA, Analysis of Residuals).*

- Lecture 10 – Model Building I

*Variable selection and information measures (Akaike, Schwarz,  $\text{adj } R^2$ ).*

- Lecture 11 – Model Building II

*Influential observations and Multicollinearity.*

- Lecture 12 – Model Building III

*Transformations of variables and Dummy variables.*

## BOOKS

### **Covering most of the topics, with some calculus and proofs**

*R.A. Gordon* Regression analysis for the social sciences. Routledge, 2015.

*M.H. Kutner et al.* Applied Linear Statistical Models. McGraw-Hill, 2005.

*J. Fox* Applied Regression Analysis and Generalized Linear Models. SAGE, 2015.

*S. Weisberg* Applied linear regression. Wiley, 2005.

*R.B. Darlington, A.F. Hayes* Regression analysis and linear models: Concepts, applications, and implementation. Guilford Press, 2016.

*I. Pardoe* Applied regression modelling. Wiley, 2012.

### **Brief description of main topics**

*L.D. Schroeder, D.L. Sjoquist, P.E. Stephan* Understanding regression analysis: An introductory guide. SAGE, 2016.

*C. Lewis-Beck, M. Lewis-Beck* Applied regression: An introduction. SAGE, 2015.

### **Advanced mathematical treatment of Linear Models**

*J.H. Stapleton* Linear statistical models. Wiley, 2009.

*J. Gross* Linear Regression. Springer, 2012.

*D.J. Olive* Linear Regression. Springer, 2017.

*J.O. Rawlings et al.* Applied Regression Analysis: a Research Tool. Springer, 2001.