

Regression Methods: 563

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Course Information

- Office Hours: 4:30-6:30, Thursday or by appointment
 - Text book: Applied Linear Regression Models, M. Kutner, C. Nachtsheim and J. Neter, McGraw-Hill, 2004, 4th edition
 - References:
 - Introduction to Linear Regression Analysis, D. Montgomery and E. Peck, Wiley, 1992
 - Statistical for Experimenters, G. Box, W. Hunter and J. Hunter, Wiley, 1978
 - These handouts will be available for you in my webpage
[http : //www.stat.rutgers.edu/ saral/](http://www.stat.rutgers.edu/saral/)
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- Grading Policy: The grading will be given based on the exams, homework and project:
 - Exams: There will be two exams, a midterm (March 9) and a final (May 4). Both are closed books and closed notes.
 - Homework: Homework problems will be assigned on a regular basis. Some homework will be collected and graded. Many problems require use of computer packages such as R, Matlab, SPSS, SAS, Minitab, Statgraphics,...
 - Project:
 - * You are expected to hand in an individual project by May 4.
 - * A one-page proposal for this project is due March 30
 - * The project report is 20 page limit
 - * It should contain: a statement of the objectives of the project, detailed explanation of the nature as well as sources of the data, the statistical procedures and software used in the analysis, obtained numerical results and appropriate conclusions.

- * Projects presentations will be arranged in the last two weeks of the semester, if possible.
- Project and collected homework should be typed and accompanied by supporting computer printouts

Topics to be covered

1. SIMPLE LINEAR REGRESSION MODEL: Review and New Issues

Readings: Handout and Chapters 1-4

Review on the simple linear regression model and discussions of some new techniques, such as lack of fit test of the proposed model and testing for non-constance variance. Most of the procedures introduced for linear regression model will be extended later to multivariate regression model.

- Linear regression with one predictor
- Inference in regression analysis
- Diagnostic and remedial measures
- Simultaneous inferences and other topics

2. MULTIPLE LINEAR REGRESSION MODELS-I

Readings: Handout and Chapter 5 (if necessary) and Chapter 6

Expressing the multiple linear regression model in matrix forms, which will simplify the development of the model and derivation of results significantly.

6. MULTIPLE LINEAR REGRESSION-II

Readings: Handout and Sections 7.1-7.5

Continuous discussions on some special topics in multiple linear regression, such as the decomposition of the sum of squares in extra sum of squares and the partial F-test which will be used plenty of times in class.

7. REGRESSION MODELS FOR QUANTITATIVE AND QUALITATIVE PREDICTORS

Readings: Handout and Chapter 8

Polynomial Regression Models are analyzed and the technique of dummy or indicator variables is revised. Among other things, interaction effects involving dummy variables and piecewise linear models are introduced.

8. BUILDING THE REGRESSION MODEL-I (Variable Selection)

Readings: Handout and Sections 9.1-9.5

Stepwise regression for variable selection and other criteria for selecting variables for model building.

9. BUILDING THE REGRESSION MODEL-II (Diagnostics)

Readings: Handout and Chapter 10 and Section 7.6

Some of the commonly used diagnostic tools for identifying outlying X and Y observations, influential cases and multicollinearity will be discussed.

10. BUILDING THE REGRESSION MODEL-III (Remedial Measures)

Readings: Handout and Chapter 11

Formal tools for dealing with multicollinearity and non-constant error variance problems will be discussed. Method for treating cases with influential observations will be introduced.

11. AUTOCORRELATION IN TIME SERIES DATA

Readings: Handout and Sections 12.1-12.5

Problems of dependent error terms as well as methods for detecting and fixing the problems will be discussed.

12. NONLINEAR REGRESSION

Readings: Handout and Chapters 13 and 14

Although linear models can provide sufficient initial approximations to some models in many applications, we still need to discuss nonlinear regression models for more general problems. We will discuss estimation and inference about coefficients.