



Department of ...STATISTICS&INFORMATION

College of Adm. & Eco.

Salahaddin University-Erbil

Subject: Linear Models (master)

Course Book – 1st Year

**Lecturer's name: Assis. Prof.Dr.Mohammed
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Academic Year: 2023- 2024

Course Book

1. Course name	Linear Models
2. Lecturer in charge	
3. Department/ College	
4. Contact	e-mail:mohammed.badal@su.edu.krd Tel: 009647504514031
5. Time (in hours) per week	Theory: 2 APPLICATION 1
6. Office hours	As per lectures time table
7. Course code	
8. Teacher's academic profile	e.g Webpage, Blog, Moodle... or few paragraphs about not less than 100 words
9. Keywords	Linear Models &Types of analytical of Regression, applied& fundamental ,bootstrap, transformation
10. Course overview:	
<p>regularly teaches a course in regression , discussion of neural networks, and regression model validation. Other topics that we would recommend for consideration are multicollinearity (because the problem occurs so often) and an introduction to generalized linear models focusing mostly on logistic regression. G.G.V. has taught a regression course for graduate students. We believe the computer should be directly integrated into the course. We also require that the students use regression software for solving the homework problems. In most cases, the problems use real data or are based on real - world settings that represent typical applications of regression.</p> <p>in statistics According to Clifford Woody research comprises defining and redefining problems, formulating hypothesis or suggested solutions; collecting, organizing and evaluating data; making deductions and reaching conclusions; and at last carefully testing the conclusions to determine whether they fit the formulating hypothesis</p>	
11. Course objective:	
<ul style="list-style-type: none"> ● To <i>gain familiarity</i> with a phenomenon or to achieve new insights into it (studies with this object in view are termed as <i>exploratory or formulative research studies</i>); ● To <i>portray accurately</i> the characteristics of a particular individual, situation or a group(studies with this object in view are known as <i>descriptive research studies</i>). ● To <i>determine the frequency</i> with which something occurs or with which it is associated with something else (studies with this object in view are known as <i>diagnostic research studies</i>); ● To <i>test a hypothesis</i> of a causal relationship between variables (such studies are known as <i>hypothesis-testing research studies</i>). 	

12. Student's obligation

- Student should attend lectures (theory part) and practicing by survey
- Student should attend exams or working in review article during the course.
- Team work projects

13. Forms of teaching

To achieve the objectives of the course, the following methods and techniques will be followed during teaching process:

1. Lecture notes will be handled to the students at the beginning of each part to facilitate easier understanding of books and also to read references.
2. Power point presentation for parts of the course as required.

14. Assessment scheme

Student must provide the following quizzes and exams during the course:

Annual Effort (50 %)		Total	
Lab Practices in review article *	Midterm Exam (Theoretical)	Theoretical	
25%	25%	50%	100%

* Quizzes and homework's are performed at the lab practices during the course.

15. Student learning outcome:

Students are expected at the end of the year will have the abilities to:

- Regression and Model Building
- Simple Linear Regression Model
- Estimation of β_0 and β_1 , Estimation of σ^2 , Hypothesis Testing
- Multiple Regression Models
- MODEL ADEQUACY CHECKING
- TRANSFORMATIONS AND WEIGHTING TO CORRECT MODEL INADEQUACIES
- MULTICOLLINEARITY
- VALIDATION OF REGRESSION MODELS
- Application of programs in computer laboratories by survey.

16. Course Reading List and References:

Students should read the lecture notes and the following references:

- Atkinson , A. C. [1985], Plots, Transformations, and Regression , Clarendon Press , Oxford
- Barnett , V. and T. Lewis [1994], Outliers in Statistical Data , 3rd ed. , Wiley , New York .
- Davis, G.B., "Introduction to Computers," 3rd ed., McGraw-Hill International

Book Co., 1981 <ul style="list-style-type: none"> • Davison , A. C. and D. V. Hinkley [1997], Bootstrap Methods and Their Application , Cambridge University Press , London • Farrar , D. E. and R. R. Glauber [1967], “ Multicollinearity in regression analysis: The problem revisited , ” Rev. Econ. Stat. , 49 , 92 – 107 . • Huber , P. J. [1981], Robust Statistics , Wiley , New York • Montgomery , D. C. , C. L. Jennings , and M. Kulahci [2008], Introduction to Time Series Analysis and Forecasting , Wiley , Hoboken, N.J . 	
17. The Topics:	Lecturer's name
	Lecturer's name ----- Date -----
18. Practical Topics (If there is any)	
Linear Models for Master degree two hour theory and one hours practice per week, means each subject after theory the student will attend the computer lab for practice, also home works or team works they will do in home.	Lecturer's name ----- 3 hrs per week Date -----
19. Examinations: <p>1. Compositional:</p> <p>In this type of exam, the questions usually start with Explain how, what are the reasons for...? Why...? How....?</p> <p>Example:</p> <p>Q1/ Consider the least - squares residuals $e_i = y_i - \hat{y}$, $i = 1, 2, \dots, n$, from the simple linear regression model. Find the variance of the residuals $\text{Var}(e_i)$. Is the variance of the residuals a constant? Discuss.</p> <p>Q2/ Suppose that a linear regression model with $k = 2$ regressors has been fit to $n = 25$ observations and $R^2 = 0.90$. a. Test for significance of regression at $\alpha = 0.05$. Use the results of the previous problem. b. What is the smallest value of R^2 that would lead to the conclusion of a significant regression if $\alpha = 0.05$? Are you surprised at how small this value of R^2 is?</p> <p>Q3/ Suppose that a linear regression model with $k = 2$ regressors has been fit to $n = 25$ observations and $R^2 = 0.90$. a. Test for significance of regression at $\alpha = 0.05$. Use the results of the previous problem.</p>	

b. What is the smallest value of R^2 that would lead to the conclusion of a significant regression if $\alpha = 0.05$? Are you surprised at how small this value of R^2 is?

Q4/ Show that an alternate computing formula for the regression sum of squares in a linear regression model is $SS_y = SS_T - SSE$

Q5/ Prove that R^2 is the square of the correlation between y and \hat{y}

20. Extra notes:

- analysis of data as to which *INFORMATION DESIGN* would prove to be more appropriate for his research project
- Finally it is important to remember that regression analysis is part of a broader data - analytic approach to problem solving

21. Peer review