

Homework 2

STAT W4315: Linear Regression Models

Simple Linear Regression Model

DUE: Tuesday, February, 23, 12:00 noon

- (1) Please sign your home work with your name and UNI number.
- (2) Homework must be submitted into the Statistics Homework Boxes room 904 on the 9th floor of SSW building.
- (3) Homework is due Tuesday, February, 23, 12:00 noon.
- (4) No late homework, under any circumstances, will be accepted.
- (5) At the end of semester, one of your lowest homework scores will be dropped before the final grade is calculated.
- (6) Your submitted solutions should consist of (i) the hand written (or printout) of the results with all the details, (ii) printout of the relevant figures, and (iii) the printout of the source code

This homework consists only of programming questions based on the material that we have covered so far in the course. (The problems are given below and the data is posted on CourseWorks.)

Please use MatLab or R to solve this homework.

Problem 1 (Question 1.20 in Chapter 1)

The Tri-City Office Equipment Corporation sells an imported copier on a franchise basis and performs preventive maintenance and repair service on this copier. The data below have been collected from 45 recent calls on users to perform routine preventive maintenance service; for each call, X is the number of copiers serviced and Y is the total number of

minutes spent by the service person. Assume that first-order regression model (1.1) is appropriate.

$i :$	1	2	3	...	43	44	45
$X_i :$	2	4	3	...	2	4	5
$Y_i :$	20	60	46	...	27	61	77

- (a)(10p) Obtain the estimated regression function.
- (b)(10p) Plot the estimated regression function and the data. How well does the estimated regression function fit the data?
- (c)(10p) Interpret b_0 in your estimated regression function. Does b_0 provide any relevant information here? Explain.
- (d)(10p) Obtain a point estimate of the mean service time when $X = 5$ copiers are serviced.

Problem 2 (Question 2.5 in Chapter 2)

Refer to Copier maintenance Problem 1.

- (a)(15p) Estimate the change in the mean service time when the number of copiers serviced increases by one. Use a 90 percent confidence interval. Interpret your confidence interval.
- (b)(15p) Conduct a t -test to determine whether or not there is a linear association between X and Y here; control the risk at 0.10. State the alternatives, decision rule, and conclusion. What is the P-value of your test?
- (c)(15p) Are your results in parts (a) and (b) consistent? Explain.
- (d)(15p) The manufacturer has suggested that the mean required time should not increase by more than 14 minutes for each additional copier that is serviced on a service call. Conduct a test to decide whether this standard is being satisfied by Tri-City. Control the risk of a Type I error at 0.05. State the alternatives, decision rule, and conclusion. What is the P-value of the test?

Please note that in the one-sided test the decision rule with the test statistic for controlling the level of significance at α is:

If $t^* \leq t(1 - \alpha; N - 2)$, conclude H_0 .

If $t^* > t(1 - \alpha; N - 2)$, conclude H_1 .