

Multiple Linear Regression

Xinyu Zhang

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Abstract

This report is about reproducing many regression analysis from Section 3.2 (pages 71-82), of *Chapter3. Linear Regression*, from the book “An Introduction to Statistical Learning” (by James et al)

Introduction

The goal is to provide advice on how to improve sales of the particular product. The idea is to determine whether there is relationship between advertising expenditure and sales, and if so, we would like to know the strength of this relationship and then we can instruct our client to adjust advertising budgets, thereby indirectly increasing sales. In other words, our goal is to develop an accurate model that can be used to predict sales on the basis of the three media (TV, radio, newspaper) budgets.

Data

The Advertising data set consists of Sales (in thousands of units) of a particular product in 200 different markets ($n = 200$), along with advertising budgets (in thousands of dollars) for the product in each of those markets for three different media: TV, Radio, and Newspaper.

setwd(“/Users/MandyZhang/Desktop/stat_159/hw03”)

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	7.03	0.46	15.36	0.00
eda\$TV	0.05	0.00	17.67	0.00

Table 1: Simple regression of Sales on TV

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	9.31	0.56	16.54	0.00
eda\$Radio	0.20	0.02	9.92	0.00

Table 2: Simple regression of Sales on Radio

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	12.35	0.62	19.88	0.00
eda\$Newspaper	0.05	0.02	3.30	0.00

Table 3: Simple regression of Sales on Newspaper

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.94	0.31	9.42	0.00
TV	0.05	0.00	32.81	0.00
Radio	0.19	0.01	21.89	0.00
Newspaper	-0.00	0.01	-0.18	0.86

Table 4: Coefficient estimates of the least squares model

	TV	Radio	Newspaper	Sales
TV	1.00	0.05	0.06	0.78
Radio	0.05	1.00	0.35	0.58
Newspaper	0.06	0.35	1.00	0.23
Sales	0.78	0.58	0.23	1.00

Table 5: Correlation matrix

Quantity	Value
Residual standard error	1.69
R2	0.90
F-statistic	570.30

Table 6: Regression Quality Indices