

R Material for Chapter 07

```
> attach(sales.data)
> sales.data
  young income sales
1  68.5   16.7 174.4
2  45.2   16.8 164.4
3  91.3   18.2 244.2
4  47.8   16.3 154.6
5  46.9   17.3 181.6
6  66.1   18.2 207.5
7  49.5   15.9 152.8
8  52.0   17.2 163.2
9  48.9   16.6 145.4
10 38.4   16.0 137.2
11 87.9   18.3 241.9
12 72.8   17.1 191.1
13 88.4   17.4 232.0
14 42.9   15.8 145.3
15 52.5   17.8 161.1
16 85.7   18.4 209.7
17 41.3   16.5 146.4
18 51.7   16.3 144.0
19 89.6   18.1 232.6
20 82.7   19.1 224.1
21 52.3   16.0 166.5

> reg <- lm(sales~ young + income)

> summary(reg)

Call:
lm(formula = sales ~ young + income)

Residuals:
    Min       1Q   Median       3Q      Max
-18.4239  -6.2161   0.7449   9.4356  20.2151

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -68.8571    60.0170  -1.147  0.2663
young         1.4546     0.2118   6.868 2e-06 ***
income        9.3655     4.0640   2.305 0.0333 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 11.01 on 18 degrees of freedom
Multiple R-squared:  0.9167,    Adjusted R-squared:  0.9075
F-statistic: 99.1 on 2 and 18 DF,  p-value: 1.921e-10

Sums of Squares:

> anova(reg)
Analysis of Variance Table

Response: sales
  Df Sum Sq Mean Sq F value Pr(>F)
young  1 23371.8 23371.8 192.8962 4.64e-11 ***
income  1   643.5   643.5   5.3108 0.03332 *
Residuals 18  2180.9   121.2

## Sums of Squares here are the type I
## (Sequential Sums of Squares)
```

```

> drop1(reg)
Single term deletions

Model:
sales ~ young + income
      Df Sum of Sq  RSS   AIC
<none>                2180.9 103.50    ## Sums of Squares here are the type III (Drop a
young   1    5715.5 7896.4 128.52    ## predictor?) Sums of Squares
income  1     643.5 2824.4 106.93

```

Correlation Transformation:

```

> msales <- mean(sales)
> sdsales <- sd(sales)
> sales.star <- (sales - msales)/(sdsales*sqrt(20)) ## transformation of the response

> myoung <- mean(young)
> sdyoung <- sd(young)
> young.star <- (young - myoung)/(sdyoung*sqrt(20)) ## transformation of first predictor

> mincome <- mean(income)
> sdcincome <- sd(income)
> income.star <- (income - mincome)/(sdcincome*sqrt(20))##transformation of second predictor

> reg2 <- lm(sales.star ~ young.star + income.star - 1) ## fits no intercept model to the
## transformed data

```

```

> summary(reg2)

```

```

Call:
lm(formula = sales.star ~ young.star + income.star - 1)

```

```

Residuals:
    Min       1Q   Median       3Q      Max
-0.113831 -0.038406  0.004602  0.058298  0.124898

```

```

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
young.star    0.7484    0.1061   7.056 1.03e-06 ***
income.star   0.2511    0.1061   2.368  0.0287 *
---
## coefficients for no intercept
## model on transformed data

```

```

Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

Residual standard error: 0.06619 on 19 degrees of freedom
Multiple R-squared:  0.9167,    Adjusted R-squared:  0.908
F-statistic: 104.6 on 2 and 19 DF,  p-value: 5.544e-11

```