Lab 03 - Regression

AML

28/10/2020

Simple Linear Regression

Setup

```
library(ggplot2)
library(stargazer)
```

```
##
## Please cite as:
```

```
##  Hlavac, Marek (2018). stargazer: Well-Formatted Regression and Summary Statistics Tables.
```

```
##  R package version 5.2.2. https://CRAN.R-project.org/package=stargazer
```

```
library(data.table)
library(Hmisc)
```

```
## Loading required package: lattice
```

```
## Loading required package: survival
```

```
## Loading required package: Formula
```

```
##
## Attaching package: 'Hmisc'
```

```
## The following objects are masked from 'package:base':
##
##     format.pval, units
```

```
setwd("/Users/andrea/Desktop/UEA/Classes/Econometrics/Data")
```

Read the csv file

```
sales <- read.csv("sales-data.csv")
dt.sales <- data.table(sales)
rm(sales)
```

Explore the data

```
nrow(dt.sales)
```

```
## [1] 22
```

```
ncol(dt.sales)
```

```
## [1] 2
```

```
head(dt.sales)
```

```
##    sales advertising
## 1:   999          48
## 2:  1169          50
## 3:  1036          68
## 4:   643          52
## 5:   988          76
## 6:  1076          74
```

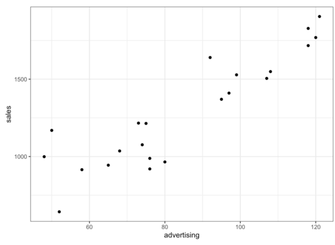
```
stargazer(dt.sales, type="text")
```

```
##
## ===============================================================
## Statistic   N    Mean    St. Dev. Min Pctl(25) Pctl(75)  Max
## ---------------------------------------------------------------
## sales      22 1,286.636 353.621  643  990.8   1,543.8  1,905
## advertising 22  85.000   23.759  48    69.2     105     121
## ---------------------------------------------------------------
```

```
summary(dt.sales)
```

```
##      sales          advertising
##  Min.   : 643.0   Min.   : 48.00
##  1st Qu.: 990.8   1st Qu.: 69.25
##  Median :1215.0   Median : 78.00
##  Mean   :1286.4   Mean   : 85.00
##  3rd Qu.:1543.8   3rd Qu.:105.00
##  Max.   :1905.0   Max.   :121.00
```

```
qplot( data = dt.sales
       , x = advertising
       , y = sales
       , geom = "point") +
  theme_bw()
```



What relationships do we observe?

```
dt.sales[, cor(sales, advertising)]
```

```
## [1] 0.9003409
```

```
dt.sales[, rcorr(sales, advertising)]
```

```
##      x   y
## x 1.0 0.9
## y 0.9 1.0
##
## n= 22
##
##
## P
##   x  y
## x    0
## y  0
```

Simple Regression Analysis

```
lm.sales <- lm(sales ~ advertising, data=dt.sales)
summary(lm.sales)
```

```
##
## Call:
## lm(formula = sales ~ advertising, data = dt.sales)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -254.63  -71.78  -17.34   82.97  351.38
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  147.590    127.618   1.157    0.261
## advertising   13.401      1.448   9.252 1.15e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 157.7 on 20 degrees of freedom
## Multiple R-squared:  0.8106, Adjusted R-squared:  0.8011
## F-statistic:  85.6 on 1 and 20 DF,  p-value: 1.15e-08
```

```
stargazer(lm.sales, type = "text")
```

```
##
## ================================================
##                         Dependent variable:
##                     ---------------------------
##                                sales
## ------------------------------------------------
## advertising                   13.401***
##                               (1.448)
##
## Constant                      147.590
##                              (127.618)
##
## ------------------------------------------------
## Observations                    22
## R2                             0.811
## Adjusted R2                    0.801
## Residual Std. Error      157.691 (df = 20)
## F Statistic         85.604*** (df = 1; 20)
## ================================================
## Note:                *p<0.1; **p<0.05; ***p<0.01
```

```
coeffs = coefficients(lm.sales)
coeffs
```

```
## (Intercept) advertising
##   147.59047    13.40054
```

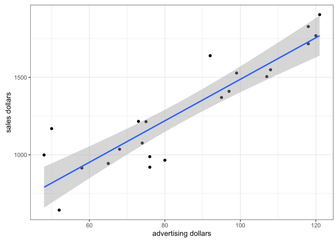
Interpretation

Plot

```
qplot( data = dt.sales
       , x = advertising
       , y = sales
       , geom = c("point", "smooth")
       , method = lm) +
  theme_bw() +
  labs( x = "advertising dollars", y = "sales dollars")
```

```
## Warning: Ignoring unknown parameters: method
```

```
## `geom_smooth()` using formula 'y ~ x'
```



Predicted values

```
advertising = 100
sales = coeffs[1] + coeffs[2]*advertising
sales
```

```
## (Intercept)
##    1487.644
```

```
my.budget = data.table(advertising=100)
predict(lm.sales, my.budget)
```

```
##        1
## 1487.644
```

```
predict(lm.sales, my.budget, interval="predict")
```

```
##        fit      lwr      upr
## 1 1487.644 1148.274 1827.014
```