Econometrics 1 - Case Study 1

2022-10-17

0 Import data

```
data = read.csv("ELCONS_GDP.csv")
head(data)
```

```
##   COUNTRY TOTALCONS      GDP
## 1     AUS    179852 537613.6
## 2     AUT     52553 235450.2
## 3     BEL     79166 284950.5
## 4     CAN    503403 901029.6
## 5     CHL     37141 146574.2
## 6     CZE     52292 166568.3
```

1 Data Analysis

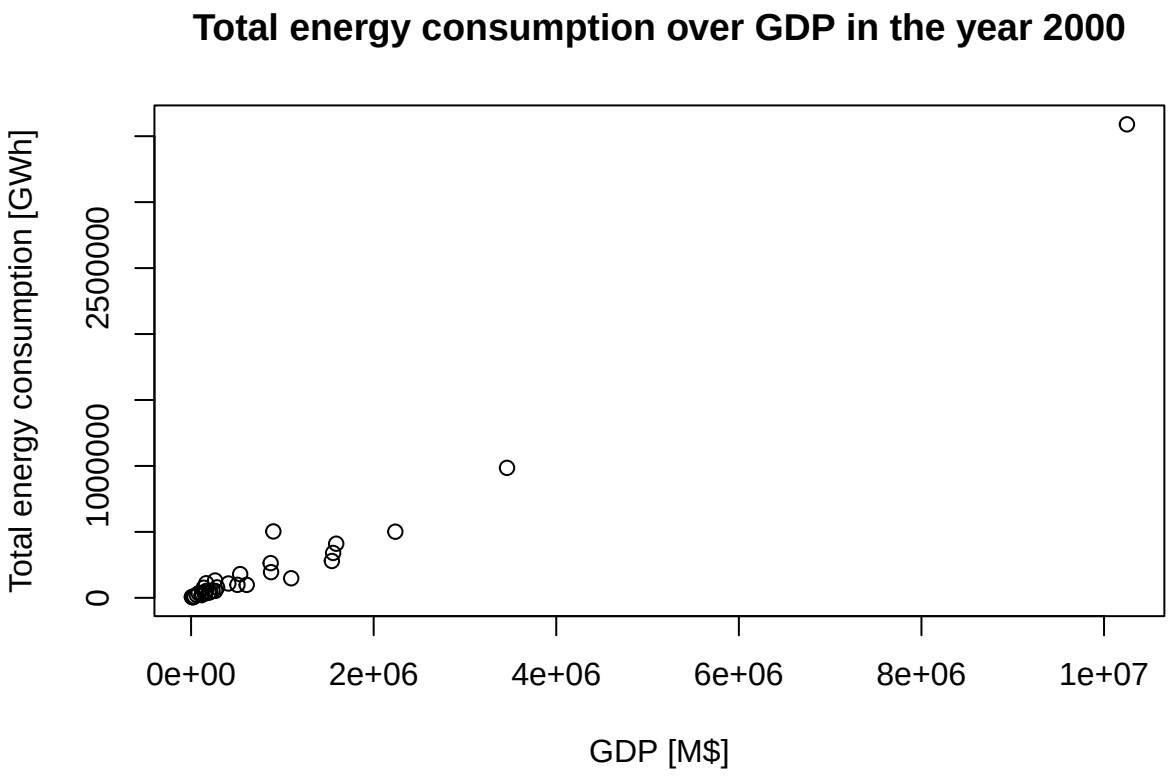
```
summary(data)
```

```
##    COUNTRY            TOTALCONS            GDP
##  Length:35          Min.   :   4484   Min.   :    8378
##  Class :character   1st Qu.:  33843   1st Qu.:  129894
##  Mode  :character   Median :  76468   Median :  235450
##                     Mean   : 245447   Mean   :  837337
##                     3rd Qu.: 187280   3rd Qu.:  873755
##                     Max.   :3589779   Max.   :10250952
```

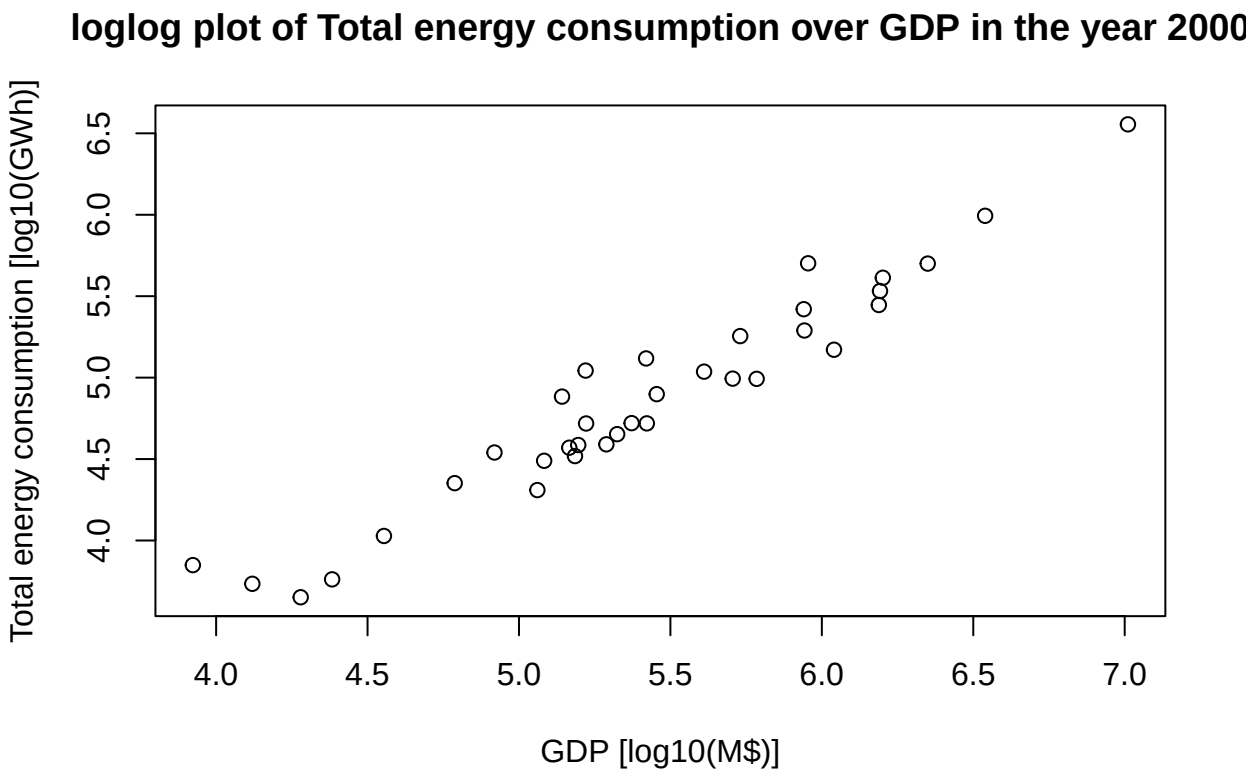
The mean of GDP is ... # TODO

```
#define plot labels
xlabel="GDP [M$]"
ylabel="Total energy consumption [GWh]"
xloglabel="GDP [log10(M$)]"
yloglabel="Total energy consumption [log10(GWh)]"
```

```
plot(data$GDP, data$TOTALCONS,
     main="Total energy consumption over GDP in the year 2000",
     xlab=xlabel,
     ylab=ylabel)
```




```
plot(log10(data$GDP), log10(data$TOTALCONS),
     main="loglog plot of Total energy consumption over GDP in the year 2000",
     xlab=xloglabel,
     ylab=yloglabel)
```



1.2 Simple linear regression

A simple linear regression with a vanishing error term ($E(u) = 0$) is easily possible with built-in commands:

```
ols = lm(
         TOTALCONS ~ GDP,
         data = data
)
summary(ols)
```

```
##
## Call:
## lm(formula = TOTALCONS ~ GDP, data = data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -217087  -17446   20405   37307  236430
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -3.754e+04  1.791e+04  -2.096   0.0438 *
## GDP          3.380e-01  9.134e-03  37.001   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 95810 on 33 degrees of freedom
## Multiple R-squared:  0.9765, Adjusted R-squared:  0.9758
## F-statistic:  1369 on 1 and 33 DF,  p-value: < 2.2e-16
```

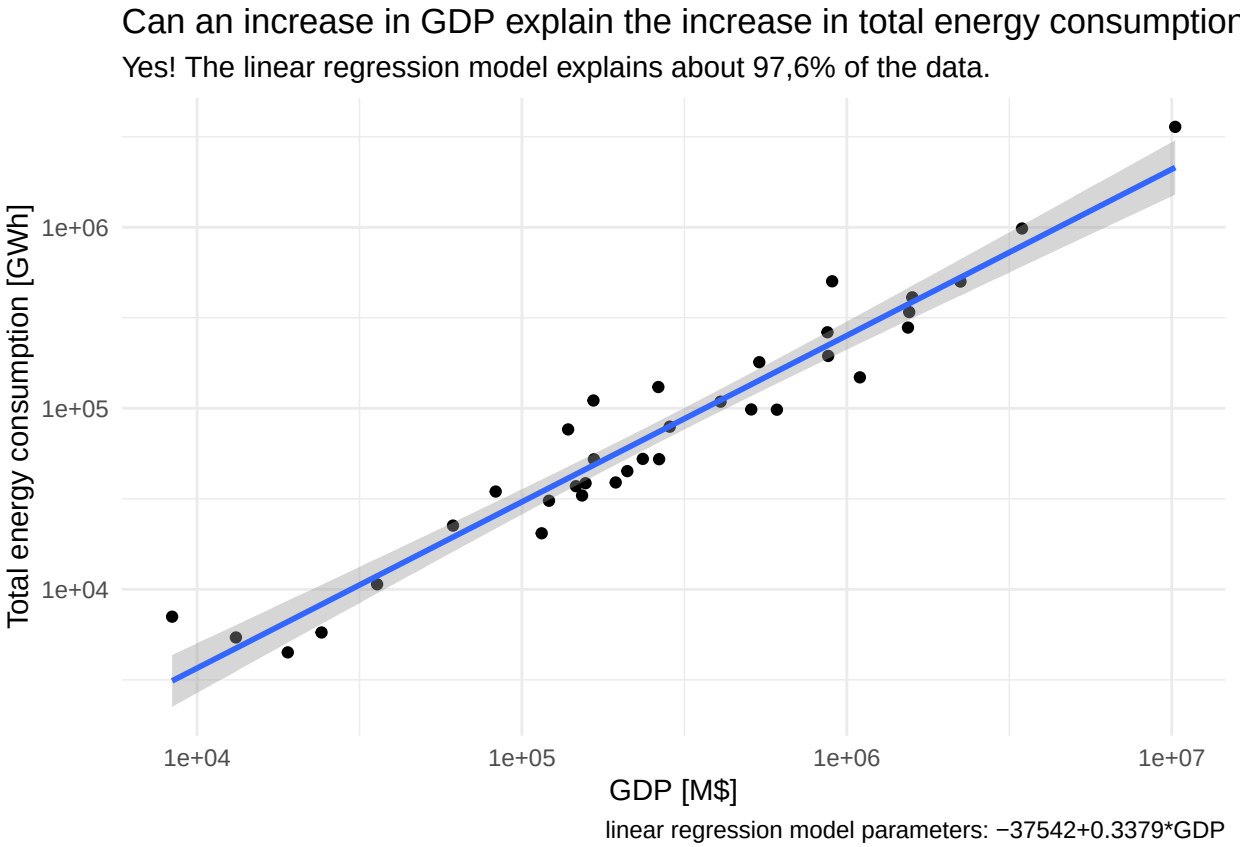
```
ols$coefficients
```

```
##   (Intercept)           GDP
## -3.754232e+04  3.379637e-01
```

```
#install.packages("dplyr")
library(dplyr)
#install.packages("ggplot2")
library(ggplot2)
```

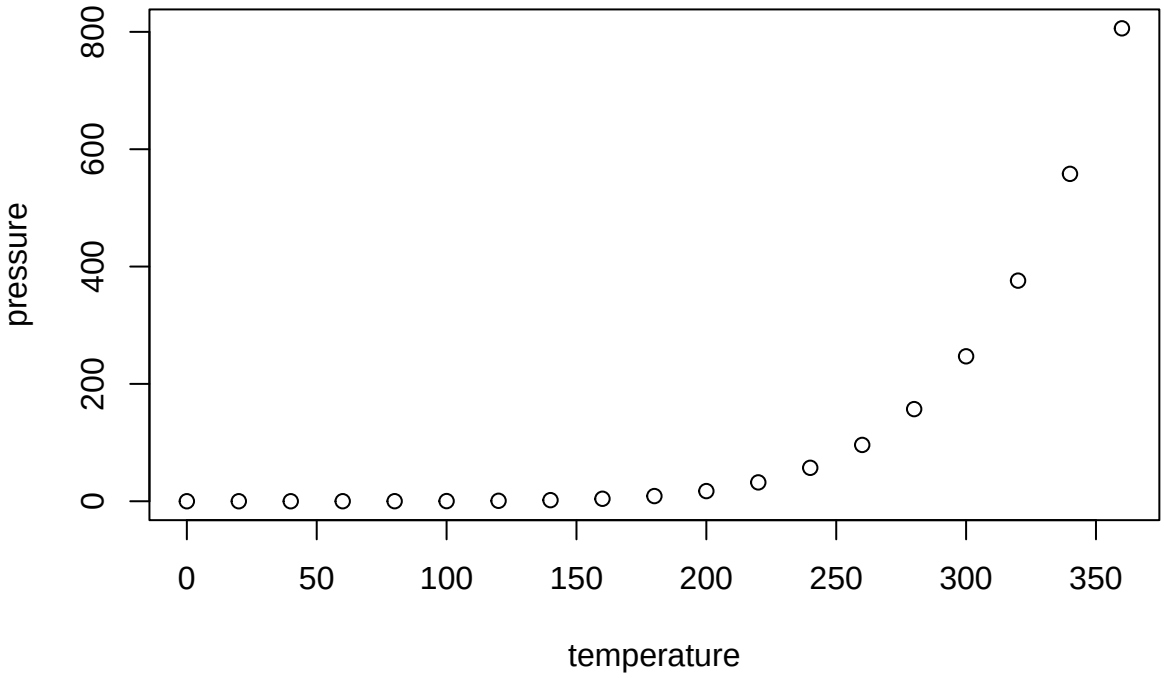
```
data %>% ggplot(mapping = aes(x = GDP, y = TOTALCONS)) +
  theme_minimal() +
  geom_point() +
  #geom_smooth(method = "lm", se = FALSE) + #no standard error plotted
  geom_smooth(method = "lm") +
  labs(x=xlabel, y=ylabel,
       title="Can an increase in GDP explain the increase in total energy consumption?",
       subtitles="Yes! The linear regression model explains about 97,6% of the data.",
       caption="linear regression model parameters: -37542+0.3379*GDP") +
  scale_x_continuous(trans='log10') +
  scale_y_continuous(trans='log10')
```

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



Including Plots

You can also embed plots, for example:



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.