creative tech 2019 fall

October 24, 2019

Design Challenge 8: Data Visualization
Start with loading the data:

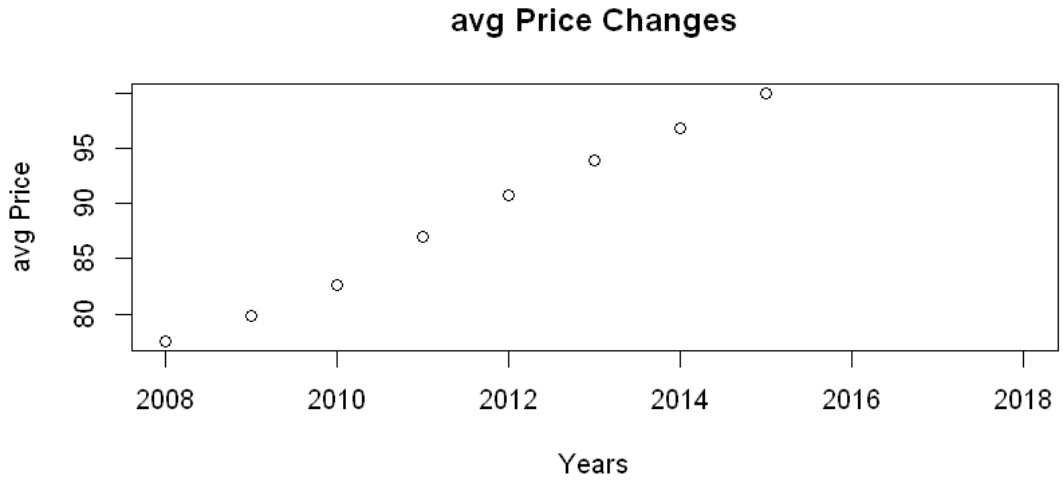
```
In [1]: data <- read.csv("World Energy Prices Consumer Price Indices.csv",check.name=F)
        data[data==".."]<-NA
        data<-data[-116,]
        country=data[,1]
        year<-data[1,]
        data<-data[,-1]
        row.names(data)<-country
        str(data)
```

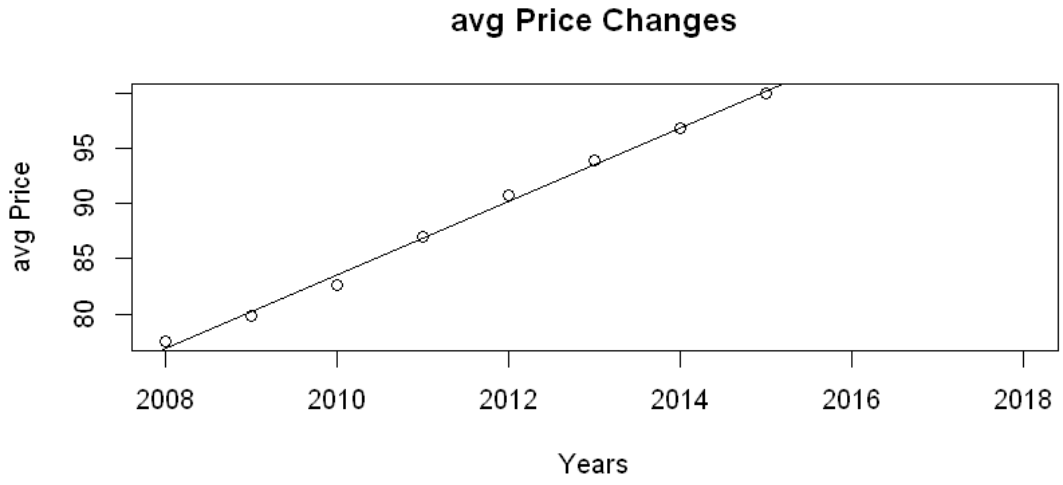
```
'data.frame':        115 obs. of  11 variables:
 $ 2008: num  79 84.7 71.8 71.7 85.2 88.3 79.2 86.3 60.7 21.2 ...
 $ 2009: num  73.6 86.6 75.9 74.1 86.7 88.7 80.3 88.7 64 24 ...
 $ 2010: num  75.3 89.8 78.9 80.1 89.3 90.3 84.9 90.5 69.2 25.8 ...
 $ 2011: num  84.1 92.9 82.5 86.3 92.2 93.3 91.6 90.1 77.1 39.6 ...
 $ 2012: num  89.6 94.7 89.8 88.5 93.8 95.6 92.6 92.6 81.8 63 ...
 $ 2013: num  96.2 96.6 92.7 93.6 96.1 97.5 94.8 95.7 88 74.6 ...
 $ 2014: num  100.7 98.1 95.4 96.4 98.5 ...
 $ 2015: int  100 100 100 100 100 100 100 100 100 100 ...
 $ 2016: Factor w/ 66 levels "","..","100",..: 33 15 40 58 15 12 49 24 36 48 ...
 $ 2017: Factor w/ 80 levels "","..","100",..: 52 24 60 78 24 22 70 31 56 66 ...
 $ 2018: Factor w/ 82 levels "","..","100.3",..: NA 37 71 13 35 34 78 43 73 76 ...
```

We can find the avg price for each year:

```
In [3]: for(i in 1:11){
            y[i]=2007+i
            p[i]=mean(as.numeric(data[,i]), na.rm = F)
            print(paste("The avg price of year",y[i],"is",p[i]))
            i=i+1
            }
        par(mfrow=c(2,1))
        plot(y,p,xlab="Years", ylab="avg Price",main="avg Price Changes")
        plot(y,p,xlab="Years", ylab="avg Price",main="avg Price Changes")
        abline(lm(p~y))
```

```
[1] "The avg price of year 2008 is 77.54"
[1] "The avg price of year 2009 is 79.7634782608696"
[1] "The avg price of year 2010 is 82.5886956521739"
[1] "The avg price of year 2011 is 86.9886956521739"
[1] "The avg price of year 2012 is 90.7252173913044"
[1] "The avg price of year 2013 is 93.9582608695652"
[1] "The avg price of year 2014 is 96.8747826086957"
[1] "The avg price of year 2015 is 100"
[1] "The avg price of year 2016 is NA"
[1] "The avg price of year 2017 is NA"
[1] "The avg price of year 2018 is NA"
```

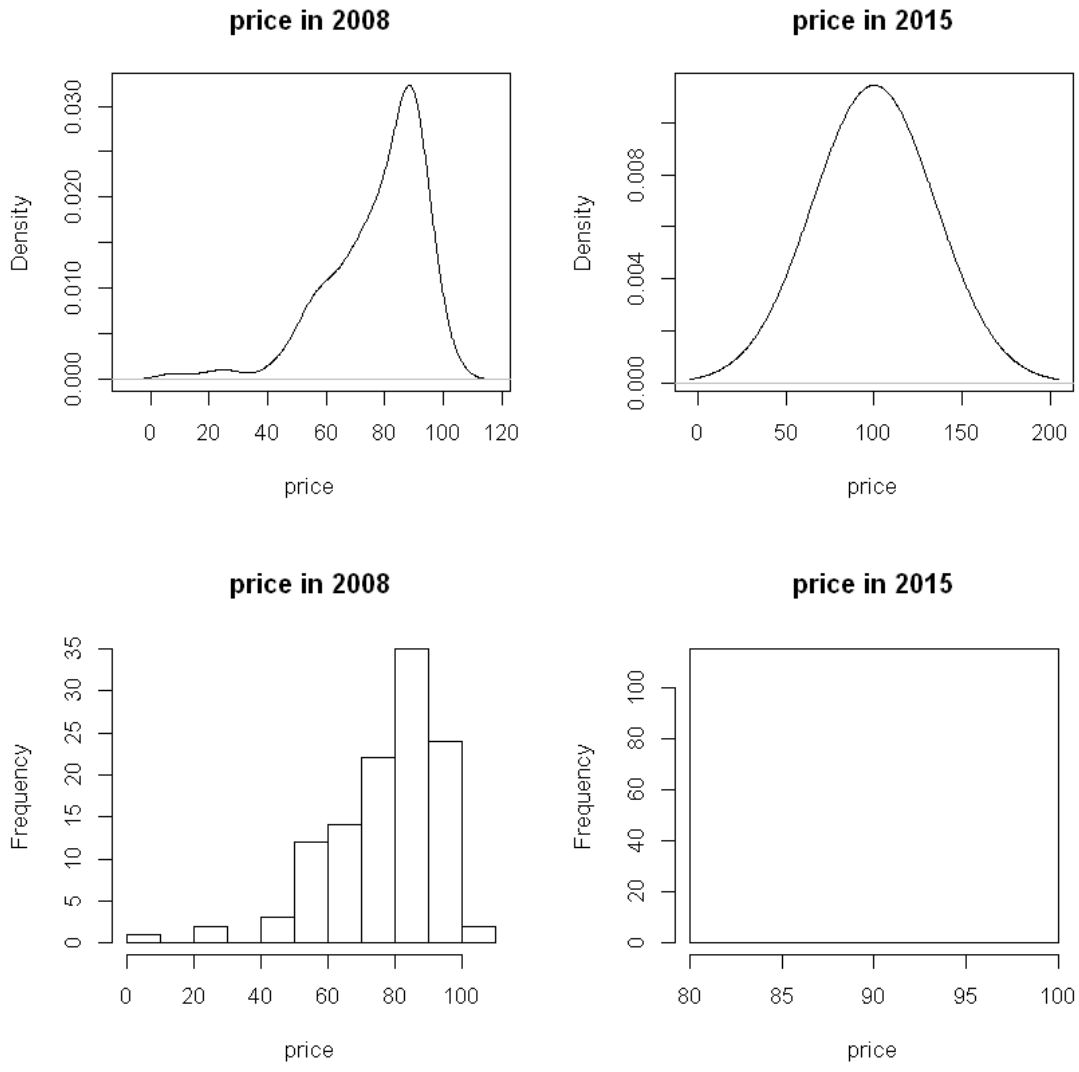




Then we can plot the densiry graph and the histogram for 2008 and 2015, observe the price

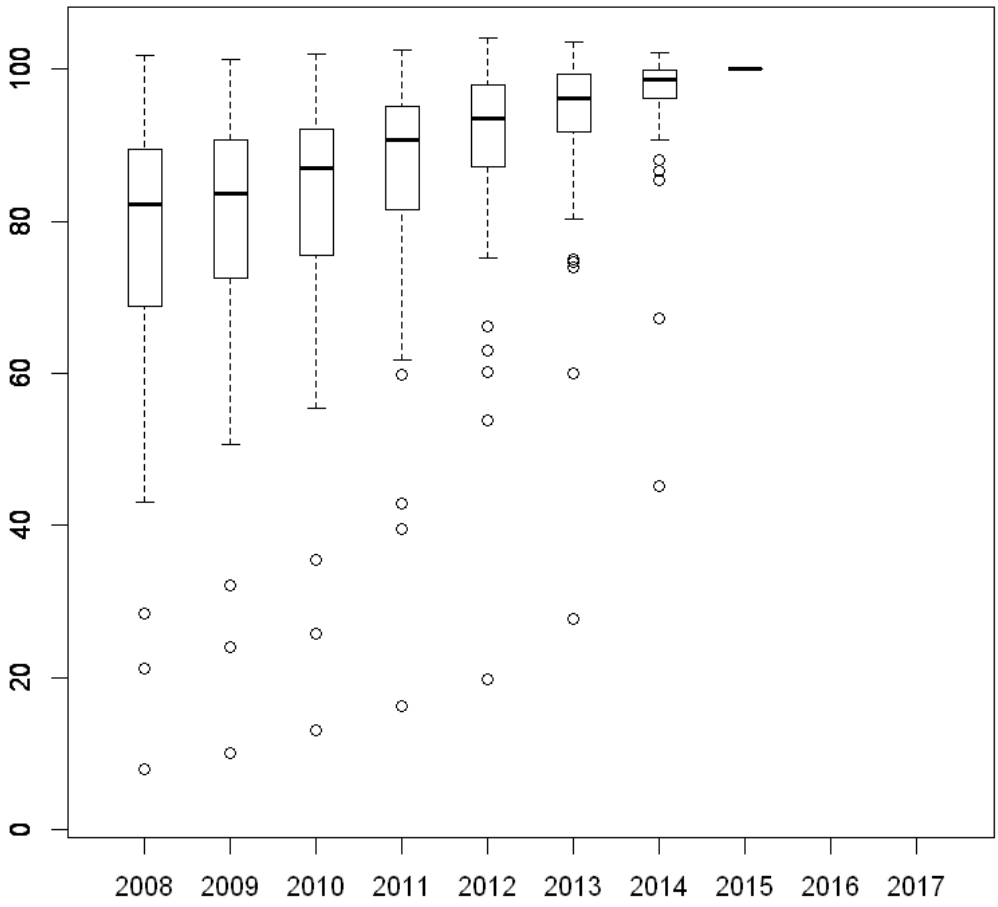
distribution and compare the differences between the two years.

```
In [4]: par(mfrow=c(2,2))
        plot(density(data[,1]),xlab="price",ylab="Density", main="price in 2008")
        plot(density(data[,8]),xlab="price",ylab="Density", main="price in 2015")
        hist(data[,1],xlab="price",ylab="Frequency", main="price in 2008")
        hist(data[,8],xlab="price",ylab="Frequency", main="price in 2015")
```



We can also use boxplot to observe the price distribution and price changes in different years.

```
In [5]: boxplot(data[,-11], boxfill = NA, border = NA)
        for(i in 1:8){
            boxplot(data[,i], add=TRUE, at=i)
        }
```



We can also calculate the avg price of each country in these years, and observe their distribution through boxplot.

```
In [6]: for(i in 1:115){
            data1<- subset(data, select=-c(9:11))
            p[i]=mean(as.numeric(data1[i,]), na.rm = F)
            print(paste("The avg price of",country[i],"is",p[i]))
            i=i+1
            }
        boxplot(p)
```

```
[1] "The avg price of Afghanistan is 87.3125"
[1] "The avg price of Albania is 92.925"
[1] "The avg price of Algeria is 85.875"
```

```
[1] "The avg price of Armenia is 86.3375"
[1] "The avg price of Australia is 92.725"
[1] "The avg price of Austria is 94.1"
[1] "The avg price of Azerbaijan is 89.9375"
[1] "The avg price of Bahrain is 92.7625"
[1] "The avg price of Bangladesh is 79.375"
[1] "The avg price of Belarus is 54.5375"
[1] "The avg price of Belgium is 95.5125"
[1] "The avg price of Benin is 95.125"
[1] "The avg price of Plurinational State of Bolivia is 84.1875"
[1] "The avg price of Bosnia and Herzegovina is 98.825"
[1] "The avg price of Botswana is 83.7625"
[1] "The avg price of Brazil is 80.375"
[1] "The avg price of Bulgaria is 96.8125"
[1] "The avg price of Cabo Verde is 95.8"
[1] "The avg price of Canada is 94.9"
[1] "The avg price of Chad is 90.4625"
[1] "The avg price of Chile is 89.4125"
[1] "The avg price of People's Republic of China is 92.2125"
[1] "The avg price of Colombia is 89.3"
[1] "The avg price of Costa Rica is 87.875"
[1] "The avg price of Cote d'Ivoire is 94.375"
[1] "The avg price of Croatia is 96.2875"
[1] "The avg price of Cyprus is 100.1375"
[1] "The avg price of Czech Republic is 95.8875"
[1] "The avg price of Denmark is 95.9"
[1] "The avg price of Dominican Republic is 88.7625"
[1] "The avg price of Ecuador is 87.8625"
[1] "The avg price of Egypt is 73.8375"
[1] "The avg price of El Salvador is 96.325"
[1] "The avg price of Estonia is 94.65"
[1] "The avg price of Finland is 95.7125"
[1] "The avg price of Former Yugoslav Republic of Macedonia is 95.625"
[1] "The avg price of France is 97"
[1] "The avg price of Georgia is 90.825"
[1] "The avg price of Germany is 96"
[1] "The avg price of Ghana is 67.3"
[1] "The avg price of Greece is 99.8875"
[1] "The avg price of Guatemala is 88.575"
[1] "The avg price of Honduras is 84.8625"
[1] "The avg price of Hong Kong (China) is 88.075"
[1] "The avg price of Hungary is 93.7375"
[1] "The avg price of Iceland is 89.15"
[1] "The avg price of India is 77.2875"
[1] "The avg price of Indonesia is 82.675"
[1] "The avg price of Islamic Republic of Iran is 56.9625"
[1] "The avg price of Ireland is 98.8375"
[1] "The avg price of Israel is 96.2125"
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[1] "The avg price of Italy is 96.15"
[1] "The avg price of Japan is 97.5625"
[1] "The avg price of Jordan is 91.5375"
[1] "The avg price of Kazakhstan is 80.7625"
[1] "The avg price of Kenya is 78.7125"
[1] "The avg price of Korea is 94.3"
[1] "The avg price of Kosovo is 94.925"
[1] "The avg price of Kyrgyzstan is 79.2"
[1] "The avg price of Lao People's Democratic Republic is 87.1875"
[1] "The avg price of Latvia is 96.625"
[1] "The avg price of Lithuania is 96.325"
[1] "The avg price of Luxembourg is 95.075"
[1] "The avg price of Madagascar is 79.975"
[1] "The avg price of Malaysia is 92.5"
[1] "The avg price of Malta is 95.375"
[1] "The avg price of Mauritania is 87.1875"
[1] "The avg price of Mauritius is 89.9375"
[1] "The avg price of Mexico is 88.525"
[1] "The avg price of Republic of Moldova is 81.375"
[1] "The avg price of Mongolia is 73.4375"
[1] "The avg price of Montenegro is 94.25"
[1] "The avg price of Morocco is 95.9125"
[1] "The avg price of Namibia is 84.5125"
[1] "The avg price of Netherlands is 94.8625"
[1] "The avg price of New Zealand is 95.4875"
[1] "The avg price of Nicaragua is 82.4625"
[1] "The avg price of Niger is 98.25"
[1] "The avg price of Nigeria is 74.05"
[1] "The avg price of Norway is 93.875"
[1] "The avg price of Oman is 94.6625"
[1] "The avg price of Pakistan is 79.05"
[1] "The avg price of Panama is 90.3125"
[1] "The avg price of Paraguay is 87.1375"
[1] "The avg price of Peru is 89.825"
[1] "The avg price of Philippines is 91.2"
[1] "The avg price of Poland is 95.9375"
[1] "The avg price of Portugal is 96.75"
[1] "The avg price of Qatar is 94.0875"
[1] "The avg price of Romania is 92.0875"
[1] "The avg price of Russian Federation is 74.6"
[1] "The avg price of Saudi Arabia is 90.5125"
[1] "The avg price of Senegal is 98.3375"
[1] "The avg price of Serbia is 85.0125"
[1] "The avg price of Singapore is 93.725"
[1] "The avg price of Slovak Republic is 96.0125"
[1] "The avg price of Slovenia is 96.825"
[1] "The avg price of South Africa is 83.8875"
[1] "The avg price of Spain is 97"
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[1] "The avg price of Sri Lanka is 84.4375"
[1] "The avg price of Sweden is 98.475"
[1] "The avg price of Switzerland is 101.3375"
[1] "The avg price of Tajikistan is 81.2875"
[1] "The avg price of United Republic of Tanzania is 76.7375"
[1] "The avg price of Thailand is 94.725"
[1] "The avg price of Tunisia is 85.3625"
[1] "The avg price of Turkey is 77.6875"
[1] "The avg price of Uganda is 79.925"
[1] "The avg price of Ukraine is 62.1125"
[1] "The avg price of United Arab Emirates is 93.3375"
[1] "The avg price of United Kingdom is 93.95"
[1] "The avg price of United States is 95.4125"
[1] "The avg price of Uruguay is 76.7"
[1] "The avg price of Bolivarian Rep. of Venezuela is 30.0125"
[1] "The avg price of Viet Nam is 81.8125"
```

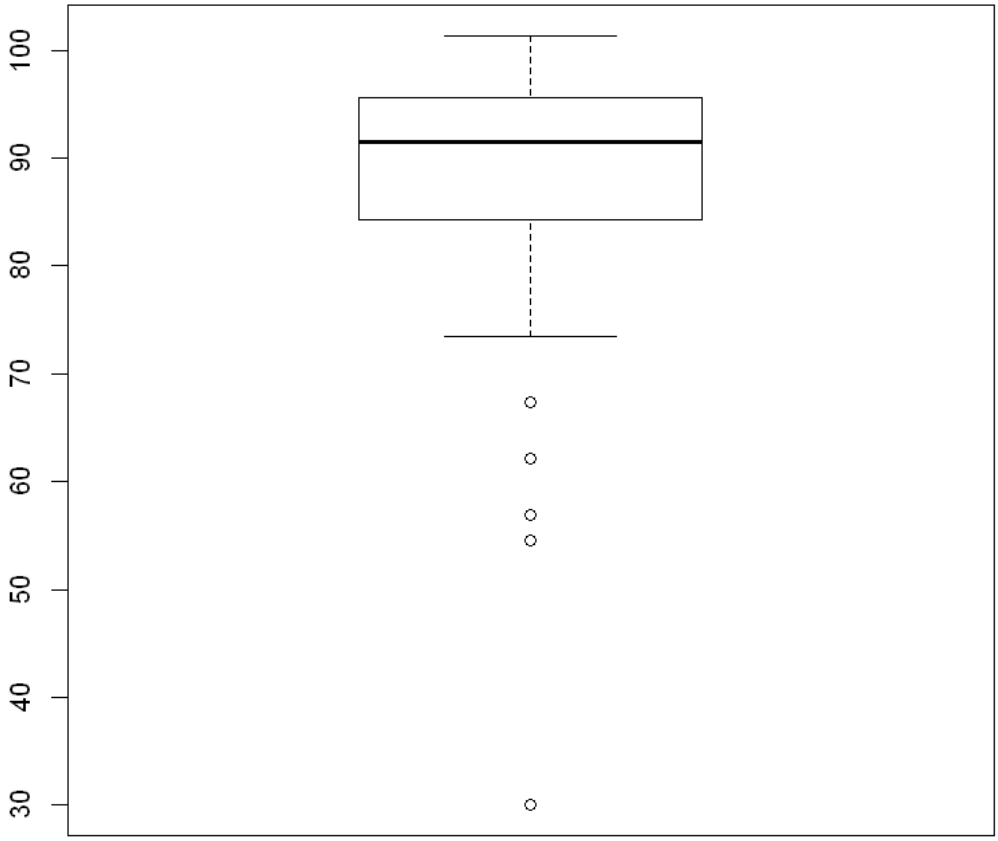
100
90
80
70
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