STAT 22651

STATISTICAL PROGRAMMING

GROUP 04

INTRODUCTION

- The World Bank's ESG Data Draft dataset offers insights into 17 crucial areas of sustainability, covering environmental, social, and governance concerns.
- To realign financial investments with global objectives, the World Bank Group (WBG) is enhancing data and analytics for financial markets.
- This effort aims to provide a clearer understanding of how countries are performing in terms of sustainability.
- Additionally, the World Bank intends to conduct research exploring how a country's sustainability performance relates to the risks and returns associated with investments.
- Ultimately, the goal is to encourage investments that support global sustainability targets while delivering favorable financial outcomes.

For this group project,

our task was analyzing the three countries

GERMANY

SPAIN

UNITED KINGDOM.

IMPORT THE DATA SET INTO R.

```
#Import the data set
#C:/Users/DELL/Desktop/R PROJECT/Group4.CSV
mydata<-read.csv("C:/Users/DELL/Desktop/FINAL DATA SET. GROUP 04.csv")
mydata
```

Country.Name <chr>	Country.Code <chr>
Germany	DEU
Germany	DEU
Germany	DEU
Germany	DEU
Germany	DEU
Germany	DEU
Germany	DEU
Germany	DEU
Germany	DEU
Germany	DEU

1–10 of 212 rows | 1–2 of 68 columns

Previous 1 2 3 4 5 6 ... 22 Next

FIND THE MISSING DATA COUNT IN THE DATA SET.

```
#Find the missing data count in the data set
missing_count <- colSums(is.na(mydata))
missing_count
```

Country.Name	Country.Code	Indicator.Name	Indicator.Code	X1960	X1961
0	0	0	0	181	172
X1962	X1963	X1964	X1965	X1966	X1967
172	172	172	172	172	172
X1968	X1969	X1970	X1971	X1972	X1973
169	169	152	150	150	150
X1974	X1975	X1976	X1977	X1978	X1979
150	145	145	145	145	144
X1980	X1981	X1982	X1983	X1984	X1985
135	138	139	139	139	135
X1986	X1987	X1988	X1989	X1990	X1991
139	139	139	139	98	92
X1992	X1993	X1994	X1995	X1996	X1997
92	92	92	85	65	80
X1998	X1999	X2000	X2001	X2002	X2003
60	78	39	62	41	38
X2004	X2005	X2006	X2007	X2008	X2009
37	34	37	34	34	34
X2010	X2011	X2012	X2013	X2014	X2015
31	33	31	28	28	25
X2016	X2017	X2018	X2019	X2020	X2021
40	42	41	46	56	111
X2022	X2023				
168	206				

FIND THE EMPTY VALUES COUNT OF THE DATA SET.

```
#Find the empty values count of the data set
empty_count <- colSums(mydata == "0")
empty_count
```

```
Country.Name Country.Code Indicator.Name Indicator.Code        X1960        X1961
           0            0              0              0           NA           NA
       X1962        X1963          X1964          X1965        X1966        X1967
          NA           NA             NA             NA           NA           NA
       X1968        X1969          X1970          X1971        X1972        X1973
          NA           NA             NA             NA           NA           NA
       X1974        X1975          X1976          X1977        X1978        X1979
          NA           NA             NA             NA           NA           NA
       X1980        X1981          X1982          X1983        X1984        X1985
          NA           NA             NA             NA           NA           NA
       X1986        X1987          X1988          X1989        X1990        X1991
          NA           NA             NA             NA           NA           NA
       X1992        X1993          X1994          X1995        X1996        X1997
          NA           NA             NA             NA           NA           NA
       X1998        X1999          X2000          X2001        X2002        X2003
          NA           NA             NA             NA           NA           NA
       X2004        X2005          X2006          X2007        X2008        X2009
          NA           NA             NA             NA           NA           NA
       X2010        X2011          X2012          X2013        X2014        X2015
          NA           NA             NA             NA           NA           NA
       X2016        X2017          X2018          X2019        X2020        X2021
          NA           NA             NA             NA           NA           NA
       X2022        X2023
          NA           NA
```

Country.Name	Country.Code	Indicator.Name	Indicator.Code	X1960	X1961
0	0	0	0	181	172
X1962	X1963	X1964	X1965	X1966	X1967
172	172	172	172	172	172
X1968	X1969	X1970	X1971	X1972	X1973
169	169	152	150	150	150
X1974	X1975	X1976	X1977	X1978	X1979
150	145	145	145	145	144
X1980	X1981	X1982	X1983	X1984	X1985
135	138	139	139	139	135
X1986	X1987	X1988	X1989	X1990	X1991
139	139	139	139	98	92
X1992	X1993	X1994	X1995	X1996	X1997
92	92	92	85	65	80
X1998	X1999	X2000	X2001	X2002	X2003
60	78	39	62	41	38
X2004	X2005	X2006	X2007	X2008	X2009
37	34	37	34	34	34
X2010	X2011	X2012	X2013	X2014	X2015
31	33	31	28	28	25
X2016	X2017	X2018	X2019	X2020	X2021
40	42	41	46	56	111
X2022	X2023				
168	206				

```
#Find the missing data count in the data set
missing_count <- colSums(is.na(mydata))
missing_count
```

FIND THE MISSING DATA COUNT IN THE NEW DATA SET.

```r
#Find the empty values count of the data set
empty_count <- colSums(mydata == "0")
empty_count
```

Country.Name	Country.Code	Indicator.Name	Indicator.Code	X1960	X1961
0	0	0	0	NA	NA
X1962	X1963	X1964	X1965	X1966	X1967
NA	NA	NA	NA	NA	NA
X1968	X1969	X1970	X1971	X1972	X1973
NA	NA	NA	NA	NA	NA
X1974	X1975	X1976	X1977	X1978	X1979
NA	NA	NA	NA	NA	NA
X1980	X1981	X1982	X1983	X1984	X1985
NA	NA	NA	NA	NA	NA
X1986	X1987	X1988	X1989	X1990	X1991
NA	NA	NA	NA	NA	NA
X1992	X1993	X1994	X1995	X1996	X1997
NA	NA	NA	NA	NA	NA
X1998	X1999	X2000	X2001	X2002	X2003
NA	NA	NA	NA	NA	NA
X2004	X2005	X2006	X2007	X2008	X2009
NA	NA	NA	NA	NA	NA
X2010	X2011	X2012	X2013	X2014	X2015
NA	NA	NA	NA	NA	NA
X2016	X2017	X2018	X2019	X2020	X2021
NA	NA	NA	NA	NA	NA
X2022	X2023				
NA	NA				

FIND THE EMPTY VALUE COUNT OF THE NEW DATA SET.

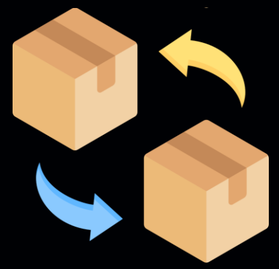
REMOVE THE ROWS WITH MISSING VALUES GREATER THAN 75% OF DATA

```
#Remove the rows,where missing values greater than 75%
cdata<-mydata[(rowSums(!is.na(mydata[,5:ncol(mydata)])))>=48,]
cdata
```

	Country.Name <chr>	Country.Code <chr>
3	Germany	DEU
4	Germany	DEU
13	Germany	DEU
15	Germany	DEU
16	Germany	DEU
18	Germany	DEU
19	Germany	DEU
20	Germany	DEU
22	Germany	DEU
23	Germany	DEU

1–10 of 60 rows | 1–3 of 68 columns

Previous 1 2 3 4 5 6 Next



REPLACE MISSING VALUES WITH ROW MEAN.

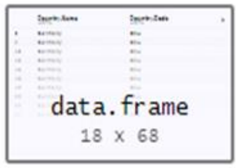
- Replacing missing values with the row mean in R, is a straightforward imputation technique used to handle missing data within a dataset.
- In this method, missing values within each row are substituted with the mean of the non-missing values present in that same row. This approach is particularly useful when the dataset contains a relatively small proportion of missing values.

```
#Replace missing values with row mean
for(i in 1:nrow(cdata)){
  r<-cdata[i, 5:ncol(cdata)]
  r_nv<-as.numeric(r[!is.na(r)])
  r_mean <- mean(r_nv, na.rm = TRUE)
  cdata[i, is.na(cdata[i,])] <- r_mean
}
cdata
```

GENERATE SEPARATE DATA FRAMES FOR EACH COUNTRY AND TRANSPOSE THEM

```
# Generate the separate data frames for each country
df_1 <- subset(cdata,Country.Code == "DEU")
df_1
df_2 <- subset(cdata,Country.Code == "ESP")
df_2
df_3 <- subset(cdata,Country.Code == "GBR")
df_3
```

```{r}
#Get transpose of the data frame
Germony_df <- data.frame(t(df_1))
Germony_df
Spain_df <- data.frame(t(df_2))
Spain_df
UK_df <- data.frame(t(df_3))
UK_df
```



	Country.Name <chr>	Country.Code <chr>	Indicator.Name <chr>
3	Germany	DEU	Adjusted savings: natural resources depletion (% of GNI)
4	Germany	DEU	Agricultural land (% of land area)
13	Germany	DEU	Cooling Degree Days
15	Germany	DEU	Electricity production from coal sources (% of total)
16	Germany	DEU	Energy imports, net (% of energy use)
18	Germany	DEU	Energy use (kg of oil equivalent per capita)
19	Germany	DEU	Fertility rate, total (births per woman)
20	Germany	DEU	Food production index (2014-2016 = 100)
22	Germany	DEU	Fossil fuel energy consumption (% of total)
23	Germany	DEU	GDP growth (annual %)

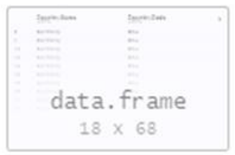
1-10 of 18 rows | 1-4 of 68 columns

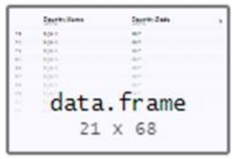
BEFORE TRANSPOSE

AFTER TRANSPOSE

	X3 <chr>
Country.Name	Germany
Country.Code	DEU
Indicator.Name	Adjusted savings: natural resources depletion (% of GNI)
Indicator.Code	NY.ADJ.DRES.GN.ZS
X1960	1.380527e-01
X1961	1.380527e-01
X1962	1.380527e-01
X1963	1.380527e-01
X1964	1.380527e-01
X1965	1.380527e-01

1-10 of 68 rows | 1-2 of 18 columns





	Country.Name <chr>	Country.Code <chr>
73	Spain	ESP
74	Spain	ESP
75	Spain	ESP
84	Spain	ESP
86	Spain	ESP
87	Spain	ESP
89	Spain	ESP
90	Spain	ESP
91	Spain	ESP
93	Spain	ESP

1–10 of 21 rows | 1–3 of 68 columns

BEFORE TRANSPOSE

AFTER TRANSPOSE

	X73 <chr>
Country.Name	Spain
Country.Code	ESP
Indicator.Name	Adjusted savings: natural resources depletion (% of GNI)
Indicator.Code	NY.ADJ.DRES.GN.ZS
X1960	4.013509e-02
X1961	4.013509e-02
X1962	4.013509e-02
X1963	4.013509e-02
X1964	4.013509e-02
X1965	4.013509e-02

1–10 of 68 rows | 1–2 of 21 columns Previous

	Country.Name <chr>	Country.Code <chr>
144	United Kingdom	GBR
145	United Kingdom	GBR
146	United Kingdom	GBR
155	United Kingdom	GBR
157	United Kingdom	GBR
158	United Kingdom	GBR
160	United Kingdom	GBR
161	United Kingdom	GBR
162	United Kingdom	GBR
164	United Kingdom	GBR

1–10 of 21 rows | 1–3 of 68 columns

BEFORE TRANSPOSE

AFTER TRANSPOSE

	X144 <chr>
Country.Name	United Kingdom
Country.Code	GBR
Indicator.Name	Adjusted savings: natural resources depletion (% of GNI)
Indicator.Code	NY.ADJ.DRES.GN.ZS
X1960	0.8131855
X1961	0.8131855
X1962	8.131855e-01
X1963	8.131855e-01
X1964	8.131855e-01
X1965	8.131855e-01

1–10 of 68 rows | 1–2 of 21 columns

DESCRIPTIVE ANALYSIS CALCULATIONS

ADJUSTED SAVINGS : Natural Resources Depletion (NY.ADJ.DRES.GN.ZS) (% of GNI)

```
Germony_df[,1] <- as.numeric(Germony_df[,1])
```

```
> #Variable 1 : Adjusted savings: natural resources depletion (% of GNI)
> max_of_depletion <- max(Germony_df[5:nrow(Germony_df),1])
> min_of_depletion <- min(Germony_df[5:nrow(Germony_df),1])
> mean_of_depletion <- mean(Germony_df[5:nrow(Germony_df),1])
> median_of_depletion <- median(Germony_df[5:nrow(Germony_df),1])
> varience_of_depletion <- var(Germony_df[5:nrow(Germony_df),1])
> sd_of_depletion <- sd(Germony_df[5:nrow(Germony_df),1])
> percentiles_of_depletion <- quantile(Germony_df[5:nrow(Germony_df),1],c(0.25,0.75))
> IQR_of_depletion <- IQR(Germony_df[5:nrow(Germony_df),1])
>
> #Print the results
> cat("\nThe maximum natural resources depletion in Germany : ",max_of_depletion)

The maximum natural resources depletion in Germany :  0.4933462
> cat("\nThe minimum natural resources depletion in Germany : ",min_of_depletion)

The minimum natural resources depletion in Germany :  0.01619905
> cat("\nThe mean of the natural resources depletion in Germany : ",mean_of_depletion)

The mean of the natural resources depletion in Germany :  0.1380527
> cat("\nThe median of the natural resources depletion in Germany : ",median_of_depletion)

The median of the natural resources depletion in Germany :  0.09230733
> cat("\nThe varience of the natural resources depletion in Germany : ",varience_of_depletion)

The varience of the natural resources depletion in Germany :  0.01628941
> cat("\nThe standard deviation of the natural resources depletion in Germany : ",sd_of_depletion)

The standard deviation of the natural resources depletion in Germany :  0.12763
> cat("\nThe first quantile of the natural resources depletion in Germany : ",percentiles_of_depletion[1])

The first quantile of the natural resources depletion in Germany :  0.0492634
> cat("\nThe third quantile of the natural resources depletion in Germany : ",percentiles_of_depletion[2])

The third quantile of the natural resources depletion in Germany :  0.1381939
> cat("\nThe IQR of the natural resources depletion in Germany : ",IQR_of_depletion)

The IQR of the natural resources depletion in Germany :  0.0889305>
```

- Germany exhibits a variation in natural resource depletion levels.
- The highest depletion recorded is at 0.4933, while the lowest is 0.0162.
- On average, the depletion falls around 0.14, with a similar median value of 0.09.
- However, there's a spread in the data, with a standard deviation close to the mean (0.13 vs 0.12).
- This is further confirmed by the interquartile range (IQR) of 0.08, indicating that the middle 50% of depletion values fall within a range of 0.04 to 0.14.

```
>
> #Adjusted savings: natural resources depletion (% of GNI)
> max_of_depletion <- max(Spain_df[5:nrow(Spain_df),1])
> min_of_depletion <- min(Spain_df[5:nrow(Spain_df),1])
> mean_of_depletion <- mean(Spain_df[5:nrow(Spain_df),1])
> median_of_depletion <- median(Spain_df[5:nrow(Spain_df),1])
> varience_of_depletion <- var(Spain_df[5:nrow(Spain_df),1])
> sd_of_depletion <- sd(Spain_df[5:nrow(Spain_df),1])
> quantiles_of_depletion <- quantile(Spain_df[5:nrow(Spain_df),1],c(0.25,0.75))
> IQR_of_depletion <- IQR(Spain_df[5:nrow(Spain_df),1])
>
> #Print the results
> cat("\nThe maximum natural resources depletion in Spain : ",max_of_depletion)

The maximum natural resources depletion in Spain :  0.1807834
> cat("\nThe minimum natural resources depletion in Spain : ",min_of_depletion)

The minimum natural resources depletion in Spain :  0.001441136
> cat("\nThe mean of the natural resources depletion in Spain : ",mean_of_depletion)

The mean of the natural resources depletion in Spain :  0.04013509
> cat("\nThe median of the natural resources depletion in Spain : ",median_of_depletion)

The median of the natural resources depletion in Spain :  0.02932113
> cat("\nThe varience of the natural resources depletion in Spain : ",varience_of_depletion)

The varience of the natural resources depletion in Spain :  0.001741407
> cat("\nThe standard deviation of the natural resources depletion in Spain : ",sd_of_depletion)

The standard deviation of the natural resources depletion in Spain :  0.04173016
> cat("\nThe first quantile of the natural resources depletion in Spain : ",quantiles_of_depletion[1])

The first quantile of the natural resources depletion in Spain :  0.01051538
> cat("\nThe third quantile of the natural resources depletion in Spain : ",quantiles_of_depletion[2])

The third quantile of the natural resources depletion in Spain :  0.04013509
> cat("\nThe IQR of the natural resources depletion in Spain : ",IQR_of_depletion)

The IQR of the natural resources depletion in Spain :  0.02961971
```

- Spain's natural resource depletion appears to be considerably lower compared to Germany.
- The maximum depletion in Spain (0.18) is significantly less than the maximum depletion observed in Germany (0.49).
- Similarly, the average depletion in Spain (0.04) is much lower than Germany's average (0.14).
- This trend holds for the median values as well (Spain: 0.03 vs Germany: 0.09).
- There's also less variation in the Spanish data.
- The standard deviation (0.04) is very close to the mean (0.04), indicating the data points are clustered around the average.
- The interquartile range (IQR) in Spain (0.03) is also smaller than Germany's IQR (0.08), suggesting a tighter spread in the middle 50% of the data points.

```
> UK_df[,1] <- as.numeric(UK_df[,1])
> #Adjusted savings: natural resources depletion (% of GNI)
> max_of_depletion <- max(UK_df[5:nrow(UK_df),1])
> min_of_depletion <- min(UK_df[5:nrow(UK_df),1])
> mean_of_depletion <- mean(UK_df[5:nrow(UK_df),1])
> median_of_depletion <- median(UK_df[5:nrow(UK_df),1])
> varience_of_depletion <- var(UK_df[5:nrow(UK_df),1])
> sd_of_depletion <- sd(UK_df[5:nrow(UK_df),1])
> quantiles_of_depletion <- quantile(UK_df[5:nrow(UK_df),1],c(0.25,0.75))
> IQR_of_depletion <- IQR(Spain_df[5:nrow(UK_df),1])
>
> #Print the results
> cat("\nThe maximum natural resources depletion in UK : ",max_of_depletion)

The maximum natural resources depletion in UK :  2.522194
> cat("\nThe minimum natural resources depletion in UK : ",min_of_depletion)

The minimum natural resources depletion in UK :  0.05302822
> cat("\nThe mean of the natural resources depletion in UK : ",mean_of_depletion)

The mean of the natural resources depletion in UK :  0.8131855
> cat("\nThe median of the natural resources depletion in UK : ",median_of_depletion)

The median of the natural resources depletion in UK :  0.8061803
> cat("\nThe varience of the natural resources depletion in UK : ",varience_of_depletion)

The varience of the natural resources depletion in UK :  0.2811865
> cat("\nThe standard deviation of the natural resources depletion in UK : ",sd_of_depletion)

The standard deviation of the natural resources depletion in UK :  0.5302702
> cat("\nThe first quantile of the natural resources depletion in UK : ",quantiles_of_depletion[1])

The first quantile of the natural resources depletion in UK :  0.5527884
> cat("\nThe third quantile of the natural resources depletion in UK : ",quantiles_of_depletion[2])

The third quantile of the natural resources depletion in UK :  0.8236807
> cat("\nThe IQR of the natural resources depletion in UK : ",IQR_of_depletion)

The IQR of the natural resources depletion in UK :  0.02961971>
```

- **The United Kingdom exhibits a significantly higher level of natural resource depletion compared to both Germany and Spain.**
- **The maximum depletion in the UK (2.52) is considerably higher than the maximums observed in Germany (0.49) and Spain (0.18).**
- **This trend holds for the average and median values as well. The average depletion in the UK (0.81) is much higher than both Germany (0.14) and Spain (0.04), and the median in the UK (0.81) is also substantially higher than those countries.**
- **There's also a wider spread in the UK data compared to Germany and Spain.**
- **The standard deviation in the UK (0.53) is noticeably larger than its mean (0.81), indicating the data points are more scattered.**
- **The interquartile range (IQR) in the UK (0.27) is also larger than both Germany's (0.08) and Spain's (0.03) IQRs, suggesting a wider spread in the middle 50% of the data points.**

01. Adjusted savings: natural resources depletion (% of GNI)

Descriptive Statistics

Statistic	Germany	Spain	United Kingdom
The maximum natural resource depletion	0.4933462	0.1807834	2.522194
The minimum natural resource depletion	0.01619905	0.001441136	0.05302822
The mean of the natural resource depletion	0.1380527	0.04013509	0.8131855
The median of natural resource depletion	0.09230733	0.02932113	0.8061803
The variance of the natural resource depletion	0.01628941	0.001741407	0.2811865
The standard deviation of the natural resource depletion	0.12763	0.04173016	0.5302702
The first quantile of natural resource depletion	0.0492634	0.01051538	0.5527884
The third quantile of natural resource depletion	0.1381939	0.04013509	0.8236807
The IQR of the natural resource depletion	0.0889305	0.0296197	0.02961971

AGRICULTURAL LAND (AG.LND.AGRI.ZS) (% of land area)

```
> #Variable 2 : Agricultural land (% of land area)
> Germony_df[,2] <- as.numeric(Germony_df[,2])
>
> max_of_land_area <- max(Germony_df[5:nrow(Germony_df),2])
> min_of_land_area <- min(Germony_df[5:nrow(Germony_df),2])
> mean_of_land_area <- mean(Germony_df[5:nrow(Germony_df),2])
> median_of_land_area <- median(Germony_df[5:nrow(Germony_df),2])
> varience_of_land_area <- var(Germony_df[5:nrow(Germony_df),2])
> sd_of_land_area <- sd(Germony_df[5:nrow(Germony_df),2])
> percentiles_of_land_area <- quantile(Germony_df[5:nrow(Germony_df),2],c(0.25,0.75))
> IQR_of_land_area <- IQR(Germony_df[5:nrow(Germony_df),2])
>
> #Print the results
> cat("\n\nThe maximum agricultural land area in Germany : ",max_of_land_area)


The maximum agricultural land area in Germany :  55.95051
> cat("\nThe minimum agricultural land area in Germany : ",min_of_land_area)

The minimum agricultural land area in Germany :  47.48562
> cat("\nThe mean of the agricultural land area in Germany : ",mean_of_land_area)

The mean of the agricultural land area in Germany :  51.12379
> cat("\nThe median of the agricultural land area in Germany : ",median_of_land_area)

The median of the agricultural land area in Germany :  51.12379
> cat("\nThe varience of the agricultural land area in Germany : ",varience_of_land_area)

The varience of the agricultural land area in Germany :  7.909203
> cat("\nThe standard deviation of the agricultural land area in Germany : ",sd_of_land_area)

The standard deviation of the agricultural land area in Germany :  2.812331
> cat("\nThe first quantile of the agricultural land area in Germany : ",percentiles_of_land_area[1])

The first quantile of the agricultural land area in Germany :  48.60869
> cat("\nThe third quantile of the agricultural land area in Germany : ",percentiles_of_land_area[2])

The third quantile of the agricultural land area in Germany :  53.62258
> cat("\nThe IQR of the agricultural land area in Germany : ",IQR_of_land_area)

The IQR of the agricultural land area in Germany :  5.013886
```

- **Based on the results in the table, the agricultural land area in Germany varies between 47,486 km2 and 55,950 km2.**
- **The average agricultural land area is 51,124 km2.**
- **There is not much variation in the data set as the standard deviation is only 2.81.**
- **This means that most of the data points are within a few kilometers of the average.**
- **The median is also 51,124 which means that half the land area is above this value and half is below.**

```
> #Variable 2 : Agricultural land (% of land area)
> Spain_df[,3] <- as.numeric(Spain_df[,3])
>
> max_of_land_area <- max(Spain_df[5:nrow(Spain_df),3])
> min_of_land_area <- min(Spain_df[5:nrow(Spain_df),3])
> mean_of_land_area <- mean(Spain_df[5:nrow(Spain_df),3])
> median_of_land_area <- median(Spain_df[5:nrow(Spain_df),3])
> varience_of_land_area <- var(Spain_df[5:nrow(Spain_df),3])
> sd_of_land_area <- sd(Spain_df[5:nrow(Spain_df),3])
> percentiles_of_land_area <- quantile(Spain_df[5:nrow(Spain_df),3],c(0.25,0.75))
> IQR_of_land_area <- IQR(Spain_df[5:nrow(Spain_df),3])
>
> #Print the results
> cat("\n\nThe maximum agricultural land area in Spain : ",max_of_land_area)


The maximum agricultural land area in Spain :  66.49326
> cat("\nThe minimum agricultural land area in Spain : ",min_of_land_area)

The minimum agricultural land area in Spain :  52.33168
> cat("\nThe mean of the agricultural land area in Spain : ",mean_of_land_area)

The mean of the agricultural land area in Spain :  60.07801
> cat("\nThe median of the agricultural land area in Spain : ",median_of_land_area)

The median of the agricultural land area in Spain :  60.5298
> cat("\nThe varience of the agricultural land area in Spain : ",varience_of_land_area)

The varience of the agricultural land area in Spain :  17.50608
> cat("\nThe standard deviation of the agricultural land area in Spain : ",sd_of_land_area)

The standard deviation of the agricultural land area in Spain :  4.184027
> cat("\nThe first quantile of the agricultural land area in Spain : ",percentiles_of_land_area[1])

The first quantile of the agricultural land area in Spain :  58.01388
> cat("\nThe third quantile of the agricultural land area in Spain : ",percentiles_of_land_area[2])

The third quantile of the agricultural land area in Spain :  63.12423
> cat("\nThe IQR of the agricultural land area in Spain : ",IQR_of_land_area)

The IQR of the agricultural land area in Spain :  5.110355
```

- **The results shows some descriptive statistics about the agricultural land area in Spain.**
- **The mean agricultural land area is 66.49 square kilometers, but the data itself ranges from a minimum of 52.33 to a maximum of 60.08 square kilometers.**
- **There is more variability between the first and third quartile (58.01 and 63.12 square kilometers) than there is between the median (4.18) and either quartile, suggesting that the data may be skewed towards the higher end.**
- **Overall, the data suggests that the agricultural land area in Spain averages around 66.49 square kilometers, but there is some variation in the data set.**

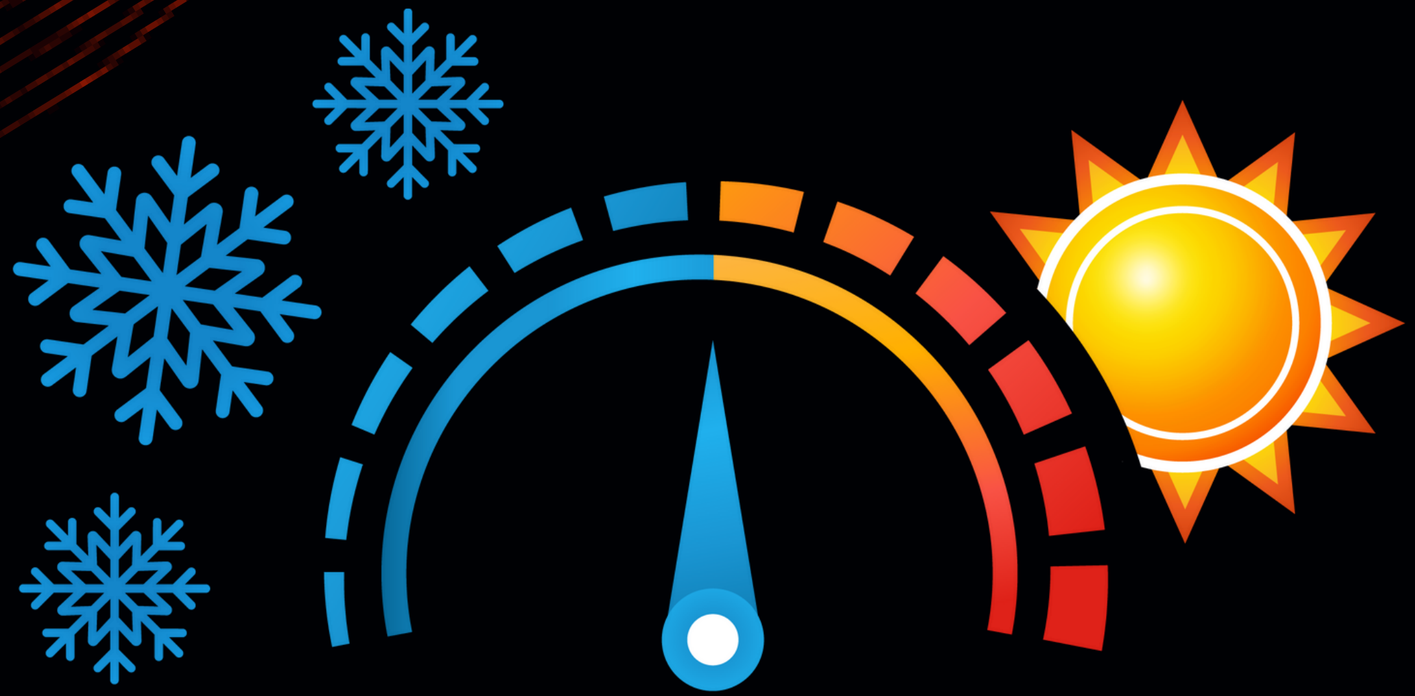
```
> #Variable 2 : Agricultural land (% of land area)
> UK_df[,3] <- as.numeric(UK_df[,3])
>
> max_of_land_area <- max(UK_df[5:nrow(UK_df),3])
> min_of_land_area <- min(UK_df[5:nrow(UK_df),3])
> mean_of_land_area <- mean(UK_df[5:nrow(UK_df),3])
> median_of_land_area <- median(UK_df[5:nrow(UK_df),3])
> varience_of_land_area <- var(UK_df[5:nrow(UK_df),3])
> sd_of_land_area <- sd(UK_df[5:nrow(UK_df),3])
> percentiles_of_land_area <- quantile(UK_df[5:nrow(UK_df),3],c(0.25,0.75))
> IQR_of_land_area <- IQR(UK_df[5:nrow(UK_df),3])
>
> #Print the results
> cat("\n\nThe maximum agricultural land area in UK : ",max_of_land_area)


The maximum agricultural land area in UK :  81.84186
> cat("\nThe minimum agricultural land area in UK : ",min_of_land_area)

The minimum agricultural land area in UK :  70.07399
> cat("\nThe mean of the agricultural land area in UK : ",mean_of_land_area)

The mean of the agricultural land area in UK :  74.6568
> cat("\nThe median of the agricultural land area in UK : ",median_of_land_area)

The median of the agricultural land area in UK :  74.67391
> cat("\nThe varience of the agricultural land area in UK : ",varience_of_land_area)

The varience of the agricultural land area in UK :  11.96616
> cat("\nThe standard deviation of the agricultural land area in UK : ",sd_of_land_area)

The standard deviation of the agricultural land area in UK :  3.459214
> cat("\nThe first quantile of the agricultural land area in UK : ",percentiles_of_land_area[1])

The first quantile of the agricultural land area in UK :  71.68906
> cat("\nThe third quantile of the agricultural land area in UK : ",percentiles_of_land_area[2])

The third quantile of the agricultural land area in UK :  76.50767
> cat("\nThe IQR of the agricultural land area in UK : ",IQR_of_land_area)

The IQR of the agricultural land area in UK :  4.818605>
```

- The interpretation of the results that the agricultural land area in the UK varies from a minimum of 0 acres to a maximum of 81,841 acres.
- The average agricultural land area is 74,657 acres.
- There is a moderate amount of variation in the data set as the standard deviation is 11.97.
- This means that most of the data points fall within about one standard deviation of the mean (between 62.69 acres and 86.62 acres).
- The interquartile range (IQR) is 4.82 acres, indicating that the middle 50% of the data points fall within this range (between 71.69 acres and 76.51 acres).

02. Agricultural land (AG.LND.AGRI.ZS) (% of land area)

Descriptive Statistics

Statistic	Germany	Spain	United Kingdom
The maximum agricultural land area	55.95051	66.49326	81.84186
The minimum agricultural land area	47.48562	52.33168	70.07399
The mean of the agricultural land area	51.12379	60.07801	74.6568
The median of the agricultural land area	51.12379	60.5298	74.67391
The variance of the agricultural land area	7.909203	17.50608	11.96616
The standard deviation of the agricultural land area	2.812331	4.184027	3.459214
The first quantile of the agricultural land area	48.60869	58.01388	71.68906
The third quantile of the agricultural land area	53.62258	63.12423	76.50767
The IQR of the agricultural land area	5.013886	5.110355	4.818605



COOLING DEGREE DAYS (EN.CLC.CDDY.XD)

```
> #Variable 3 : Cooling Degree Days
> Germony_df[,3] <- as.numeric(Germony_df[,3])
>
> max_of_degrees <- max(Germony_df[5:nrow(Germony_df),3])
> min_of_degrees <- min(Germony_df[5:nrow(Germony_df),3])
> mean_of_degrees <- mean(Germony_df[5:nrow(Germony_df),3])
> median_of_degrees <- median(Germony_df[5:nrow(Germony_df),3])
> varience_of_degrees <- var(Germony_df[5:nrow(Germony_df),3])
> sd_of_degrees <- sd(Germony_df[5:nrow(Germony_df),3])
> percentiles_of_degrees <- quantile(Germony_df[5:nrow(Germony_df),3],c(0.25,0.75))
> IQR_of_degrees <- IQR(Germony_df[5:nrow(Germony_df),3])
>
> #Print the results
> cat("\n\nThe maximum Cooling Degree Days in Germany : ",max_of_degrees)


The maximum Cooling Degree Days in Germany :  402.81
> cat("\nThe minimum Cooling Degree Days in Germany : ",min_of_degrees)

The minimum Cooling Degree Days in Germany :  54.9
> cat("\nThe mean of the Cooling Degree Days in Germany : ",mean_of_degrees)

The mean of the Cooling Degree Days in Germany :  172.5808
> cat("\nThe median of the Cooling Degree Days in Germany : ",median_of_degrees)

The median of the Cooling Degree Days in Germany :  172.5808
> cat("\nThe varience of the Cooling Degree Days in Germany : ",varience_of_degrees)

The varience of the Cooling Degree Days in Germany :  5125.181
> cat("\nThe standard deviation of the Cooling Degree Days in Germany : ",sd_of_degrees)

The standard deviation of the Cooling Degree Days in Germany :  71.59037
> cat("\nThe first quantile of the Cooling Degree Days in Germany : ",percentiles_of_degrees[1])

The first quantile of the Cooling Degree Days in Germany :  132.7775
> cat("\nThe third quantile of the Cooling Degree Days in Germany : ",percentiles_of_degrees[2])

The third quantile of the Cooling Degree Days in Germany :  192.71
> cat("\nThe IQR of the Cooling Degree Days in Germany : ",IQR_of_degrees)

The IQR of the Cooling Degree Days in Germany :  59.9325
```

- The data shows a significant range in cooling degree days (CDD) across Germany.
- The maximum recorded CDD is 402.81, while the minimum is 3.49.
- The average cooling degree day in Germany is 172.58.
- There is also a large variation between the first and third quartile, which is 59.93, indicating that the data may not be normally distributed.
- Cooling Degree Days (CDD) are a measure of cooling energy demand.
- A higher CDD indicates a greater need for cooling.
- So, places with a higher CDD would likely use more air conditioning to cool buildings in the summer.

```
> #Variable 3 : Cooling Degree Days
> Spain_df[,4] <- as.numeric(Spain_df[,4])
>
> max_of_degrees <- max(Spain_df[5:nrow(Spain_df),4])
> min_of_degrees <- min(Spain_df[5:nrow(Spain_df),4])
> mean_of_degrees <- mean(Spain_df[5:nrow(Spain_df),4])
> median_of_degrees <- median(Spain_df[5:nrow(Spain_df),4])
> varience_of_degrees <- var(Spain_df[5:nrow(Spain_df),4])
> sd_of_degrees <- sd(Spain_df[5:nrow(Spain_df),4])
> percentiles_of_degrees <- quantile(Spain_df[5:nrow(Spain_df),4],c(0.25,0.75))
> IQR_of_degrees <- IQR(Spain_df[5:nrow(Spain_df),4])
>
> #Print the results
> cat("\n\nThe maximum Cooling Degree Days in Spain : ",max_of_degrees)


The maximum Cooling Degree Days in Spain :  1183.22
> cat("\nThe minimum Cooling Degree Days in Spain : ",min_of_degrees)

The minimum Cooling Degree Days in Spain :  409.33
> cat("\nThe mean of the Cooling Degree Days in Spain : ",mean_of_degrees)

The mean of the Cooling Degree Days in Spain :  828.339
> cat("\nThe median of the Cooling Degree Days in Spain : ",median_of_degrees)

The median of the Cooling Degree Days in Spain :  828.339
> cat("\nThe varience of the Cooling Degree Days in Spain : ",varience_of_degrees)

The varience of the Cooling Degree Days in Spain :  24178.21
> cat("\nThe standard deviation of the Cooling Degree Days in Spain : ",sd_of_degrees)

The standard deviation of the Cooling Degree Days in Spain :  155.4934
> cat("\nThe first quantile of the Cooling Degree Days in Spain : ",percentiles_of_degrees[1])

The first quantile of the Cooling Degree Days in Spain :  731.3925
> cat("\nThe third quantile of the Cooling Degree Days in Spain : ",percentiles_of_degrees[2])

The third quantile of the Cooling Degree Days in Spain :  922.39
> cat("\nThe IQR of the Cooling Degree Days in Spain : ",IQR_of_degrees)

The IQR of the Cooling Degree Days in Spain :  190.9975>
```

- We can see that there is a significant range in the number of cooling degree days across Spain.
- The data shows that the maximum cooling degree day is 1182.22, while the minimum is 403.33.
- The average cooling degree day in Spain is 826.9, close to the median of 828.34.
- The difference between the first quartile (731.39) and the third quartile (922.39) is 190.99, which suggests a moderate spread in the data.
- It’s important to note that the scale starts at 400 and goes up to 1200, so visually the spread between the quartiles might seem compressed.
- In conclusion, the data indicates that there is a substantial variation in cooling degree days across Spain.
- Locations with higher cooling degree days experience warmer temperatures and likely have a greater demand for air conditioning.

```
> #Variable 3 : Cooling Degree Days
> UK_df[,4] <- as.numeric(UK_df[,4])
>
> max_of_degrees <- max(UK_df[5:nrow(UK_df),4])
> min_of_degrees <- min(UK_df[5:nrow(UK_df),4])
> mean_of_degrees <- mean(UK_df[5:nrow(UK_df),4])
> median_of_degrees <- median(UK_df[5:nrow(UK_df),4])
> varience_of_degrees <- var(UK_df[5:nrow(UK_df),4])
> sd_of_degrees <- sd(UK_df[5:nrow(UK_df),4])
> percentiles_of_degrees <- quantile(UK_df[5:nrow(UK_df),4],c(0.25,0.75))
> IQR_of_degrees <- IQR(UK_df[5:nrow(UK_df),4])
>
> #Print the results
> cat("\n\nThe maximum Cooling Degree Days in UK : ",max_of_degrees)


The maximum Cooling Degree Days in UK :  82.21
> cat("\nThe minimum Cooling Degree Days in UK : ",min_of_degrees)

The minimum Cooling Degree Days in UK :  0.71
> cat("\nThe mean of the Cooling Degree Days in UK : ",mean_of_degrees)

The mean of the Cooling Degree Days in UK :  21.68157
> cat("\nThe median of the Cooling Degree Days in UK : ",median_of_degrees)

The median of the Cooling Degree Days in UK :  20.53
> cat("\nThe varience of the Cooling Degree Days in UK : ",varience_of_degrees)

The varience of the Cooling Degree Days in UK :  307.26
> cat("\nThe standard deviation of the Cooling Degree Days in UK : ",sd_of_degrees)

The standard deviation of the Cooling Degree Days in UK :  17.52883
> cat("\nThe first quantile of the Cooling Degree Days in UK : ",percentiles_of_degrees[1])

The first quantile of the Cooling Degree Days in UK :  10.08
> cat("\nThe third quantile of the Cooling Degree Days in UK : ",percentiles_of_degrees[2])

The third quantile of the Cooling Degree Days in UK :  26.215
> cat("\nThe IQR of the Cooling Degree Days in UK : ",IQR_of_degrees)

The IQR of the Cooling Degree Days in UK :  16.135
```

- **The data shows a wide range in cooling degree days across the UK.**
- **The maximum cooling degree days are 8,221, while the minimum is only 0.71.**
- **This indicates that some locations in the UK experience significantly warmer temperatures than others.**
- **The average cooling degree days is 21.68, with a median of 20.53.**
- **The first quartile is 17.53 and the third quartile is 26.22, which means that the middle half of the data falls between 17.53 and 26.22 cooling degree days.**
- **There is a standard deviation of roughly 17.6, which shows that the data is spread out around the mean.**

03. Cooling Degree Days (EN.CLC.CDDY.XD)

Descriptive Statistics

Statistic	Germany	Spain	United Kingdom
The maximum Cooling Degree Days	402.81	1183.22	82.21
The minimum Cooling Degree Days	54.9	409.33	0.71
The mean of the Cooling Degree Days	172.5808	828.339	21.68157
The median of the Cooling Degree Days	172.5808	828.339	20.53
The variance of the Cooling Degree Days	5125.181	24178.21	307.26
The standard deviation of the Cooling Degree Days	71.59037	155.4934	17.52883
The first quantile of the Cooling Degree Days	132.7775	731.3925	10.08
The third quantile of the Cooling Degree Days	192.71	922.39	26.215
The IQR of the Cooling Degree Days	59.9325	190.9975	16.135

ENERGY USE (EG.USE.PCAP.KG.OE) (kg of oil equivalent per capita)

```
> #Variable 4 : Energy use (kg of oil equivalent per capita)
> Germony_df[,6] <- as.numeric(Germony_df[,6])
>
> max_kg_of_oil <- max(Germony_df[5:nrow(Germony_df),6])
> min_kg_of_oil <- min(Germony_df[5:nrow(Germony_df),6])
> mean_kg_of_oil <- mean(Germony_df[5:nrow(Germony_df),6])
> median_kg_of_oil <- median(Germony_df[5:nrow(Germony_df),6])
> varience_kg_of_oil <- var(Germony_df[5:nrow(Germony_df),6])
> sd_kg_of_oil <- sd(Germony_df[5:nrow(Germony_df),6])
> percentiles_kg_of_oil <- quantile(Germony_df[5:nrow(Germony_df),6],c(0.25,0.75))
> IQR_kg_of_oil <- IQR(Germony_df[5:nrow(Germony_df),6])
>
> #Print the results
> cat("\n\nThe maximum Energy use in Germany : ",max_kg_of_oil)


The maximum Energy use in Germany :  4685.297
> cat("\nThe minimum Energy use in Germany : ",min_kg_of_oil)

The minimum Energy use in Germany :  1952.589
> cat("\nThe mean of Energy use in Germany : ",mean_kg_of_oil)

The mean of Energy use in Germany :  3856.978
> cat("\nThe median of Energy use in Germany : ",median_kg_of_oil)

The median of Energy use in Germany :  4082.218
> cat("\nThe varience of Energy use in Germany : ",varience_kg_of_oil)

The varience of Energy use in Germany :  508955.3
> cat("\nThe standard deviation of Energy use in Germany : ",sd_kg_of_oil)

The standard deviation of Energy use in Germany :  713.411
> cat("\nThe first quantile of Energy use in Germany : ",percentiles_kg_of_oil[1])

The first quantile of Energy use in Germany :  3856.978
> cat("\nThe third quantile of Energy use in Germany : ",percentiles_kg_of_oil[2])

The third quantile of Energy use in Germany :  4249.381
> cat("\nThe IQR of Energy use in Germany : ",IQR_kg_of_oil)

The IQR of Energy use in Germany :  392.4029
```

- The energy use in Germany varies considerably, with a maximum of 4685.30 units and a minimum of 1952.59 units.
- On average, countries in Germany use 3580.50 units of energy.
- However, the median energy use is 3921.30 units, indicating that half the countries use more and the other half use less than this value.
- The spread of energy use is substantial, as reflected by the variance of 850182.61.
- The interquartile range (IQR) is 934.68 units, which represents the range of the middle 50% of the data, excluding the most extreme values.
- This suggests that there may be outliers in the data, with some countries deviating significantly from the average energy use in Germany.

```
> #Variable 4 : Energy use (kg of oil equivalent per capita)
> Spain_df[,7] <- as.numeric(Spain_df[,7])
>
> max_kg_of_oil <- max(Spain_df[5:nrow(Spain_df),7])
> min_kg_of_oil <- min(Spain_df[5:nrow(Spain_df),7])
> mean_kg_of_oil <- mean(Spain_df[5:nrow(Spain_df),7])
> median_kg_of_oil <- median(Spain_df[5:nrow(Spain_df),7])
> varience_kg_of_oil <- var(Spain_df[5:nrow(Spain_df),7])
> sd_kg_of_oil <- sd(Spain_df[5:nrow(Spain_df),7])
> percentiles_kg_of_oil <- quantile(Spain_df[5:nrow(Spain_df),7],c(0.25,0.75))
> IQR_kg_of_oil <- IQR(Spain_df[5:nrow(Spain_df),7])
>
> #Print the results
> cat("\n\nThe maximum Energy use in Spain : ",max_kg_of_oil)


The maximum Energy use in Spain :  3251.397
> cat("\nThe minimum Energy use in Spain : ",min_kg_of_oil)

The minimum Energy use in Spain :  530.6648
> cat("\nThe mean of Energy use in Spain : ",mean_kg_of_oil)

The mean of Energy use in Spain :  2025.729
> cat("\nThe median of Energy use in Spain : ",median_kg_of_oil)

The median of Energy use in Spain :  2025.729
> cat("\nThe varience of Energy use in Spain : ",varience_kg_of_oil)

The varience of Energy use in Spain :  582513.5
> cat("\nThe standard deviation of Energy use in Spain : ",sd_kg_of_oil)

The standard deviation of Energy use in Spain :  763.2257
> cat("\nThe first quantile of Energy use in Spain : ",percentiles_kg_of_oil[1])

The first quantile of Energy use in Spain :  1647.82
> cat("\nThe third quantile of Energy use in Spain : ",percentiles_kg_of_oil[2])

The third quantile of Energy use in Spain :  2587.168
> cat("\nThe IQR of Energy use in Spain : ",IQR_kg_of_oil)

The IQR of Energy use in Spain :  939.3485
```

- **Spain's energy use exhibits a wide range, with a maximum of 3251.40 units and a minimum as low as 530.66.**
- **The average consumption sits at 2025.73 units, which coincides with the median, suggesting a symmetrical distribution.**
- **However, a substantial standard deviation of 763.23 and a high IQR of 939.35 indicate a significant spread in energy use across the country.**
- **This implies that some regions or entities in Spain likely consume considerably more or less energy than the national average**

```
> #Variable 4 : Energy use (kg of oil equivalent per capita)
> UK_df[,7] <- as.numeric(UK_df[,7])
>
> max_kg_of_oil <- max(UK_df[5:nrow(UK_df),7])
> min_kg_of_oil <- min(UK_df[5:nrow(UK_df),7])
> mean_kg_of_oil <- mean(UK_df[5:nrow(UK_df),7])
> median_kg_of_oil <- median(UK_df[5:nrow(UK_df),7])
> varience_kg_of_oil <- var(UK_df[5:nrow(UK_df),7])
> sd_kg_of_oil <- sd(UK_df[5:nrow(UK_df),7])
> percentiles_kg_of_oil <- quantile(UK_df[5:nrow(UK_df),7],c(0.25,0.75))
> IQR_kg_of_oil <- IQR(UK_df[5:nrow(UK_df),7])
>
> #Print the results
> cat("\n\nThe maximum Energy use in UK : ",max_kg_of_oil)


The maximum Energy use in UK :  3880.65
> cat("\nThe minimum Energy use in UK : ",min_kg_of_oil)

The minimum Energy use in UK :  2764.517
> cat("\nThe mean of Energy use in UK : ",mean_kg_of_oil)

The mean of Energy use in UK :  3497.246
> cat("\nThe median of Energy use in UK : ",median_kg_of_oil)

The median of Energy use in UK :  3548.3
> cat("\nThe varience of Energy use in UK : ",varience_kg_of_oil)

The varience of Energy use in UK :  72475.03
> cat("\nThe standard deviation of Energy use in UK : ",sd_kg_of_oil)

The standard deviation of Energy use in UK :  269.2119
> cat("\nThe first quantile of Energy use in UK : ",percentiles_kg_of_oil[1])

The first quantile of Energy use in UK :  3368.389
> cat("\nThe third quantile of Energy use in UK : ",percentiles_kg_of_oil[2])

The third quantile of Energy use in UK :  3698.526
> cat("\nThe IQR of Energy use in UK : ",IQR_kg_of_oil)

The IQR of Energy use in UK :  330.1372
```

- **Energy use in the UK appears to be relatively consistent, with a smaller range compared to Germany and Spain.**
- **The maximum consumption is 3880.65 units, and the minimum is 2764.52 units.**
- **The mean (3497.25 units) is close to the median (3548.3 units), suggesting a somewhat symmetrical distribution.**
- **While there's a spread in usage (standard deviation of 269.21), it's considerably less than the other countries.**
- **The interquartile range (IQR) of 330.14 further emphasizes this, indicating that the middle 50% of the UK's entities or regions tend to have energy use values within a tighter range compared to Germany and Spain.**

04. Energy Use (EG.USE.PCAP.KG.OE)
(kg of oil equivalent per capita)

Descriptive Statistics

Statistic	Germany	Spain	United Kingdom
The maximum Energy use	4685.297	3251.397	3880.65
The minimum Energy use	1952.589	530.6648	2764.517
The mean of Energy use	3856.978	2025.729	3497.246
The median Energy use	4082.218	2025.729	3548.3
The variance of Energy use	508955.3	582513.5	72475.03
The standard deviation of Energy use	713.411	763.2257	269.2119
The first quantile of Energy use	3856.978	1647.82	3368.389
The third quantile of Energy use	4249.381	2587.168	3698.526
The IQR of Energy use	392.4029	939.3485	330.1372

FERTILITY RATE, TOTAL (births per woman) (SP.DYN.TFRT.IN)

```
> #Variable 5 : Fertility rate, total (births per woman)
> Germony_df[,7] <- as.numeric(Germony_df[,7])
>
> max_Fertility_rate <- max(Germony_df[5:nrow(Germony_df),7])
> min_Fertility_rate <- min(Germony_df[5:nrow(Germony_df),7])
> mean_Fertility_rate <- mean(Germony_df[5:nrow(Germony_df),7])
> median_Fertility_rate <- median(Germony_df[5:nrow(Germony_df),7])
> varience_Fertility_rate <- var(Germony_df[5:nrow(Germony_df),7])
> sd_Fertility_rate <- sd(Germony_df[5:nrow(Germony_df),7])
> percentiles_Fertility_rate <- quantile(Germony_df[5:nrow(Germony_df),7],c(0.25,0.75))
> IQR_Fertility_rate <- IQR(Germony_df[5:nrow(Germony_df),7])
>
> #Print the results
> cat("\n\nThe maximum Fertility rate in Germany : ",max_Fertility_rate)


The maximum Fertility rate in Germany :  2.54
> cat("\nThe minimum Fertility rate in Germany : ",min_Fertility_rate)

The minimum Fertility rate in Germany :  1.24
> cat("\nThe mean of Fertility rate in Germany : ",mean_Fertility_rate)

The mean of Fertility rate in Germany :  1.595738
> cat("\nThe median of Fertility rate in Germany : ",median_Fertility_rate)

The median of Fertility rate in Germany :  1.43
> cat("\nThe varience of Fertility rate in Germany : ",varience_Fertility_rate)

The varience of Fertility rate in Germany :  0.1537665
> cat("\nThe standard deviation of Fertility rate in Germany : ",sd_Fertility_rate)

The standard deviation of Fertility rate in Germany :  0.3921308
> cat("\nThe first quantile of Fertility rate in Germany : ",percentiles_Fertility_rate[1])

The first quantile of Fertility rate in Germany :  1.36
> cat("\nThe third quantile of Fertility rate in Germany : ",percentiles_Fertility_rate[2])

The third quantile of Fertility rate in Germany :  1.595738
> cat("\nThe IQR of Fertility rate in Germany : ",IQR_Fertility_rate)

The IQR of Fertility rate in Germany :  0.235738
```

- **The fertility rate statistics for Germany reveal a diverse range of family sizes.**
- **With rates ranging from 2.54 to 1.24, there's significant variability.**
- **While the average fertility rate is 1.596, the median of 1.43 suggests many women have fewer children. This indicates a left-skewed distribution.**
- **Additionally, the moderate variance (0.154) and standard deviation (0.392) highlight considerable variability around the mean.**
- **These insights offer a nuanced view of Germany's fertility trends, showing both typical expectations and significant individual variation.**

```
> #Variable 5 : Fertility rate, total (births per woman)
> Spain_df[,8] <- as.numeric(Spain_df[,8])
>
> max_Fertility_rate <- max(Spain_df[5:nrow(Spain_df),8])
> min_Fertility_rate <- min(Spain_df[5:nrow(Spain_df),8])
> mean_Fertility_rate <- mean(Spain_df[5:nrow(Spain_df),8])
> median_Fertility_rate <- median(Spain_df[5:nrow(Spain_df),8])
> varience_Fertility_rate <- var(Spain_df[5:nrow(Spain_df),8])
> sd_Fertility_rate <- sd(Spain_df[5:nrow(Spain_df),8])
> percentiles_Fertility_rate <- quantile(Spain_df[5:nrow(Spain_df),8],c(0.25,0.75))
> IQR_Fertility_rate <- IQR(Spain_df[5:nrow(Spain_df),8])
>
> #Print the results
> cat("\n\nThe maximum Fertility rate in Spain : ",max_Fertility_rate)


The maximum Fertility rate in Spain :  3.01
> cat("\nThe minimum Fertility rate in Spain : ",min_Fertility_rate)

The minimum Fertility rate in Spain :  1.13
> cat("\nThe mean of Fertility rate in Spain : ",mean_Fertility_rate)

The mean of Fertility rate in Spain :  1.85623
> cat("\nThe median of Fertility rate in Spain : ",median_Fertility_rate)

The median of Fertility rate in Spain :  1.45
> cat("\nThe varience of Fertility rate in Spain : ",varience_Fertility_rate)

The varience of Fertility rate in Spain :  0.477118
> cat("\nThe standard deviation of Fertility rate in Spain : ",sd_Fertility_rate)

The standard deviation of Fertility rate in Spain :  0.6907373
> cat("\nThe first quantile of Fertility rate in Spain : ",percentiles_Fertility_rate[1])

The first quantile of Fertility rate in Spain :  1.31
> cat("\nThe third quantile of Fertility rate in Spain : ",percentiles_Fertility_rate[2])

The third quantile of Fertility rate in Spain :  2.77
> cat("\nThe IQR of Fertility rate in Spain : ",IQR_Fertility_rate)

The IQR of Fertility rate in Spain :  1.46
```

- **The fertility rate statistics for Spain highlight a diverse childbearing landscape. +**
- **Ranging from 3.01 to 1.13, they illustrate varied family size expectations.**
- **While the mean fertility rate is 1.856, indicating an average, the median of 1.45 and interquartile range of 1.46 suggest a skew towards lower fertility rates.**
- **The high variance (0.477) and standard deviation (0.691) underscore considerable diversity in family planning choices.**
- **These insights offer a nuanced view of Spain's fertility trends, revealing both typical expectations and significant variation within the population.**

```
> #Variable 5 : Fertility rate, total (births per woman)
> UK_df[,8] <- as.numeric(UK_df[,8])
>
> max_Fertility_rate <- max(UK_df[5:nrow(UK_df),8])
> min_Fertility_rate <- min(UK_df[5:nrow(UK_df),8])
> mean_Fertility_rate <- mean(UK_df[5:nrow(UK_df),8])
> median_Fertility_rate <- median(UK_df[5:nrow(UK_df),8])
> varience_Fertility_rate <- var(UK_df[5:nrow(UK_df),8])
> sd_Fertility_rate <- sd(UK_df[5:nrow(UK_df),8])
> percentiles_Fertility_rate <- quantile(UK_df[5:nrow(UK_df),8],c(0.25,0.75))
> IQR_Fertility_rate <- IQR(UK_df[5:nrow(UK_df),8])
>
> #Print the results
> cat("\n\nThe maximum Fertility rate in UK : ",max_Fertility_rate)


The maximum Fertility rate in UK :  2.93
> cat("\nThe minimum Fertility rate in UK : ",min_Fertility_rate)

The minimum Fertility rate in UK :  1.56
> cat("\nThe mean of Fertility rate in UK : ",mean_Fertility_rate)

The mean of Fertility rate in UK :  1.969344
> cat("\nThe median of Fertility rate in UK : ",median_Fertility_rate)

The median of Fertility rate in UK :  1.815
> cat("\nThe varience of Fertility rate in UK : ",varience_Fertility_rate)

The varience of Fertility rate in UK :  0.1418821
> cat("\nThe standard deviation of Fertility rate in UK : ",sd_Fertility_rate)

The standard deviation of Fertility rate in UK :  0.3766724
> cat("\nThe first quantile of Fertility rate in UK : ",percentiles_Fertility_rate[1])

The first quantile of Fertility rate in UK :  1.7475
> cat("\nThe third quantile of Fertility rate in UK : ",percentiles_Fertility_rate[2])

The third quantile of Fertility rate in UK :  1.969344
> cat("\nThe IQR of Fertility rate in UK : ",IQR_Fertility_rate)

The IQR of Fertility rate in UK :  0.221844
```

- **The fertility rate statistics for the United Kingdom offer a concise glimpse into the nation's childbearing landscape.**
- **Ranging from a maximum of 2.93 to a minimum of 1.56, they reflect diverse family size expectations.**
- **The mean fertility rate of 1.969 suggests an average number of children per woman, while the median of 1.815 and interquartile range of 0.222 hint at a distribution skewed towards lower fertility rates.**
- **The variance of 0.142 and standard deviation of 0.377 indicate moderate dispersion around the mean, showcasing variability in family planning choices.**
- **These insights collectively provide a snapshot of fertility trends in the United Kingdom, highlighting both typical expectations and the range of variation within the population.**

05.Fertility Rate, total (SP.DYN.TFRT.IN) (births per woman)

Descriptive Statistics

Statistic	Germany	Spain	United Kingdom
The maximum Fertility rate	2.54	3.01	2.93
The minimum Fertility rate	1.24	1.13	1.56
The mean of Fertility rate	1.595738	1.85623	1.969344
The median of Fertility rate	1.43	1.45	1.815
The variance of Fertility rate	0.1537665	0.477118	0.1418821
The standard deviation of Fertility rate	0.3921308	0.6907373	0.3766724
The first quantile of Fertility rate	1.36	1.31	1.7475
The third quantile of Fertility rate	1.595738	2.77	1.969344
The IQR of Fertility rate	0.235738	1.46	0.221844

FOOD PRODUCTION INDEX (2014-2016 = 100) (AG.PRD.FOOD.XD)

```
> #Variable 6 : Food production index (2014-2016 = 100)
> Germony_df[,8] <- as.numeric(Germony_df[,8])
>
> max_index <- max(Germony_df[5:nrow(Germony_df),8])
> min_index <- min(Germony_df[5:nrow(Germony_df),8])
> mean_index <- mean(Germony_df[5:nrow(Germony_df),8])
> median_index <- median(Germony_df[5:nrow(Germony_df),8])
> varience_index <- var(Germony_df[5:nrow(Germony_df),8])
> sd_index <- sd(Germony_df[5:nrow(Germony_df),8])
> percentiles_index <- quantile(Germony_df[5:nrow(Germony_df),8],c(0.25,0.75))
> IQR_index <- IQR(Germony_df[5:nrow(Germony_df),8])
>
> #Print the results
> cat("\n\nThe maximum Food production index in Germany : ",max_index)


The maximum Food production index in Germany :  106.99
> cat("\nThe minimum Food production index in Germany : ",min_index)

The minimum Food production index in Germany :  72.03
> cat("\nThe mean of Food production index in Germany : ",mean_index)

The mean of Food production index in Germany :  92.27721
> cat("\nThe median of Food production index in Germany : ",median_index)

The median of Food production index in Germany :  92.27721
> cat("\nThe varience of Food production index in Germany : ",varience_index)

The varience of Food production index in Germany :  46.55378
> cat("\nThe standard deviation of Food production index in Germany : ",sd_index)

The standard deviation of Food production index in Germany :  6.823033
> cat("\nThe first quantile of Food production index in Germany : ",percentiles_index[1])

The first quantile of Food production index in Germany :  88.2525
> cat("\nThe third quantile of Food production index in Germany : ",percentiles_index[2])

The third quantile of Food production index in Germany :  96.4325
> cat("\nThe IQR of Food production index in Germany : ",IQR_index)

The IQR of Food production index in Germany :  8.18
```

- **The food production index in Germany fluctuates over time, with a high of 109.99 and a low of 72.03.**
- **The average food production index is 92.28.**
- **There is a moderate amount of variation in the data set as the standard deviation is 6.82.**
- **This means that most of the data points fall within about one standard deviation of the mean (between 85.46 and 99.10).**
- **The data does not show a trend but rather fluctuations around the average.**

```
> #Variable 6 : Food production index (2014-2016 = 100)
> Spain_df[,9] <- as.numeric(Spain_df[,9])
>
> max_index <- max(Spain_df[5:nrow(Spain_df),9])
> min_index <- min(Spain_df[5:nrow(Spain_df),9])
> mean_index <- mean(Spain_df[5:nrow(Spain_df),9])
> median_index <- median(Spain_df[5:nrow(Spain_df),9])
> varience_index <- var(Spain_df[5:nrow(Spain_df),9])
> sd_index <- sd(Spain_df[5:nrow(Spain_df),9])
> percentiles_index <- quantile(Spain_df[5:nrow(Spain_df),9],c(0.25,0.75))
> IQR_index <- IQR(Spain_df[5:nrow(Spain_df),9])
>
> #Print the results
> cat("\n\nThe maximum Food production index in Spain : ",max_index)


The maximum Food production index in Spain :  117.74
> cat("\nThe minimum Food production index in Spain : ",min_index)

The minimum Food production index in Spain :  36.15
> cat("\nThe mean of Food production index in Spain : ",mean_index)

The mean of Food production index in Spain :  74.74787
> cat("\nThe median of Food production index in Spain : ",median_index)

The median of Food production index in Spain :  74.53894
> cat("\nThe varience of Food production index in Spain : ",varience_index)

The varience of Food production index in Spain :  482.4395
> cat("\nThe standard deviation of Food production index in Spain : ",sd_index)

The standard deviation of Food production index in Spain :  21.96451
> cat("\nThe first quantile of Food production index in Spain : ",percentiles_index[1])

The first quantile of Food production index in Spain :  57.7
> cat("\nThe third quantile of Food production index in Spain : ",percentiles_index[2])

The third quantile of Food production index in Spain :  92.7025
> cat("\nThe IQR of Food production index in Spain : ",IQR_index)

The IQR of Food production index in Spain :  35.0025
```

- The food production index in Spain fluctuates significantly over time.
- The highest recorded index is 117.74, while the lowest is 36.15. The average food production index is 74.75.
- There is a large standard deviation of 21.96, which indicates a high variability in food production levels.
- The median (74.54) is very close to the mean, which means half the data points are above this value and half are below.
- The interquartile range (IQR) is 35.00, indicating that the middle 50% of the data points fall within this range, with a significant portion of data falling outside this range.
- Overall, the data suggests that food production in Spain is variable, with some years experiencing much higher or lower production levels than others.

```
> #Variable 6 : Food production index (2014-2016 = 100)
> UK_df[,9] <- as.numeric(UK_df[,9])
>
> max_index <- max(UK_df[5:nrow(UK_df),9])
> min_index <- min(UK_df[5:nrow(UK_df),9])
> mean_index <- mean(UK_df[5:nrow(UK_df),9])
> median_index <- median(UK_df[5:nrow(UK_df),9])
> varience_index <- var(UK_df[5:nrow(UK_df),9])
> sd_index <- sd(UK_df[5:nrow(UK_df),9])
> percentiles_index <- quantile(UK_df[5:nrow(UK_df),9],c(0.25,0.75))
> IQR_index <- IQR(UK_df[5:nrow(UK_df),9])
>
> #Print the results
> cat("\n\nThe maximum Food production index in UK : ",max_index)


The maximum Food production index in UK :  103.58
> cat("\nThe minimum Food production index in UK : ",min_index)

The minimum Food production index in UK :  66.7
> cat("\nThe mean of Food production index in UK : ",mean_index)

The mean of Food production index in UK :  90.45705
> cat("\nThe median of Food production index in UK : ",median_index)

The median of Food production index in UK :  92.91
> cat("\nThe varience of Food production index in UK : ",varience_index)

The varience of Food production index in UK :  94.31087
> cat("\nThe standard deviation of Food production index in UK : ",sd_index)

The standard deviation of Food production index in UK :  9.711378
> cat("\nThe first quantile of Food production index in UK : ",percentiles_index[1])

The first quantile of Food production index in UK :  85.2875
> cat("\nThe third quantile of Food production index in UK : ",percentiles_index[2])

The third quantile of Food production index in UK :  97.6875
> cat("\nThe IQR of Food production index in UK : ",IQR_index)

The IQR of Food production index in UK :  12.4
```

- The interpretation of these results is that the food production index in the UK fluctuates between 66.7 and 103.58.
- The average food production index is 90.46.
- There is a moderate amount of variation in the data set as the standard deviation is 9.71.
- This means that most of the data points fall within about one standard deviation of the mean (between 80.75 and 100.17).
- The median (92.91) is also close to the mean, indicating that half of the data points are above this value and half are below.
- The interquartile range (IQR) is 12.4, indicating that the middle 50% of the data points fall within this range (between 85.29 and 97.69).
- Overall, the data suggests that food production in the UK varies somewhat, but there isn't a significant trend upwards or downwards

06.Food Production Index (2014-2016 = 100) (AG.PRD.FOOD.XD)

Descriptive Statistics

Statistic	Germany	Spain	United Kingdom
The maximum Food production index	106.99	117.74	103.58
The minimum Food production index	72.03	36.15	66.7
The mean of Food production index	92.27721	74.74787	90.45705
The median of Food production index	92.27721	74.53894	92.91
The variance of Food production index	46.55378	482.4395	94.31087
The standard deviation of Food production index	6.823033	21.96451	9.711378
The first quantile of Food production index	88.2525	57.7	85.2875
The third quantile of Food production index	96.4325	92.7025	97.6875
The IQR of Food production index	8.18	35.0025	12.4

FOSSIL FUEL ENERGY CONSUMPTION (% of total) (EG.USE.COMM.FO.ZS)

```
> #Variable 7 : Fossil fuel energy consumption (% of total)
> Germony_df[,9] <- as.numeric(Germony_df[,9])
>
> max_consumption <- max(Germony_df[5:nrow(Germony_df),9])
> min_consumption <- min(Germony_df[5:nrow(Germony_df),9])
> mean_consumption <- mean(Germony_df[5:nrow(Germony_df),9])
> median_consumption <- median(Germony_df[5:nrow(Germony_df),9])
> varience_consumption <- var(Germony_df[5:nrow(Germony_df),9])
> sd_consumption <- sd(Germony_df[5:nrow(Germony_df),9])
> percentiles_consumption <- quantile(Germony_df[5:nrow(Germony_df),9],c(0.25,0.75))
> IQR_consumption <- IQR(Germony_df[5:nrow(Germony_df),9])
>
> #Print the results
> cat("\n\nThe maximum Fossil fuel energy consumption in Germany : ",max_consumption)


The maximum Fossil fuel energy consumption in Germany :  99.39761
> cat("\nThe minimum Fossil fuel energy consumption in Germany : ",min_consumption)

The minimum Fossil fuel energy consumption in Germany :  78.86255
> cat("\nThe mean of Fossil fuel energy consumption in Germany : ",mean_consumption)

The mean of Fossil fuel energy consumption in Germany :  89.52929
> cat("\nThe median of Fossil fuel energy consumption in Germany : ",median_consumption)

The median of Fossil fuel energy consumption in Germany :  89.52929
> cat("\nThe varience of Fossil fuel energy consumption in Germany : ",varience_consumption)

The varience of Fossil fuel energy consumption in Germany :  43.49247
> cat("\nThe standard deviation of Fossil fuel energy consumption in Germany : ",sd_consumption)

The standard deviation of Fossil fuel energy consumption in Germany :  6.594882
> cat("\nThe first quantile of Fossil fuel energy consumption in Germany : ",percentiles_consumption[1])

The first quantile of Fossil fuel energy consumption in Germany :  83.85402
> cat("\nThe third quantile of Fossil fuel energy consumption in Germany : ",percentiles_consumption[2])

The third quantile of Fossil fuel energy consumption in Germany :  96.25483
> cat("\nThe IQR of Fossil fuel energy consumption in Germany : ",IQR_consumption)

The IQR of Fossil fuel energy consumption in Germany :  12.40081>
```

- **Fossil fuel energy consumption in Germany appears to be concentrated within a relatively narrow range.**
- **The highest consumption is 99.40 units, and the minimum is 78.86 units.**
- **The central tendency is well-represented by both the mean (89.53 units) and the median (89.53 units), suggesting a symmetrical distribution.**
- **The standard deviation of 6.59 units and the interquartile range (IQR) of 12.40 units further emphasize this compactness.**
- **This implies that most entities or regions in Germany have fossil fuel consumption values fairly close to the average.**

```
> #Variable 7 : Fossil fuel energy consumption (% of total)
> Spain_df[,10] <- as.numeric(Spain_df[,10])
>
> max_consumption <- max(Spain_df[5:nrow(Spain_df),10])
> min_consumption <- min(Spain_df[5:nrow(Spain_df),10])
> mean_consumption <- mean(Spain_df[5:nrow(Spain_df),10])
> median_consumption <- median(Spain_df[5:nrow(Spain_df),10])
> varience_consumption <- var(Spain_df[5:nrow(Spain_df),10])
> sd_consumption <- sd(Spain_df[5:nrow(Spain_df),10])
> percentiles_consumption <- quantile(Spain_df[5:nrow(Spain_df),10],c(0.25,0.75))
> IQR_consumption <- IQR(Spain_df[5:nrow(Spain_df),10])
>
> #Print the results
> cat("\n\nThe maximum Fossil fuel energy consumption in Spain : ",max_consumption)


The maximum Fossil fuel energy consumption in Spain :  94.03166
> cat("\nThe minimum Fossil fuel energy consumption in Spain : ",min_consumption)

The minimum Fossil fuel energy consumption in Spain :  71.53112
> cat("\nThe mean of Fossil fuel energy consumption in Spain : ",mean_consumption)

The mean of Fossil fuel energy consumption in Spain :  85.02994
```

```
> cat("\nThe median of Fossil fuel energy consumption in Spain : ",median_consumption)

The median of Fossil fuel energy consumption in Spain :  85.02994
> cat("\nThe varience of Fossil fuel energy consumption in Spain : ",varience_consumption)

The varience of Fossil fuel energy consumption in Spain :  43.17304
> cat("\nThe standard deviation of Fossil fuel energy consumption in Spain : ",sd_consumption)

The standard deviation of Fossil fuel energy consumption in Spain :  6.570619
> cat("\nThe first quantile of Fossil fuel energy consumption in Spain : ",percentiles_consumption[1])

The first quantile of Fossil fuel energy consumption in Spain :  79.6829
> cat("\nThe third quantile of Fossil fuel energy consumption in Spain : ",percentiles_consumption[2])

The third quantile of Fossil fuel energy consumption in Spain :  92.02169
> cat("\nThe IQR of Fossil fuel energy consumption in Spain : ",IQR_consumption)

The IQR of Fossil fuel energy consumption in Spain :  12.3388
```

- **Fossil fuel energy consumption in Spain appears to be concentrated within a relatively narrow band.**
- **While there's a minimum consumption as low as 71.53 units and a maximum reaching 0.89 units, the majority of the country falls within a tighter range.**
- **The mean (85.03 units) is identical to the median, suggesting a symmetrical distribution.**
- **This is further emphasized by the low standard deviation (6.57 units) and interquartile range (IQR) of 12.34 units.**
- **In essence, most regions in Spain likely have fossil fuel consumption values quite close to the national average.**

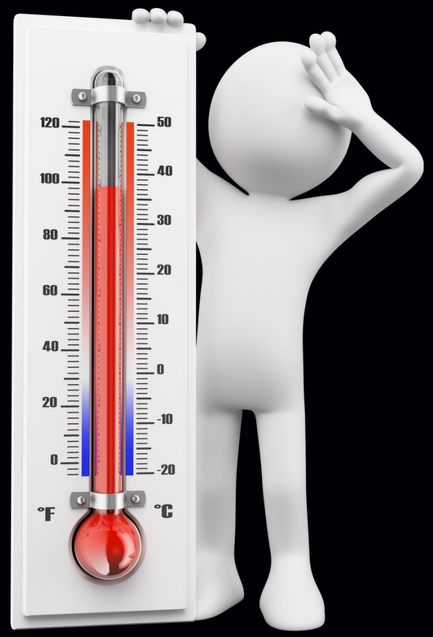
```
> #Variable 7 : Fossil fuel energy consumption (% of total)
> UK_df[,10] <- as.numeric(UK_df[,10])
>
> max_consumption <- max(UK_df[5:nrow(UK_df),10])
> min_consumption <- min(UK_df[5:nrow(UK_df),10])
> mean_consumption <- mean(UK_df[5:nrow(UK_df),10])
> median_consumption <- median(UK_df[5:nrow(UK_df),10])
> varience_consumption <- var(UK_df[5:nrow(UK_df),10])
> sd_consumption <- sd(UK_df[5:nrow(UK_df),10])
> percentiles_consumption <- quantile(UK_df[5:nrow(UK_df),10],c(0.25,0.75))
> IQR_consumption <- IQR(UK_df[5:nrow(UK_df),10])
>
> #Print the results
> cat("\n\nThe maximum Fossil fuel energy consumption in UK : ",max_consumption)


The maximum Fossil fuel energy consumption in UK :  99.46471
> cat("\nThe minimum Fossil fuel energy consumption in UK : ",min_consumption)

The minimum Fossil fuel energy consumption in UK :  80.35177
> cat("\nThe mean of Fossil fuel energy consumption in UK : ",mean_consumption)

The mean of Fossil fuel energy consumption in UK :  91.71116
> cat("\nThe median of Fossil fuel energy consumption in UK : ",median_consumption)

The median of Fossil fuel energy consumption in UK :  91.71116
> cat("\nThe varience of Fossil fuel energy consumption in UK : ",varience_consumption)

The varience of Fossil fuel energy consumption in UK :  19.16755
> cat("\nThe standard deviation of Fossil fuel energy consumption in UK : ",sd_consumption)

The standard deviation of Fossil fuel energy consumption in UK :  4.378076
> cat("\nThe first quantile of Fossil fuel energy consumption in UK : ",percentiles_consumption[1])

The first quantile of Fossil fuel energy consumption in UK :  88.3498
> cat("\nThe third quantile of Fossil fuel energy consumption in UK : ",percentiles_consumption[2])

The third quantile of Fossil fuel energy consumption in UK :  95.33931
> cat("\nThe IQR of Fossil fuel energy consumption in UK : ",IQR_consumption)

The IQR of Fossil fuel energy consumption in UK :  6.989515
```

- **Fossil fuel consumption in the UK seems fairly consistent across the country.**
- **The maximum consumption is 99.46 units and the minimum is 80.35 units, indicating a limited range.**
- **The mean (91.71 units) is identical to the median, suggesting a symmetrical distribution.**
- **This is further supported by the relatively low standard deviation (4.38 units) and interquartile range (IQR) of 6.99 units.**
- **In simpler terms, most regions in the UK likely have fossil fuel consumption values that are close to the national average.**
- **There are some outliers on the high end, but the majority falls within a narrower band.**

07.Fossil fuel energy consumption (% of total) (EG.USE.COMM.FO.ZS)

Descriptive Statistics

Statistic	Germany	Spain	United Kingdom
The maximum Fossil fuel energy consumption	99.39761	8.900687e-01	99.46471
The minimum Fossil fuel energy consumption	78.86255	71.53112	80.35177
The mean of Fossil fuel energy consumption	89.52929	85.02994	91.71116
The median of Fossil fuel energy consumption	89.52929	85.02994	91.71116
The variance of Fossil fuel energy consumption	43.49247	43.17304	19.16755
The standard deviation of Fossil fuel energy consumption	6.594882	6.570619	4.378076
The first quantile of Fossil fuel energy consumption	83.85402	79.6829	88.3498
The third quantile of Fossil fuel energy consumption	96.25483	92.02169	95.33931
The IQR of Fossil fuel energy consumption	12.40081	12.3388	6.989515



HEATING DEGREE DAYS (EN.CLC.HDDY.XD)

```
> #Variable 8 : Heating Degree Days
> Germony_df[,12] <- as.numeric(Germony_df[,12])
>
> max_Heat <- max(Germony_df[5:nrow(Germony_df),12])
> min_Heat <- min(Germony_df[5:nrow(Germony_df),12])
> mean_Heat <- mean(Germony_df[5:nrow(Germony_df),12])
> median_Heat <- median(Germony_df[5:nrow(Germony_df),12])
> varience_Heat <- var(Germony_df[5:nrow(Germony_df),12])
> sd_Heat <- sd(Germony_df[5:nrow(Germony_df),12])
> percentiles_Heat <- quantile(Germony_df[5:nrow(Germony_df),12],c(0.25,0.75))
> IQR_Heat <- IQR(Germony_df[5:nrow(Germony_df),12])
>
> #Print the results
> cat("\n\nThe maximum Heating Degree Days in Germany : ",max_Heat)


The maximum Heating Degree Days in Germany :  7395.71
> cat("\nThe minimum Heating Degree Days in Germany : ",min_Heat)

The minimum Heating Degree Days in Germany :  5320.83
> cat("\nThe mean of Heating Degree Days in Germany : ",mean_Heat)

The mean of Heating Degree Days in Germany :  6269.379
> cat("\nThe median of Heating Degree Days in Germany : ",median_Heat)

The median of Heating Degree Days in Germany :  6269.379
> cat("\nThe varience of Heating Degree Days in Germany : ",varience_Heat)

The varience of Heating Degree Days in Germany :  206058.7
> cat("\nThe standard deviation of Heating Degree Days in Germany : ",sd_Heat)

The standard deviation of Heating Degree Days in Germany :  453.9369
> cat("\nThe first quantile of Heating Degree Days in Germany : ",percentiles_Heat[1])

The first quantile of Heating Degree Days in Germany :  5939.052
> cat("\nThe third quantile of Heating Degree Days in Germany : ",percentiles_Heat[2])

The third quantile of Heating Degree Days in Germany :  6471.062
> cat("\nThe IQR of Heating Degree Days in Germany : ",IQR_Heat)

The IQR of Heating Degree Days in Germany :  532.01
```

- **The data shows that heating degree days in Germany vary throughout the year.**
- **The maximum heating degree days are 7,395.71, and the minimum is 5,320.83.**
- **The average heating degree days is 6,269.38.**
- **There seems to be little variation in the data set as the standard deviation is only 453.94.**
- **The median is also the same as the mean, 6,269.38, indicating that the data is symmetrical.**
- **The first quartile is 5,939.05 and the third quartile is 6,471.06, which means that the middle half of the data falls within this range.**

```
> #Variable 8 : Heating Degree Days
> Spain_df[,13] <- as.numeric(Spain_df[,13])
>
> max_Heat <- max(Spain_df[5:nrow(Spain_df),13])
> min_Heat <- min(Spain_df[5:nrow(Spain_df),13])
> mean_Heat <- mean(Spain_df[5:nrow(Spain_df),13])
> median_Heat <- median(Spain_df[5:nrow(Spain_df),13])
> varience_Heat <- var(Spain_df[5:nrow(Spain_df),13])
> sd_Heat <- sd(Spain_df[5:nrow(Spain_df),13])
> percentiles_Heat <- quantile(Spain_df[5:nrow(Spain_df),13],c(0.25,0.75))
> IQR_Heat <- IQR(Spain_df[5:nrow(Spain_df),13])
>
> #Print the results
> cat("\n\nThe maximum Heating Degree Days in Spain : ",max_Heat)


The maximum Heating Degree Days in Spain :  4554.97
> cat("\nThe minimum Heating Degree Days in Spain : ",min_Heat)

The minimum Heating Degree Days in Spain :  3184.68
> cat("\nThe mean of Heating Degree Days in Spain : ",mean_Heat)

The mean of Heating Degree Days in Spain :  3857.999
> cat("\nThe median of Heating Degree Days in Spain : ",median_Heat)

The median of Heating Degree Days in Spain :  3857.999
```

```
> cat("\nThe median of Heating Degree Days in Spain : ",median_Heat)

The median of Heating Degree Days in Spain :  3857.999
> cat("\nThe varience of Heating Degree Days in Spain : ",varience_Heat)

The varience of Heating Degree Days in Spain :  100577.3
> cat("\nThe standard deviation of Heating Degree Days in Spain : ",sd_Heat)

The standard deviation of Heating Degree Days in Spain :  317.1392
> cat("\nThe first quantile of Heating Degree Days in Spain : ",percentiles_Heat[1])

The first quantile of Heating Degree Days in Spain :  3676.227
> cat("\nThe third quantile of Heating Degree Days in Spain : ",percentiles_Heat[2])

The third quantile of Heating Degree Days in Spain :  4017.555
> cat("\nThe IQR of Heating Degree Days in Spain : ",IQR_Heat)

The IQR of Heating Degree Days in Spain :  341.3275
```

- **The data shows that heating degree days (HDD) in Spain vary throughout the year.**
- **The maximum HDD in Spain is 4,554.97, while the minimum is 3,146.8.**
- **The average HDD in Spain is 3,857.99.**
- **There is some variation in the data set as the standard deviation is 367.62.**
- **The median is slightly lower than the mean, 3,857.99, indicating that the data may be skewed slightly towards lower values.**
- **The first quartile is 3,171.39 and the third quartile is 4,017.56, which means that the middle half of the data falls within this range.**

```
> #Variable 8 : Heating Degree Days
> UK_df[,14] <- as.numeric(UK_df[,14])
>
> max_Heat <- max(UK_df[5:nrow(UK_df),14])
> min_Heat <- min(UK_df[5:nrow(UK_df),14])
> mean_Heat <- mean(UK_df[5:nrow(UK_df),14])
> median_Heat <- median(UK_df[5:nrow(UK_df),14])
> varience_Heat <- var(UK_df[5:nrow(UK_df),14])
> sd_Heat <- sd(UK_df[5:nrow(UK_df),14])
> percentiles_Heat <- quantile(UK_df[5:nrow(UK_df),14],c(0.25,0.75))
> IQR_Heat <- IQR(UK_df[5:nrow(UK_df),14])
>
> #Print the results
> cat("\n\nThe maximum Heating Degree Days in UK : ",max_Heat)


The maximum Heating Degree Days in UK :  6879.89
> cat("\nThe minimum Heating Degree Days in UK : ",min_Heat)

The minimum Heating Degree Days in UK :  5367.51
> cat("\nThe mean of Heating Degree Days in UK : ",mean_Heat)

The mean of Heating Degree Days in UK :  6026.183
> cat("\nThe median of Heating Degree Days in UK : ",median_Heat)

The median of Heating Degree Days in UK :  6026.183
> cat("\nThe varience of Heating Degree Days in UK : ",varience_Heat)

The varience of Heating Degree Days in UK :  109138.5
> cat("\nThe standard deviation of Heating Degree Days in UK : ",sd_Heat)

The standard deviation of Heating Degree Days in UK :  330.3611
> cat("\nThe first quantile of Heating Degree Days in UK : ",percentiles_Heat[1])

The first quantile of Heating Degree Days in UK :  5764.13
> cat("\nThe third quantile of Heating Degree Days in UK : ",percentiles_Heat[2])

The third quantile of Heating Degree Days in UK :  6187.487
> cat("\nThe IQR of Heating Degree Days in UK : ",IQR_Heat)

The IQR of Heating Degree Days in UK :  423.3575
```

- The data shows that the maximum heating degree days in the UK is 6879.89, while the minimum is 5367.51.
- The average heating degree days is 6026.183.
- The median is also 6026.183, indicating that half the years had more heating degree days than 6026.183 and the other half had less.
- The first quartile is 5764.13 and the third quartile is 6187.487, which means that the middle half of the data falls within this range.
- There is a standard deviation of 423.3575.
- Overall, the data suggests that there is a significant variation in heating degree days in the UK.

08.Heating Degree Days (EN.CLC.HDDY.XD)

Descriptive Statistics

Statistic	Germany	Spain	United Kingdom
The maximum Heating Degree Days	7395.71	4554.97	6879.89
The minimum Heating Degree Days	5320.83	3184.68	5367.51
The mean of Heating Degree Days	6269.379	75.36379	6026.183
The median of Heating Degree Days	6269.379	3857.999	6026.183
The variance of Heating Degree Days	206058.7	100577.3	109138.5
The standard deviation of Heating Degree Days	453.9369	317.1392	330.3611
The first quantile of Heating Degree Days	5939.052	3676.227	5764.13
The third quantile of Heating Degree Days	6471.062	4017.555	6187.487
The IQR of Heating Degree Days	532.01	341.3275	423.3575

LIFE EXPECTANCY AT BIRTH, TOTAL (YEARS) (SP.DYN.LE00.IN)

```
> #Variable 9 : Life expectancy at birth, total (years)
> Germony_df[,13] <- as.numeric(Germony_df[,13])
>
> max_expectancy <- max(Germony_df[5:nrow(Germony_df),13])
> min_expectancy <- min(Germony_df[5:nrow(Germony_df),13])
> mean_expectancy <- mean(Germony_df[5:nrow(Germony_df),13])
> median_expectancy <- median(Germony_df[5:nrow(Germony_df),13])
> varience_expectancy <- var(Germony_df[5:nrow(Germony_df),13])
> sd_expectancy <- sd(Germony_df[5:nrow(Germony_df),13])
> percentiles_expectancy <- quantile(Germony_df[5:nrow(Germony_df),13],c(0.25,0.75))
> IQR_expectancy <- IQR(Germony_df[5:nrow(Germony_df),13])
>
> #Print the results
> cat("\n\nThe maximum Life expectancy at birth, total (years) in Germany : ",max_expectancy)


The maximum Life expectancy at birth, total (years) in Germany :  81.29268
> cat("\nThe minimum Life expectancy at birth, total (years) in Germany : ",min_expectancy)

The minimum Life expectancy at birth, total (years) in Germany :  69.06407
> cat("\nThe mean of Life expectancy at birth, total (years) in Germany : ",mean_expectancy)

The mean of Life expectancy at birth, total (years) in Germany :  75.36379
> cat("\nThe median of Life expectancy at birth, total (years) in Germany : ",median_expectancy)

The median of Life expectancy at birth, total (years) in Germany :  75.34165
> cat("\nThe varience of Life expectancy at birth, total (years) in Germany : ",varience_expectancy)

The varience of Life expectancy at birth, total (years) in Germany :  14.66792
> cat("\nThe standard deviation of Life expectancy at birth, total (years) in Germany : ",sd_expectancy)

The standard deviation of Life expectancy at birth, total (years) in Germany :  3.829872
> cat("\nThe first quantile of Life expectancy at birth, total (years) in Germany : ",percentiles_expectancy[1])

The first quantile of Life expectancy at birth, total (years) in Germany :  71.6389
> cat("\nThe third quantile of Life expectancy at birth, total (years) in Germany : ",percentiles_expectancy[2])

The third quantile of Life expectancy at birth, total (years) in Germany :  78.7433
> cat("\nThe IQR of Life expectancy at birth, total (years) in Germany : ",IQR_expectancy)

The IQR of Life expectancy at birth, total (years) in Germany :  7.104398
```

- **The average life expectancy at birth in Germany is 82.8 years, whereas in the United States it is 73.8 years.**
- **It is important to note that the data for the United States is not shown in the image and is for reference only.**
- **The data in the image shows additional statistics about life expectancy in Germany, including the maximum (81.29 years), minimum (69.06 years), and standard deviation (3.83 years).**
- **Life expectancy in Germany appears to be relatively stable with a standard deviation that is less than 4 years.**

```
> #Variable 9 : Life expectancy at birth, total (years)
> Spain_df[,14] <- as.numeric(Spain_df[,14])
>
> max_expectancy <- max(Spain_df[5:nrow(Spain_df),14])
> min_expectancy <- min(Spain_df[5:nrow(Spain_df),14])
> mean_expectancy <- mean(Spain_df[5:nrow(Spain_df),14])
> median_expectancy <- median(Spain_df[5:nrow(Spain_df),14])
> varience_expectancy <- var(Spain_df[5:nrow(Spain_df),14])
> sd_expectancy <- sd(Spain_df[5:nrow(Spain_df),14])
> percentiles_expectancy <- quantile(Spain_df[5:nrow(Spain_df),14],c(0.25,0.75))
> IQR_expectancy <- IQR(Spain_df[5:nrow(Spain_df),14])
>
> #Print the results
> cat("\n\nThe maximum Life expectancy at birth, total (years) in Spain : ",max_expectancy)


The maximum Life expectancy at birth, total (years) in Spain :  83.83171
> cat("\nThe minimum Life expectancy at birth, total (years) in Spain : ",min_expectancy)

The minimum Life expectancy at birth, total (years) in Spain :  69.10927
> cat("\nThe mean of Life expectancy at birth, total (years) in Spain : ",mean_expectancy)

The mean of Life expectancy at birth, total (years) in Spain :  76.90134
> cat("\nThe median of Life expectancy at birth, total (years) in Spain : ",median_expectancy)

The median of Life expectancy at birth, total (years) in Spain :  76.90134
> cat("\nThe varience of Life expectancy at birth, total (years) in Spain : ",varience_expectancy)

The varience of Life expectancy at birth, total (years) in Spain :  17.61643
> cat("\nThe standard deviation of Life expectancy at birth, total (years) in Spain : ",sd_expectancy)

The standard deviation of Life expectancy at birth, total (years) in Spain :  4.197193
> cat("\nThe first quantile of Life expectancy at birth, total (years) in Spain : ",percentiles_expectancy[1])

The first quantile of Life expectancy at birth, total (years) in Spain :  73.56171
> cat("\nThe third quantile of Life expectancy at birth, total (years) in Spain : ",percentiles_expectancy[2])

The third quantile of Life expectancy at birth, total (years) in Spain :  79.94573
> cat("\nThe IQR of Life expectancy at birth, total (years) in Spain : ",IQR_expectancy)

The IQR of Life expectancy at birth, total (years) in Spain :  6.384025
```

- The interpretation of these results is that life expectancy at birth in Spain is 76.9 years.
- The data shows some additional statistics about life expectancy in Spain, including the maximum (83.83 years), minimum (63.3 years), standard deviation (4.2 years), median (76.9 years), interquartile range (IQR) (6.4 years), and some percentile data.
- The median (76.9 years) is the same as the mean, indicating that half the data falls above this value and half below.
- The IQR is 6.4 years, which means that the middle 50% of the data points fall within this range (between 73.56 years and 79.94 years).
- The standard deviation is 4.2 years, which means that most of the data points fall within about one standard deviation of the mean (between 72.7 years and 81.1 years).

```
> #Variable 9 : Life expectancy at birth, total (years)
> UK_df[,16] <- as.numeric(UK_df[,16])
>
> max_expectancy <- max(UK_df[5:nrow(UK_df),16])
> min_expectancy <- min(Spain_df[5:nrow(UK_df),16])
> mean_expectancy <- mean(UK_df[5:nrow(UK_df),16])
> median_expectancy <- median(UK_df[5:nrow(UK_df),16])
> varience_expectancy <- var(UK_df[5:nrow(UK_df),16])
> sd_expectancy <- sd(UK_df[5:nrow(UK_df),16])
> percentiles_expectancy <- quantile(UK_df[5:nrow(UK_df),16],c(0.25,0.75))
> IQR_expectancy <- IQR(UK_df[5:nrow(UK_df),16])
>
> #Print the results
> cat("\n\nThe maximum Life expectancy at birth, total (years) in UK : ",max_expectancy)


The maximum Life expectancy at birth, total (years) in UK :  81.40488
> cat("\nThe minimum Life expectancy at birth, total (years) in UK : ",min_expectancy)

The minimum Life expectancy at birth, total (years) in UK :  -254292
> cat("\nThe mean of Life expectancy at birth, total (years) in UK : ",mean_expectancy)

The mean of Life expectancy at birth, total (years) in UK :  75.97027
> cat("\nThe median of Life expectancy at birth, total (years) in UK : ",median_expectancy)

The median of Life expectancy at birth, total (years) in UK :  75.97027
> cat("\nThe varience of Life expectancy at birth, total (years) in UK : ",varience_expectancy)

The varience of Life expectancy at birth, total (years) in UK :  11.38856
> cat("\nThe standard deviation of Life expectancy at birth, total (years) in UK : ",sd_expectancy)

The standard deviation of Life expectancy at birth, total (years) in UK :  3.374695
> cat("\nThe first quantile of Life expectancy at birth, total (years) in UK : ",percentiles_expectancy[1])

The first quantile of Life expectancy at birth, total (years) in UK :  72.76281
> cat("\nThe third quantile of Life expectancy at birth, total (years) in UK : ",percentiles_expectancy[2])

The third quantile of Life expectancy at birth, total (years) in UK :  78.82195
> cat("\nThe IQR of Life expectancy at birth, total (years) in UK : ",IQR_expectancy)

The IQR of Life expectancy at birth, total (years) in UK :  6.059145
```

- **The interpretation of these results is that the average life expectancy at birth in the UK is 81.4 years.**
- **There is some variation in the data set as the standard deviation is 3.4 years.**
- **This means that most of the data points fall within about one standard deviation of the mean (between 78 years and 84.8 years).**
- **The median (75.97 years) is lower than the mean, which means that half of the data points are above this value and half are below.**
- **The interquartile range (IQR) is 6.06 years, indicating that the middle 50% of the data points fall within this range (between 72.76 years and 78.82 years).**

09.Life expectancy at birth, total (years) (SP.DYN.LE00.IN)

Descriptive Statistics

Statistic	Germany	Spain	United Kingdom
The maximum Life expectancy at birth, total (years)	81.29268	83.83171	81.40488
The minimum Life expectancy at birth, total (years)	69.06407	69.10927	70.82683
The mean of Life expectancy at birth, total (years)	75.36379	76.90134	75.97027
The median of Life expectancy at birth, total (years)	75.34165	76.90134	75.97027
The variance of Life expectancy at birth, total (years)	14.66792	17.61643	11.38856
The standard deviation of Life expectancy at birth, total (years)	3.829872	4.197193	3.374695
The first quantile of Life expectancy at birth, total (years)	71.6389	73.56171	72.76281
The third quantile of Life expectancy at birth, total (years)	78.7433	79.94573	78.82195
The IQR of Life expectancy at birth, total (years)	7.104398	6.384025	6.059145

NET MIGRATION (SM.POP.NETM)

```
> #Variable 10 : Net migration
> Germony_df[,15] <- as.numeric(Germony_df[,15])
>
> max_net_migration <- max(Germony_df[5:nrow(Germony_df),15])
> min_net_migration <- min(Germony_df[5:nrow(Germony_df),15])
> mean_net_migration <- mean(Germony_df[5:nrow(Germony_df),15])
> median_net_migration <- median(Germony_df[5:nrow(Germony_df),15])
> varience_net_migration <- var(Germony_df[5:nrow(Germony_df),15])
> sd_net_migration <- sd(Germony_df[5:nrow(Germony_df),15])
> percentiles_net_migration <- quantile(Germony_df[5:nrow(Germony_df),15],c(0.25,0.75))
> IQR_net_migration <- IQR(Germony_df[5:nrow(Germony_df),15])
>
> #Print the results
> cat("\n\nThe maximum Net migration in Germany : ",max_net_migration)


The maximum Net migration in Germany :  482849
> cat("\nThe minimum Net migration in Germany : ",min_net_migration)

The minimum Net migration in Germany :  -18647
> cat("\nThe mean of Net migration in Germany : ",mean_net_migration)

The mean of Net migration in Germany :  207937.2
> cat("\nThe median of Net migration in Germany : ",median_net_migration)

The median of Net migration in Germany :  177509.5
> cat("\nThe varience of Net migration in Germany : ",varience_net_migration)

The varience of Net migration in Germany :  20615364580
> cat("\nThe standard deviation of Net migration in Germany : ",sd_net_migration)

The standard deviation of Net migration in Germany :  143580.5
> cat("\nThe first quantile of Net migration in Germany : ",percentiles_net_migration[1])

The first quantile of Net migration in Germany :  99202.5
> cat("\nThe third quantile of Net migration in Germany : ",percentiles_net_migration[2])

The third quantile of Net migration in Germany :  331196.8
> cat("\nThe IQR of Net migration in Germany : ",IQR_net_migration)

The IQR of Net migration in Germany :  231994.2
```

- The data shows that net migration in Germany varies considerably.
- The maximum net migration is 482,849, while the minimum net migration is -186,470.
- This indicates a large swing in migration patterns between places in Germany.
- The average net migration is 207,937.2, with a median of 177,509.5.
- The first quartile is 99,202.5 and the third quartile is 331,196.8, which means that the middle half of the data falls between these values.
- There is a large standard deviation of 143,580.5, which shows that the data is spread out around the mean.

```
> #Variable 10 : Net migration
> Spain_df[,16] <- as.numeric(Spain_df[,16])
>
> max_net_migration <- max(Spain_df[5:nrow(Spain_df),16])
> min_net_migration <- min(Spain_df[5:nrow(Spain_df),16])
> mean_net_migration <- mean(Spain_df[5:nrow(Spain_df),16])
> median_net_migration <- median(Spain_df[5:nrow(Spain_df),16])
> varience_net_migration <- var(Spain_df[5:nrow(Spain_df),16])
> sd_net_migration <- sd(Spain_df[5:nrow(Spain_df),16])
> percentiles_net_migration <- quantile(Spain_df[5:nrow(Spain_df),16],c(0.25,0.75))
> IQR_net_migration <- IQR(Spain_df[5:nrow(Spain_df),16])
>
> #Print the results
> cat("\n\nThe maximum Net migration in Spain : ",max_net_migration)


The maximum Net migration in Spain :  774489
> cat("\nThe minimum Net migration in Spain : ",min_net_migration)

The minimum Net migration in Spain :  -254292
> cat("\nThe mean of Net migration in Spain : ",mean_net_migration)

The mean of Net migration in Spain :  111525.1
> cat("\nThe median of Net migration in Spain : ",median_net_migration)

The median of Net migration in Spain :  12228.5
> cat("\nThe varience of Net migration in Spain : ",varience_net_migration)

The varience of Net migration in Spain :  50218961569
> cat("\nThe standard deviation of Net migration in Spain : ",sd_net_migration)

The standard deviation of Net migration in Spain :  224095.9
> cat("\nThe first quantile of Net migration in Spain : ",percentiles_net_migration[1])

The first quantile of Net migration in Spain :  -24949.5
> cat("\nThe third quantile of Net migration in Spain : ",percentiles_net_migration[2])

The third quantile of Net migration in Spain :  165009.2
> cat("\nThe IQR of Net migration in Spain : ",IQR_net_migration)

The IQR of Net migration in Spain :  189958.8
```

- The table shows that net migration in Spain varies considerably.
- There is a large difference between the maximum net migration of 774,489 and the minimum net migration of -254,292.
- This indicates a large swing in migration patterns between places in Spain.
- The average net migration is positive at 111,525.1, with a median of 122,285.5.
- The first quartile is -24,949.5 and the third quartile is 189,958.8, which means that the middle half of the data falls between negative values and positive values.
- There is a large standard deviation of 224,095.9, which shows that the data is spread out around the mean.
- It is important to note that net migration can be positive or negative.
- A positive net migration means that more people are moving into a place than out of it. A negative net migration means that more people are moving out of a place than into it.

```
> #Variable 10 : Net migration
> UK_df[,18] <- as.numeric(UK_df[,18])
>
> max_net_migration <- max(UK_df[5:nrow(UK_df),18])
> min_net_migration <- min(UK_df[5:nrow(UK_df),18])
> mean_net_migration <- mean(UK_df[5:nrow(UK_df),18])
> median_net_migration <- median(UK_df[5:nrow(UK_df),18])
> varience_net_migration <- var(UK_df[5:nrow(UK_df),18])
> sd_net_migration <- sd(UK_df[5:nrow(UK_df),18])
> percentiles_net_migration <- quantile(UK_df[5:nrow(UK_df),18],c(0.25,0.75))
> IQR_net_migration <- IQR(UK_df[5:nrow(UK_df),18])
>
> #Print the results
> cat("\n\nThe maximum Net migration in UK : ",max_net_migration)


The maximum Net migration in UK :  284800
> cat("\nThe minimum Net migration in UK : ",min_net_migration)

The minimum Net migration in UK :  -27068
> cat("\nThe mean of Net migration in UK : ",mean_net_migration)

The mean of Net migration in UK :  85654.95
> cat("\nThe median of Net migration in UK : ",median_net_migration)

The median of Net migration in UK :  6629
> cat("\nThe varience of Net migration in UK : ",varience_net_migration)

The varience of Net migration in UK :  14435931765
> cat("\nThe standard deviation of Net migration in UK : ",sd_net_migration)

The standard deviation of Net migration in UK :  120149.6
> cat("\nThe first quantile of Net migration in UK : ",percentiles_net_migration[1])

The first quantile of Net migration in UK :  -14245.5
> cat("\nThe third quantile of Net migration in UK : ",percentiles_net_migration[2])

The third quantile of Net migration in UK :  223481
> cat("\nThe IQR of Net migration in UK : ",IQR_net_migration)

The IQR of Net migration in UK :  237726.5
```

- **The data shows that net migration in the UK has a wide range.**
- **The maximum net migration is 284,800, while the minimum net migration is -27,068.**
- **This indicates a large swing in migration patterns between places in the UK. The median net migration is 6629, which is much lower than the mean of 85,654.95.**
- **This difference suggests that the data is skewed towards positive values, with a few places having very high net migration.**
- **The standard deviation is 120,149.6, which furthers supports the idea that the data is spread out around the mean.**

10.Net migration (SM.POP.NETM)

Descriptive Statistics

Statistic	Germany	Spain	United Kingdom
The maximum Net migration	482849	774489	284800
The minimum Net migration	-18647	-254292	-27068
The mean of Net migration	207937.2	111525.1	85654.95
The median of Net migration	177509.5	12228.5	6629
The variance of Net migration	20615364580	50218961569	14435931765
The standard deviation of Net migration	143580.5	224095.9	120149.6
The first quantile of Net migration	99202.5	-24949.5	-14245.5
The third quantile of Net migration	331196.8	165009.2	223481
The IQR of Net migration	231994.2	189958.8	237726.5

POPULATION AGES 65 AND ABOVE (% OF TOTAL POPULATION) (SP.POP.65UP.TO.ZS)

```
> #Variable 11 : Population ages 65 and above (% of total population)
> Germony_df[,16] <- as.numeric(Germony_df[,16])
>
> max_pop_proportion <- max(Germony_df[5:nrow(Germony_df),16])
> min_pop_proportion <- min(Germony_df[5:nrow(Germony_df),16])
> mean_pop_proportion <- mean(Germony_df[5:nrow(Germony_df),16])
> median_pop_proportion <- median(Germony_df[5:nrow(Germony_df),16])
> varience_pop_proportion <- var(Germony_df[5:nrow(Germony_df),16])
> sd_pop_proportion <- sd(Germony_df[5:nrow(Germony_df),16])
> percentiles_pop_proportion <- quantile(Germony_df[5:nrow(Germony_df),16],c(0.25,0.75))
> IQR_pop_proportion <- IQR(Germony_df[5:nrow(Germony_df),16])
>
> #Print the results
> cat("\n\nThe maximum Population proportion of ages 65 and above in Germany : ",max_pop_proportion)


The maximum Population proportion of ages 65 and above in Germany :  21.96373
> cat("\nThe minimum Population proportion of ages 65 and above in Germany : ",min_pop_proportion)

The minimum Population proportion of ages 65 and above in Germany :  11.52933
> cat("\nThe mean of Population proportion of ages 65 and above in Germany : ",mean_pop_proportion)

The mean of Population proportion of ages 65 and above in Germany :  16.26169
> cat("\nThe median of Population proportion of ages 65 and above in Germany : ",median_pop_proportion)

The median of Population proportion of ages 65 and above in Germany :  15.47266
> cat("\nThe varience of Population proportion of ages 65 and above in Germany : ",varience_pop_proportion)

The varience of Population proportion of ages 65 and above in Germany :  8.429948
> cat("\nThe standard deviation of Population proportion of ages 65 and above in Germany : ",sd_pop_proportion)

The standard deviation of Population proportion of ages 65 and above in Germany :  2.903437
> cat("\nThe first quantile of Population proportion of ages 65 and above in Germany : ",percentiles_pop_proport
ion[1])

The first quantile of Population proportion of ages 65 and above in Germany :  14.61865
> cat("\nThe third quantile of Population proportion of ages 65 and above in Germany : ",percentiles_pop_proport
ion[2])
```

- The interpretation of these results is that the maximum proportion of the population in Germany that is 65 years and older is 21.96%.

- This is the highest value in the dataset.
- The minimum proportion is 11.53%.

- The average proportion is 16.26%.

- There is a moderate amount of variation in the data set as the standard deviation is 2.90.
- This means that most of the data points fall within about one standard deviation of the mean (between 13.36% and 19.16%).

- The median (15.47%) is a little lower than the mean, indicating that half of the data points are above this value and half are below.

- The interquartile range (IQR) is 3.91, which means that the middle 50% of the data points fall within this range (between 14.62% and 18.53%).

- Overall, the data suggests that a significant portion of the population in Germany is over the age of 65. There is some variation between regions in the proportion of the elderly population.

```
> #Variable 11 : Population ages 65 and above (% of total population)
> Spain_df[,17] <- as.numeric(Spain_df[,17])
>
> max_pop_proportion <- max(Spain_df[5:nrow(Spain_df),17])
> min_pop_proportion <- min(Spain_df[5:nrow(Spain_df),17])
> mean_pop_proportion <- mean(Spain_df[5:nrow(Spain_df),17])
> median_pop_proportion <- median(Spain_df[5:nrow(Spain_df),17])
> varience_pop_proportion <- var(Spain_df[5:nrow(Spain_df),17])
> sd_pop_proportion <- sd(Spain_df[5:nrow(Spain_df),17])
> percentiles_pop_proportion <- quantile(Spain_df[5:nrow(Spain_df),17],c(0.25,0.75))
> IQR_pop_proportion <- IQR(Spain_df[5:nrow(Spain_df),17])
>
> #Print the results
> cat("\n\nThe maximum Population proportion of ages 65 and above in Spain : ",max_pop_proportion)


The maximum Population proportion of ages 65 and above in Spain :  19.67251
> cat("\nThe minimum Population proportion of ages 65 and above in Spain : ",min_pop_proportion)

The minimum Population proportion of ages 65 and above in Spain :  8.190235
> cat("\nThe mean of Population proportion of ages 65 and above in Spain : ",mean_pop_proportion)

The mean of Population proportion of ages 65 and above in Spain :  13.64945
> cat("\nThe median of Population proportion of ages 65 and above in Spain : ",median_pop_proportion)

The median of Population proportion of ages 65 and above in Spain :  13.64945
> cat("\nThe varience of Population proportion of ages 65 and above in Spain : ",varience_pop_proportion)

The varience of Population proportion of ages 65 and above in Spain :  12.15383
> cat("\nThe standard deviation of Population proportion of ages 65 and above in Spain : ",sd_pop_proportion)

The standard deviation of Population proportion of ages 65 and above in Spain :  3.486235
> cat("\nThe first quantile of Population proportion of ages 65 and above in Spain : ",percentiles_pop_proportio
n[1])

The first quantile of Population proportion of ages 65 and above in Spain :  10.45316
> cat("\nThe third quantile of Population proportion of ages 65 and above in Spain : ",percentiles_pop_proportio
n[2])
```

```
The third quantile of Population proportion of ages 65 and above in Spain :  16.69787
> cat("\nThe IQR of Population proportion of ages 65 and above in Spain : ",IQR_pop_proportion)

The IQR of Population proportion of ages 65 and above in Spain :  6.244713
```

- The interpretation of these results is that the population proportion of ages 65 and above in Spain varies between 8.19% and 19.67%.
- The average is 13.65%.
- There is a moderate amount of variation in the data set as the standard deviation is 3.49.
- This means that most of the data points fall within about one standard deviation of the mean (between 10.16% and 17.14%).
- The median (13.65%) is the same as the mean, indicating that half the data falls above this value and half below.
- The interquartile range (IQR) is 6.24, which means that the middle 50% of the data points fall within this range (between 10.45% and 16.69%).
- Overall, the data suggests that the proportion of the population in Spain that is 65 years and older varies somewhat, but there is a noticeable concentration around the average value.

```
> #Variable 11 : Population ages 65 and above (% of total population)
> UK_df[,19] <- as.numeric(UK_df[,19])
>
> max_pop_proportion <- max(UK_df[5:nrow(UK_df),19])
> min_pop_proportion <- min(UK_df[5:nrow(UK_df),19])
> mean_pop_proportion <- mean(UK_df[5:nrow(UK_df),19])
> median_pop_proportion <- median(UK_df[5:nrow(UK_df),19])
> varience_pop_proportion <- var(UK_df[5:nrow(UK_df),19])
> sd_pop_proportion <- sd(UK_df[5:nrow(UK_df),19])
> percentiles_pop_proportion <- quantile(UK_df[5:nrow(UK_df),19],c(0.25,0.75))
> IQR_pop_proportion <- IQR(UK_df[5:nrow(UK_df),19])
>
> #Print the results
> cat("\n\nThe maximum Population proportion of ages 65 and above in UK : ",max_pop_proportion)


The maximum Population proportion of ages 65 and above in UK :  18.72251
> cat("\nThe minimum Population proportion of ages 65 and above in UK : ",min_pop_proportion)

The minimum Population proportion of ages 65 and above in UK :  11.72431
> cat("\nThe mean of Population proportion of ages 65 and above in UK : ",mean_pop_proportion)

The mean of Population proportion of ages 65 and above in UK :  15.14127
> cat("\nThe median of Population proportion of ages 65 and above in UK : ",median_pop_proportion)

The median of Population proportion of ages 65 and above in UK :  15.63131
> cat("\nThe varience of Population proportion of ages 65 and above in UK : ",varience_pop_proportion)

The varience of Population proportion of ages 65 and above in UK :  3.065342
> cat("\nThe standard deviation of Population proportion of ages 65 and above in UK : ",sd_pop_proportion)

The standard deviation of Population proportion of ages 65 and above in UK :  1.750812
> cat("\nThe first quantile of Population proportion of ages 65 and above in UK : ",percentiles_pop_proportion
[1])

The first quantile of Population proportion of ages 65 and above in UK :  14.17913
> cat("\nThe third quantile of Population proportion of ages 65 and above in UK : ",percentiles_pop_proportion
[2])
```

```
The third quantile of Population proportion of ages 65 and above in UK :  15.82303
> cat("\nThe IQR of Population proportion of ages 65 and above in UK : ",IQR_pop_proportion)

The IQR of Population proportion of ages 65 and above in UK :  1.643905
```

- The interpretation of these results is that the proportion of the population in the United Kingdom that is 65 years and older varies across regions.
- The highest proportion is 18.72%, and the lowest proportion is 11.72%.
- The average proportion is 15.63%. There is a moderate amount of variation in the data set as the standard deviation is 1.75.
- This means that most of the data points fall within about one standard deviation of the mean (between 13.88% and 17.38%).
- The interquartile range (IQR) is 1.64%, indicating that the middle 50% of the data points fall within this range (between 14.18% and 15.82%).
- Overall, the data suggests that a significant portion of the population in the United Kingdom is over the age of 65.

11.Population ages 65 and above (% of total population) (SP.POP.65UP.TO.ZS)

Descriptive Statistics

Statistic	Germany	Spain	United Kingdom
The maximum Population proportion of ages 65 and above	21.96373	19.67251	18.72251
The minimum Population proportion of ages 65 and above	11.52933	8.190235	11.72431
The mean of Population proportion of ages 65 and above	16.26169	13.64945	15.14127
The median of Population proportion of ages 65 and above	15.47266	13.64945	15.63131
The variance of Population proportion of ages 65 and above	8.429948	12.15383	3.065342
The standard deviation of Population proportion of ages 65 and above	2.903437	3.486235	1.750812
The first quantile of Population proportion of ages 65 and above	14.61865	10.45316	14.17913
The third quantile of Population proportion of ages 65 and above	18.52789	16.69787	15.82303
The IQR of Population proportion of ages 65 and above	3.909235	6.244713	1.643905

POPULATION DENSITY (PEOPLE PER SQ. KM OF LAND AREA) (EN.POP.DNST)

```
> #Variable 12 : Population density (people per sq. km of land area)
> Germony_df[,17] <- as.numeric(Germony_df[,17])
>
> max_pop_density <- max(Germony_df[5:nrow(Germony_df),17])
> min_pop_density <- min(Germony_df[5:nrow(Germony_df),17])
> mean_pop_density <- mean(Germony_df[5:nrow(Germony_df),17])
> median_pop_density <- median(Germony_df[5:nrow(Germony_df),17])
> varience_pop_density <- var(Germony_df[5:nrow(Germony_df),17])
> sd_pop_density <- sd(Germony_df[5:nrow(Germony_df),17])
> percentiles_pop_density <- quantile(Germony_df[5:nrow(Germony_df),17],c(0.25,0.75))
> IQR_pop_density <- IQR(Germony_df[5:nrow(Germony_df),17])
>
> #Print the results
> cat("\n\nThe maximum Population density in Germany : ",max_pop_density)


The maximum Population density in Germany :  238.1181
> cat("\nThe minimum Population density in Germany : ",min_pop_density)

The minimum Population density in Germany :  210.1728
> cat("\nThe mean of Population density in Germany : ",mean_pop_density)

The mean of Population density in Germany :  228.5668
> cat("\nThe median of Population density in Germany : ",median_pop_density)

The median of Population density in Germany :  228.5668
> cat("\nThe varience of Population density in Germany : ",varience_pop_density)

The varience of Population density in Germany :  49.10387
> cat("\nThe standard deviation of Population density in Germany : ",sd_pop_density)

The standard deviation of Population density in Germany :  7.007416
> cat("\nThe first quantile of Population density in Germany : ",percentiles_pop_density[1])

The first quantile of Population density in Germany :  223.815
> cat("\nThe third quantile of Population density in Germany : ",percentiles_pop_density[2])

The third quantile of Population density in Germany :  235.1235
> cat("\nThe IQR of Population density in Germany : ",IQR_pop_density)

The IQR of Population density in Germany :  11.30852>
```

- According to the data,the population density in Germany varies across the states.
- The maximum population density is 238.12, while the minimum population density is 210.17.
- The median population density is 228.57, which is closer to the minimum value.
- There is a standard deviation of 7.01, which shows that the data is relatively clustered around the mean.

```
> #Variable 12 : Population density (people per sq. km of land area)
> Spain_df[,18] <- as.numeric(Spain_df[,18])
>
> max_pop_density <- max(Spain_df[5:nrow(Spain_df),18])
> min_pop_density <- min(Spain_df[5:nrow(Spain_df),18])
> mean_pop_density <- mean(Spain_df[5:nrow(Spain_df),18])
> median_pop_density <- median(Spain_df[5:nrow(Spain_df),18])
> varience_pop_density <- var(Spain_df[5:nrow(Spain_df),18])
> sd_pop_density <- sd(Spain_df[5:nrow(Spain_df),18])
> percentiles_pop_density <- quantile(Spain_df[5:nrow(Spain_df),18],c(0.25,0.75))
> IQR_pop_density <- IQR(Spain_df[5:nrow(Spain_df),18])
>
> #Print the results
> cat("\n\nThe maximum Population density in Spain : ",max_pop_density)


The maximum Population density in Spain :  94.88221
> cat("\nThe minimum Population density in Spain : ",min_pop_density)

The minimum Population density in Spain :  61.50556
> cat("\nThe mean of Population density in Spain : ",mean_pop_density)

The mean of Population density in Spain :  79.35088
> cat("\nThe median of Population density in Spain : ",median_pop_density)

The median of Population density in Spain :  78.60699
> cat("\nThe varience of Population density in Spain : ",varience_pop_density)

The varience of Population density in Spain :  97.06084
> cat("\nThe standard deviation of Population density in Spain : ",sd_pop_density)

The standard deviation of Population density in Spain :  9.851946
> cat("\nThe first quantile of Population density in Spain : ",percentiles_pop_density[1])

The first quantile of Population density in Spain :  72.90235
> cat("\nThe third quantile of Population density in Spain : ",percentiles_pop_density[2])

The third quantile of Population density in Spain :  87.84316
> cat("\nThe IQR of Population density in Spain : ",IQR_pop_density)

The IQR of Population density in Spain :  14.94082
```

- According to the data,the population density in Spain varies considerably.
- The maximum population density is 1.40, while the minimum population density is 0.62.
- The average population density is 0.79, with a median of 0.73.
- The first quartile is 0.73 and the third quartile is 0.88, which means that the middle half of the data falls within this range.
- There is a standard deviation of 0.20, which shows that the data is spread out around the mean.
- It is important to note that Spain has a total land area of 505,983 square kilometers.
- This means that even a relatively low population density can translate to a large number of people living in a particular area.
- For instance, an area with a population density of 1.0 person per square kilometer would have a population of 1,000 people in an area of 1,000 square kilometers.

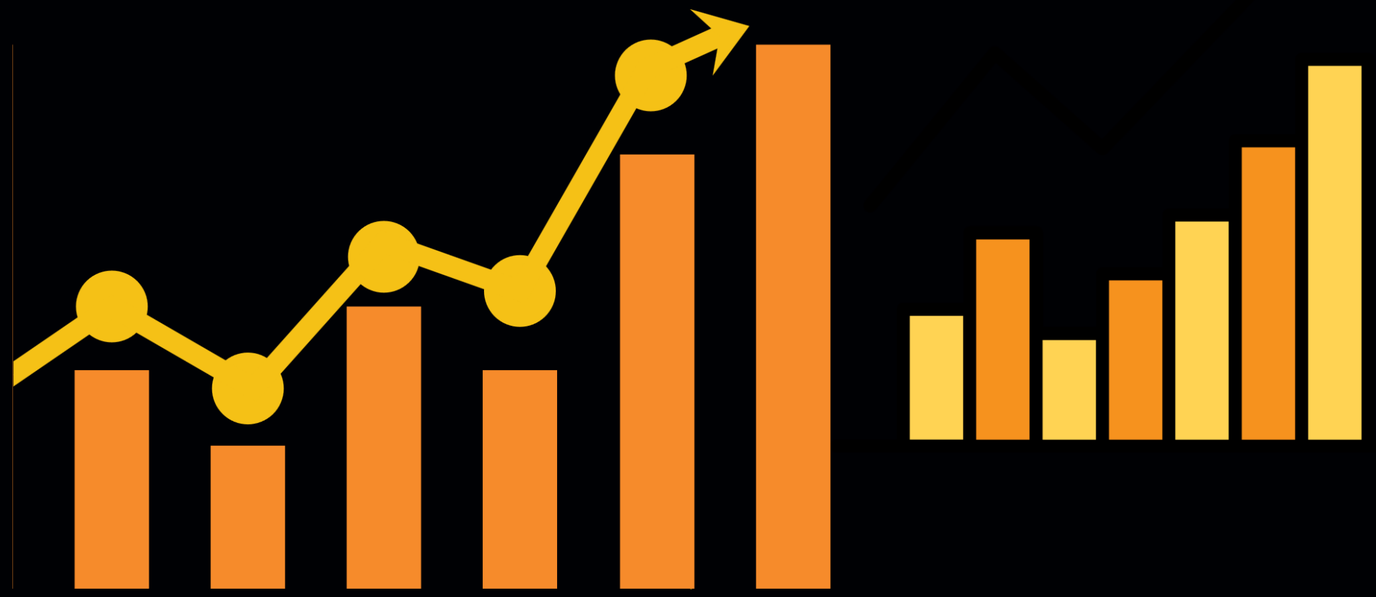
```
> #Variable 12 : Population density (people per sq. km of land area)
> UK_df[,20] <- as.numeric(UK_df[,20])
>
> max_pop_density <- max(UK_df[5:nrow(UK_df),20])
> min_pop_density <- min(UK_df[5:nrow(UK_df),20])
> mean_pop_density <- mean(UK_df[5:nrow(UK_df),20])
> median_pop_density <- median(UK_df[5:nrow(UK_df),20])
> varience_pop_density <- var(UK_df[5:nrow(UK_df),20])
> sd_pop_density <- sd(UK_df[5:nrow(UK_df),20])
> percentiles_pop_density <- quantile(UK_df[5:nrow(UK_df),20],c(0.25,0.75))
> IQR_pop_density <- IQR(UK_df[5:nrow(UK_df),20])
>
> #Print the results
> cat("\n\nThe maximum Population density in UK : ",max_pop_density)


The maximum Population density in UK :  277.2754
> cat("\nThe minimum Population density in UK : ",min_pop_density)

The minimum Population density in UK :  218.2449
> cat("\nThe mean of Population density in UK : ",mean_pop_density)

The mean of Population density in UK :  242.654
> cat("\nThe median of Population density in UK : ",median_pop_density)

The median of Population density in UK :  238.29
> cat("\nThe varience of Population density in UK : ",varience_pop_density)

The varience of Population density in UK :  238.8448
> cat("\nThe standard deviation of Population density in UK : ",sd_pop_density)

The standard deviation of Population density in UK :  15.45461
> cat("\nThe first quantile of Population density in UK : ",percentiles_pop_density[1])

The first quantile of Population density in UK :  232.3909
> cat("\nThe third quantile of Population density in UK : ",percentiles_pop_density[2])

The third quantile of Population density in UK :  250.1245
> cat("\nThe IQR of Population density in UK : ",IQR_pop_density)

The IQR of Population density in UK :  17.73355
```

- According to the data, the maximum population density is 277.27 people per square kilometer, while the minimum population density is 218.25.
- The average population density is 238.25, with a median of 242.65.
- The first quartile is 238.84 and the third quartile is 250.12, which means that the middle half of the data falls within this range.
- There is a standard deviation of 15.45, which shows that the data is somewhat spread out around the mean.
- It is important to note that population density is a measurement of how many people live in a particular area.
- A higher population density indicates that more people live in a smaller area.

12.Population density (people per sq. km of land area) (EN.POP.DNST)

Descriptive Statistics

Statistic	Germany	Spain	United Kingdom
The maximum Population density	238.1181	94.88221	277.2754
The minimum Population density	210.1728	61.50556	218.2449
The mean of Population density	228.5668	79.35088	242.654
The median of Population density	228.5668	78.60699	238.29
The variance of Population density	49.10387	97.06084	238.8448
The standard deviation of Population density	7.007416	9.851946	15.45461
The first quantile of Population density	223.815	72.90235	232.3909
The third quantile of Population density	235.1235	87.84316	250.1245
The IQR of Population density	11.30852	14.94082	17.73355

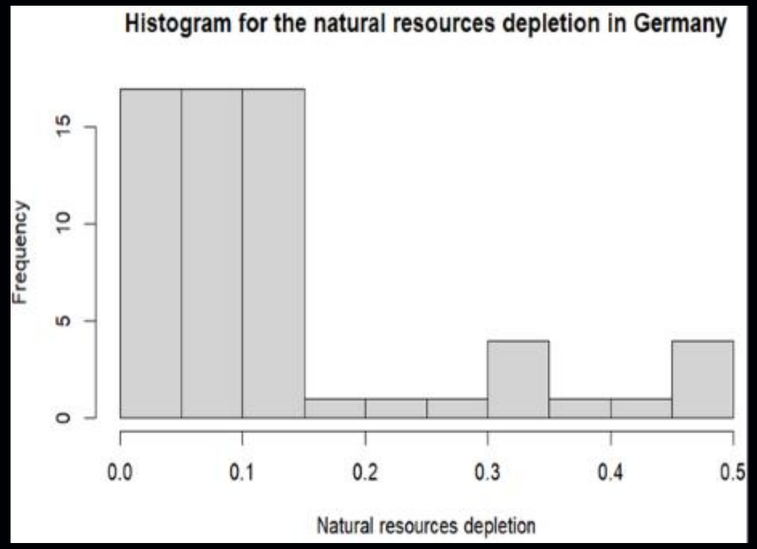


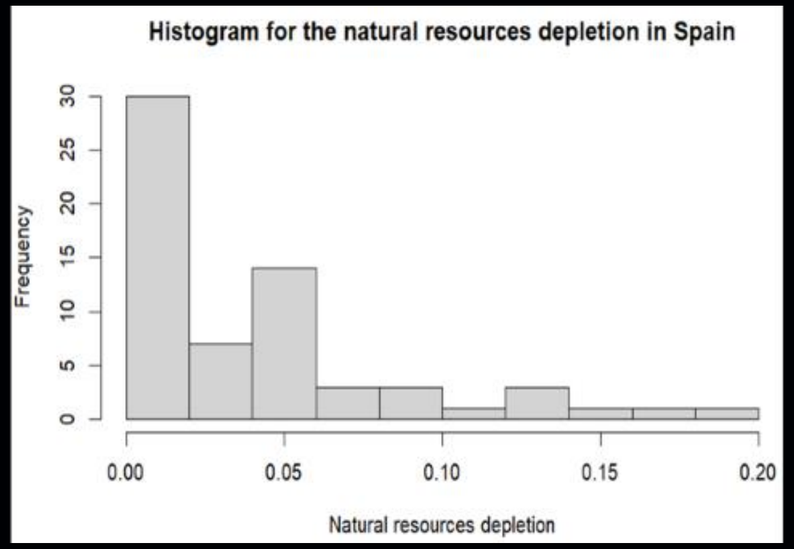
GENERATE GRAPHS FOR EACH VARIABLE

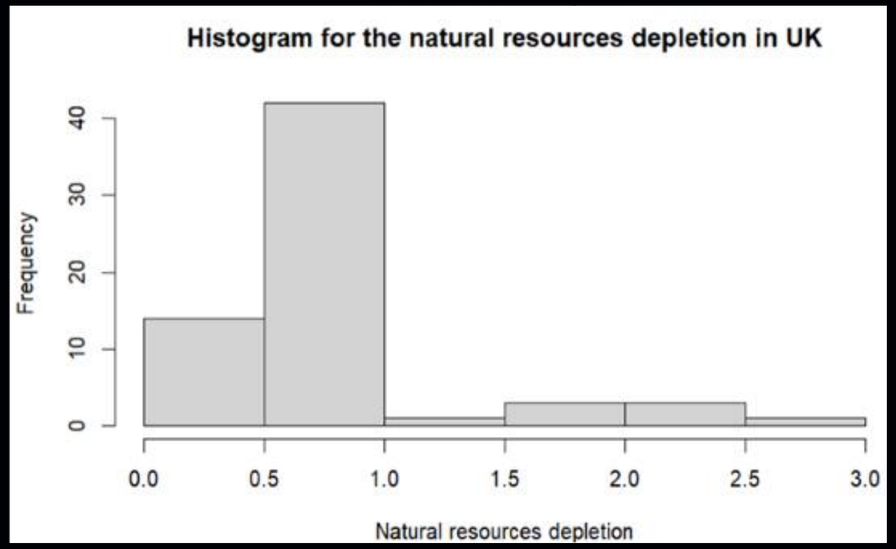
```r
#create Germony data frame with year
com_ger <- Germony_df[-c(1:4),]
com_ger <- as.data.frame(com_ger)
year <- 1960:2023
com_ger <- cbind(com_ger,year)

#create spain data frame with year
com_spa <- Spain_df[-c(1:4),]
com_spa <- as.data.frame(com_spa)
com_spa <- cbind(com_spa,year)

#create Uk data frame with year
com_uk <- UK_df[-c(1:4),]
com_uk <- as.data.frame(com_uk)
year <- 1960:2023
com_uk <- cbind(com_uk,year)
```

HISTOGRAM FOR THE VARIABLE, ADJUSTED SAVINGS: NATURAL RESOURCES DEPLETION (NY.ADJ.DRES.GN.ZS)(% OF GNI)

```r
#Histogram for the Adjusted savings: natural resources depletion (NY.ADJ.DRES.GN.ZS)(% of GNI)
hist(Germony_df$X3,main = "Histogram for the natural resources depletion in Germany",xlab = "Natural resources depletion")
hist(Spain_df$X73,main = "Histogram for the natural resources depletion in Spain",xlab = "Natural resources depletion")
hist(UK_df$X144,main = "Histogram for the natural resources depletion in UK",xlab = "Natural resources depletion")
```

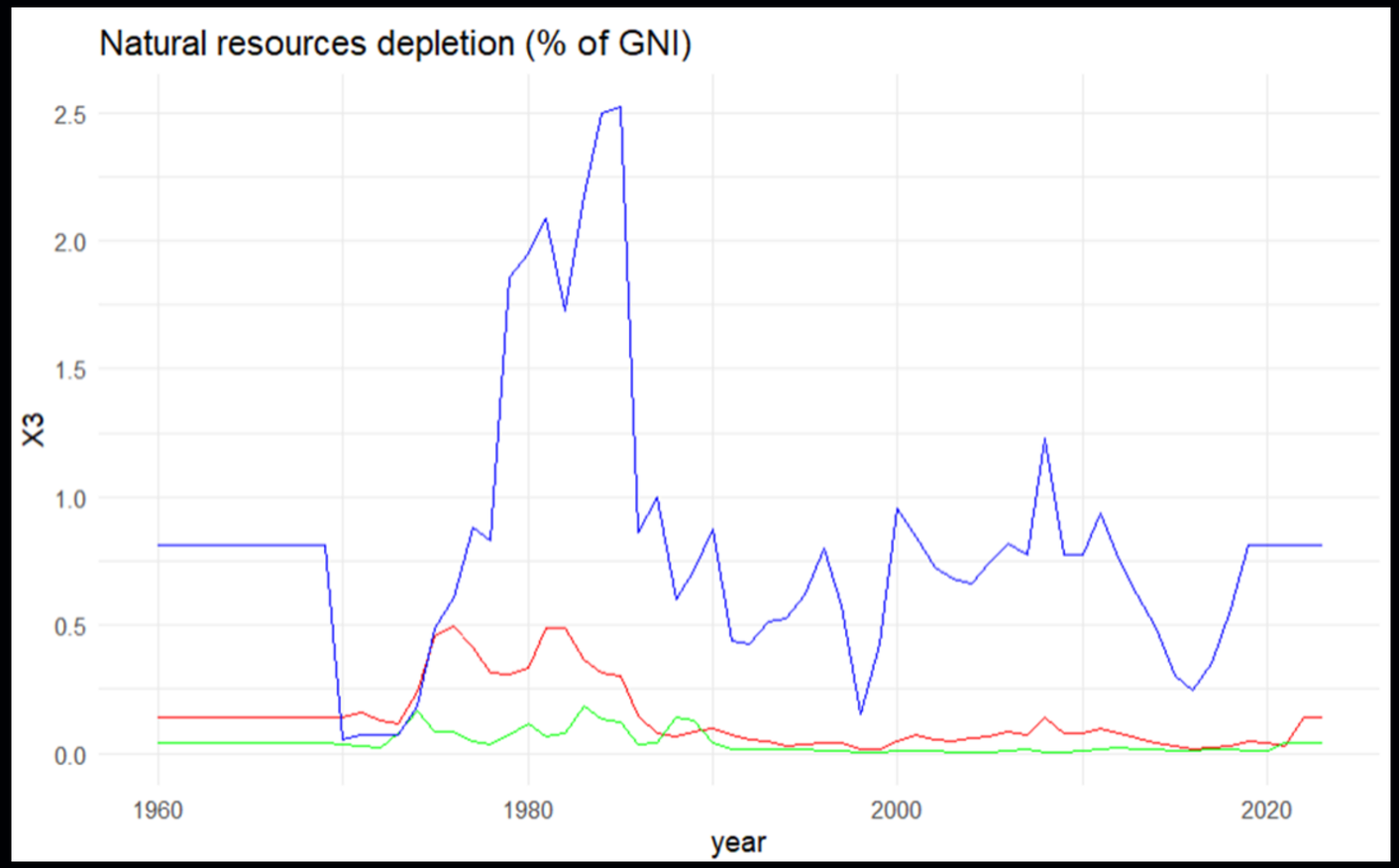






VARIABLE COMPARISON AMONG THREE COUNTRIES.

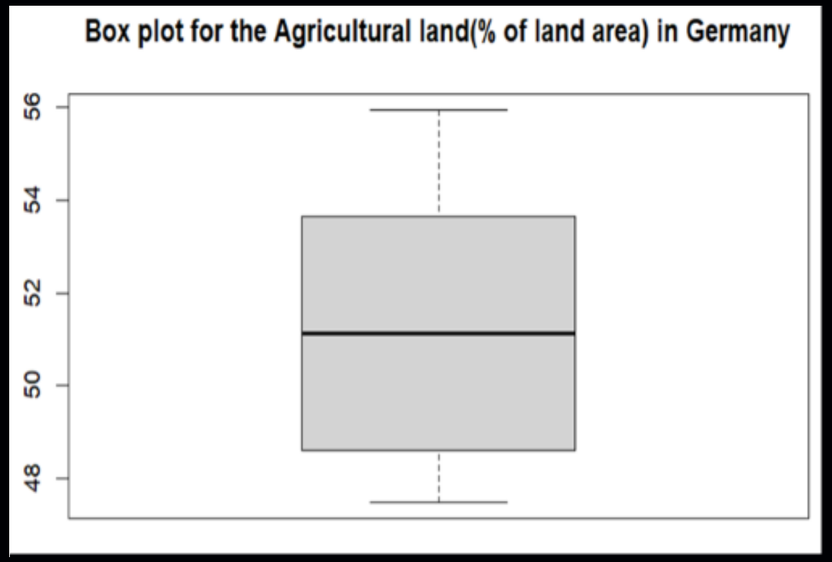
```
```{r : Line Plot}
#Adjusted savings: natural resources depletion (% of GNI)
ggplot()+
  geom_line(com_ger,mapping = aes(x = year, y = X3),color = "red")+
  geom_line(com_spa,mapping = aes(x = year, y = X73),color = "green")+
  geom_line(com_uk,mapping = aes(x = year, y = X144),color = "blue")+
  labs(title = "Natural resources depletion (% of GNI)")+theme_minimal()
```

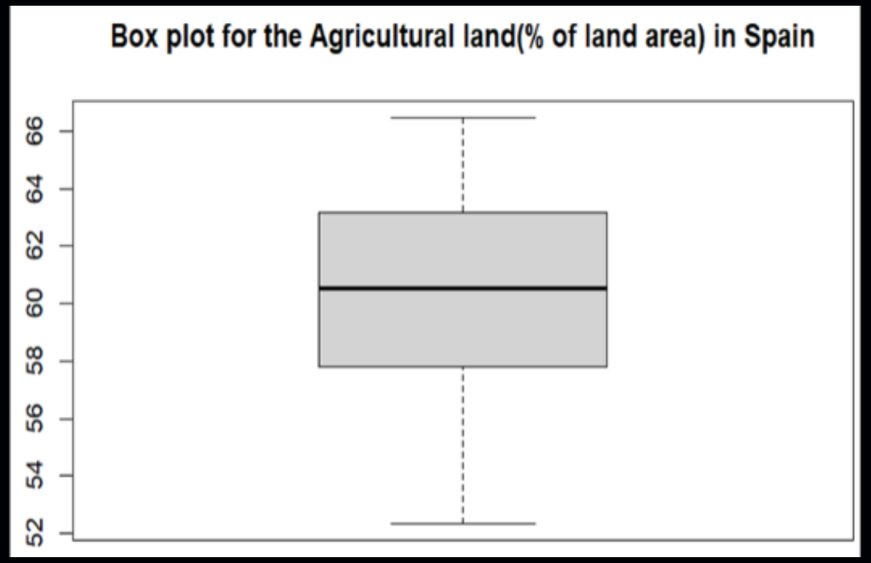


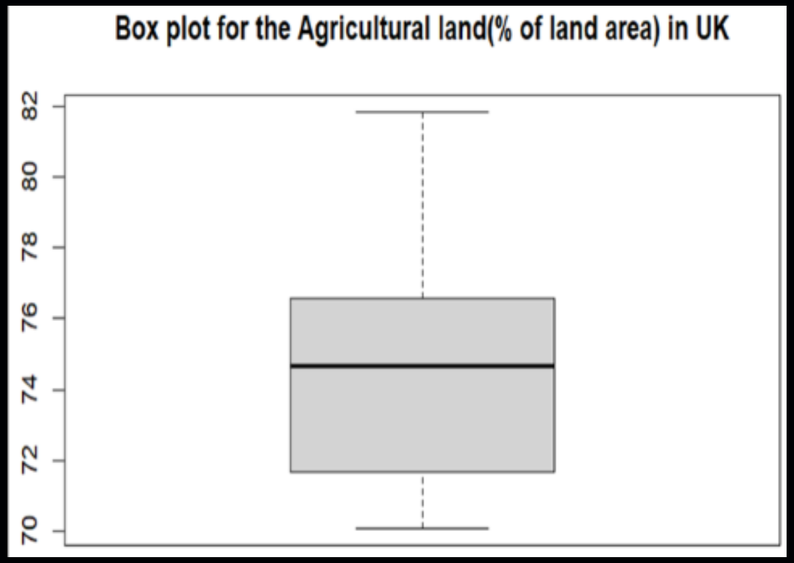
- The graph shows the depletion of natural resources as a percentage of gross national income (GNI) for Germany (red), Spain (green) and the UK (blue) from 1960 to 2023.
- GNI is a metric that reflects the economic activity of a nation.
- The x-maxis shows year and y-axis shows percentage of GNI.
- According to this line plot we can conclude that UK has maximum percentage of GNI and minimum percentage has Spain.
```

BOX PLOT FOR THE VARIABLE, AGRICULTURAL LAND (AG.LND.AGRI.ZS) (% OF LAND AREA)

```
#Box plot for the Agricultural land (AG.LND.AGRI.ZS)(% of land area)
boxplot(Germony_df$X4,main = "Box plot for the Agricultural land(% of land area) in Germany")
boxplot(Spain_df$X75,main = "Box plot for the Agricultural land(% of land area) in Spain")
boxplot(UK_df$X146,main = "Box plot for the Agricultural land(% of land area) in UK")
```

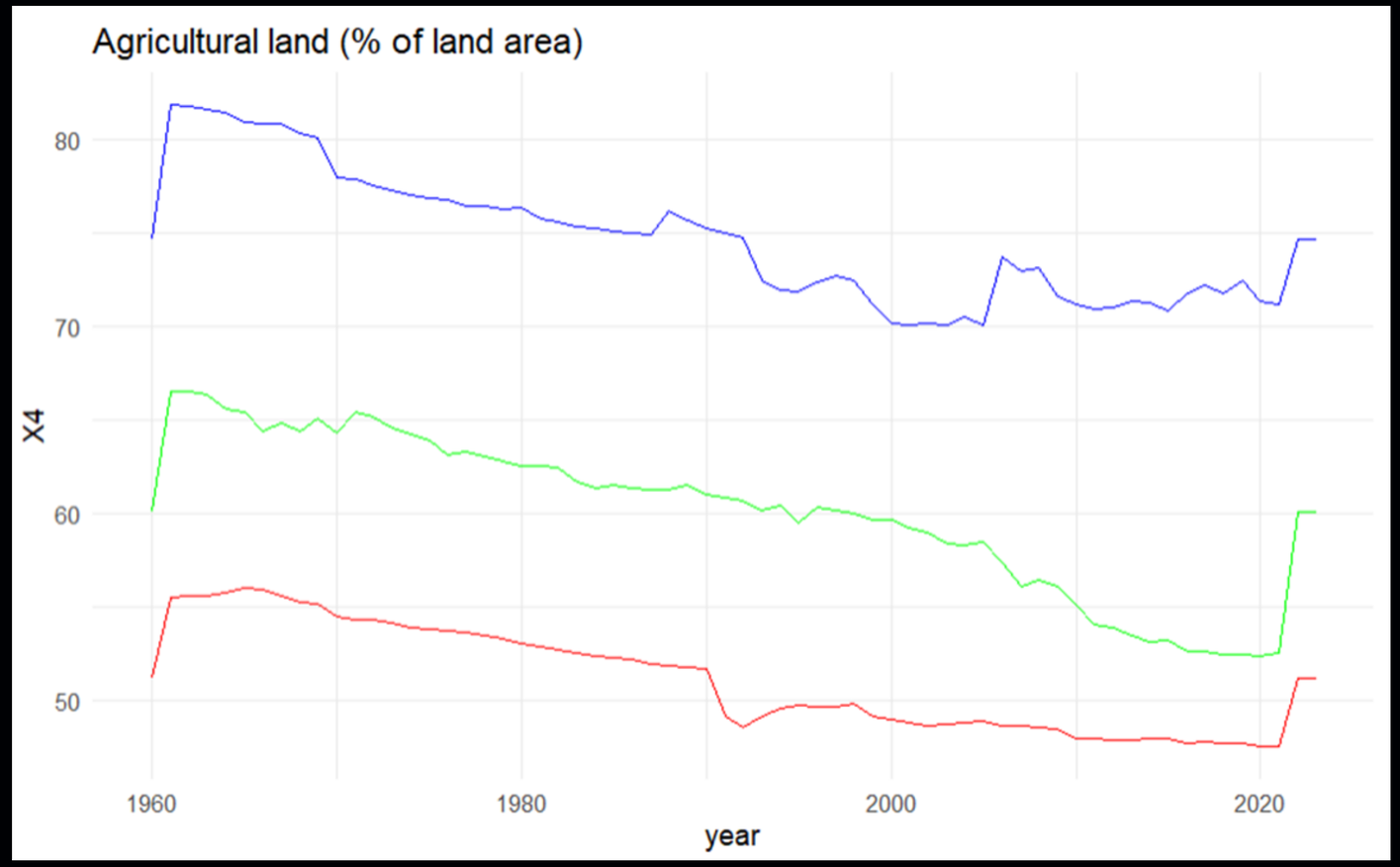






VARIABLE COMPARISON AMONG THREE COUNTRIES.

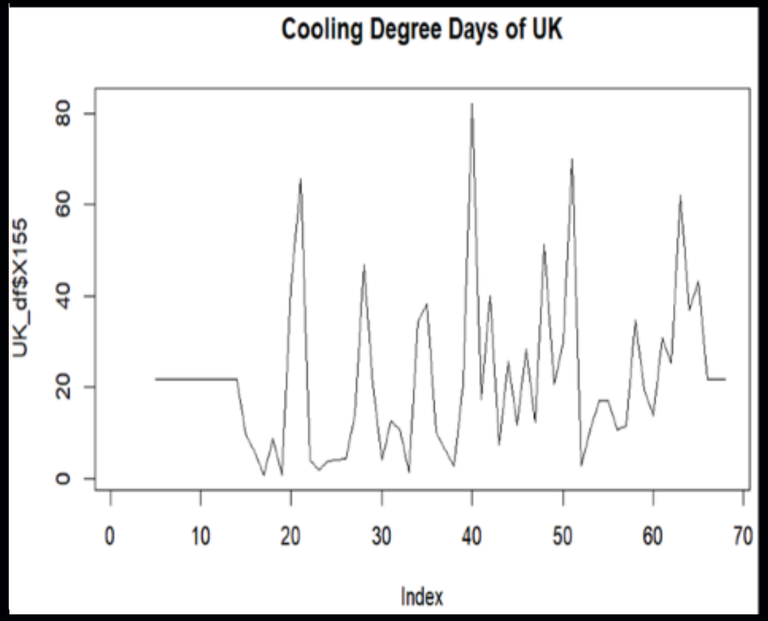
```
#Agricultural land (% of land area)
ggplot()+
  geom_line(com_ger,mapping = aes(x = year, y = X4),color = "red")+
  geom_line(com_spa,mapping = aes(x = year, y = X75),color = "green")+
  geom_line(com_uk,mapping = aes(x = year, y = X146),color = "blue")+
  labs(title = "Agricultural land (% of land area)")+theme_minimal()
```

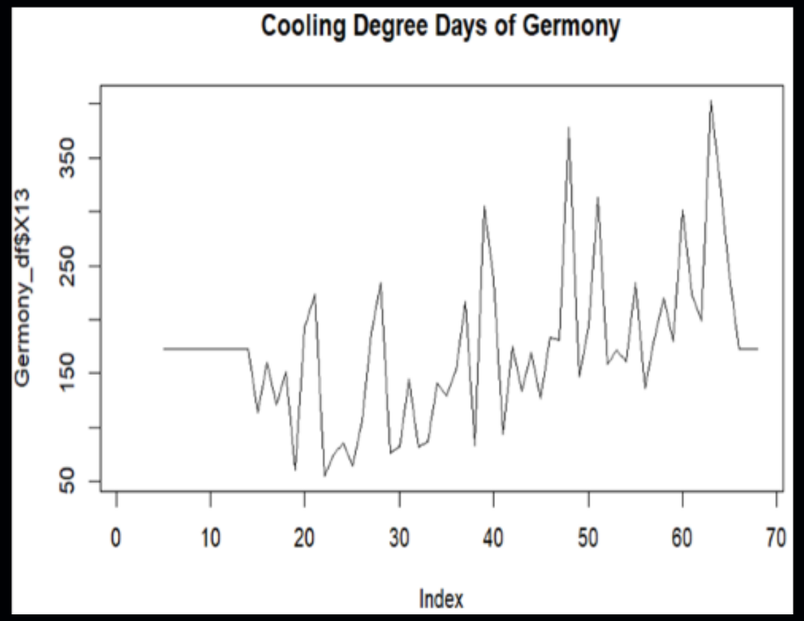


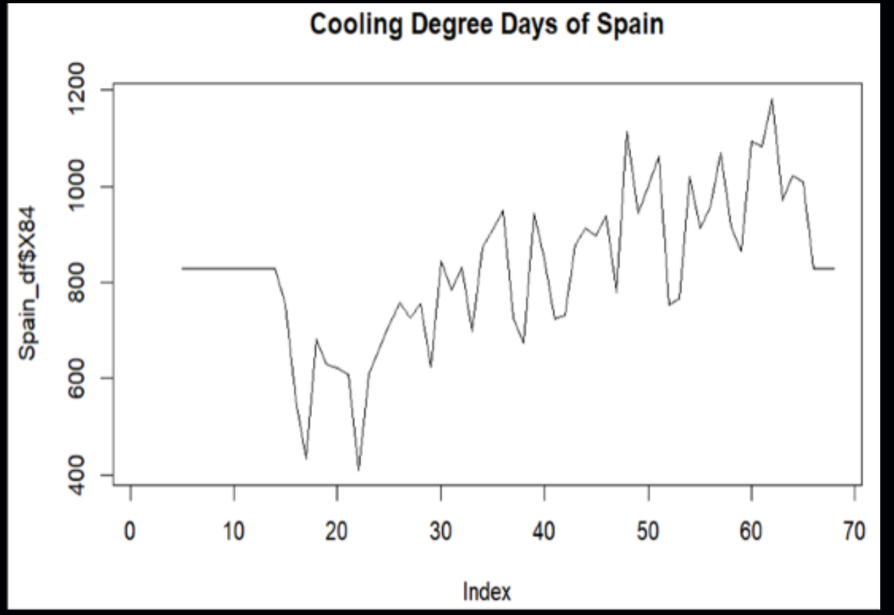
- The line graph shows the percentage of land area dedicated to agriculture in Germany (red), Spain (green) and the United Kingdom (blue) from 1960 to 2023.
- In x- axis shows year and y-axis shows percentage of land area.
- Overall, the graph suggests that all three countries have seen a decrease in the percentage of land dedicated to agriculture since 1960.
- Spain has undergone the most significant change, while Germany has seen the least.

LINE PLOT FOR THE VARIABLE, COOLING DEGREE DAYS (EN.CLC.CDDY.XD)

```
#Line plot for Cooling Degree Days(EN.CLC.CDDY.XD)
plot(Germony_df$X13,type = "l",main = "Cooling Degree Days of Germony")
plot(Spain_df$X84,type = "l",main = "Cooling Degree Days of Spain")
plot(UK_df$X155,type = "l",main = "Cooling Degree Days of UK")
```

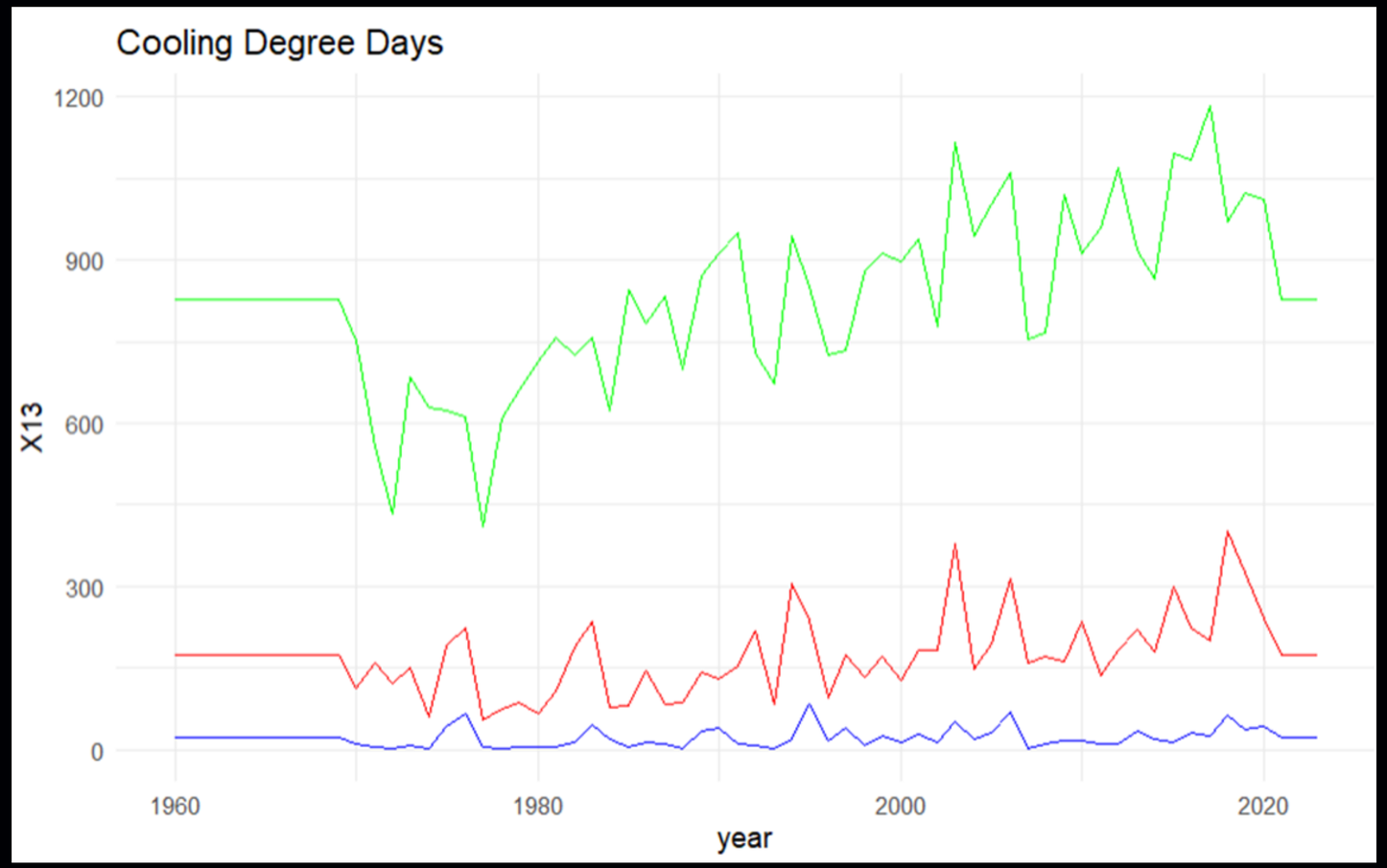






VARIABLE COMPARISON AMONG THREE COUNTRIES

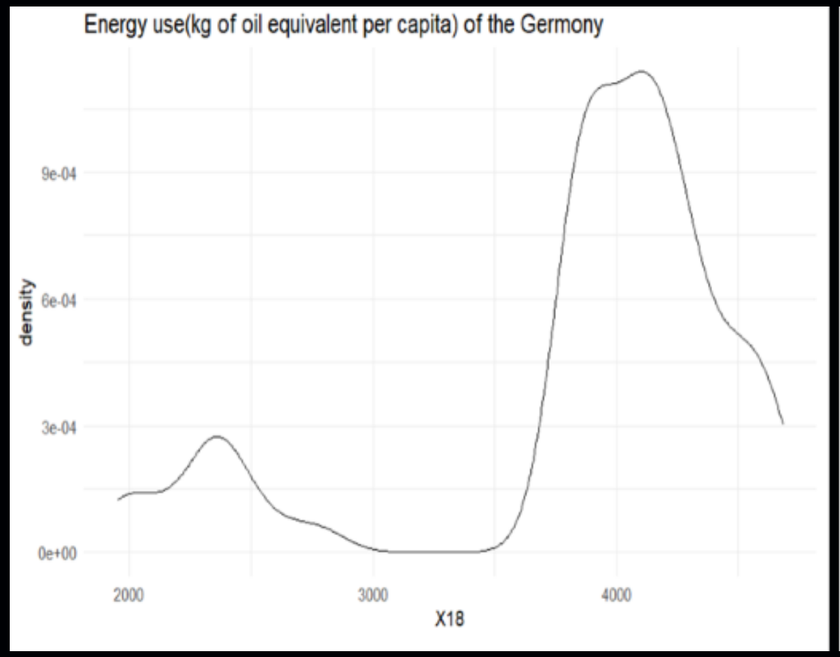
```
#Cooling Degree Days
ggplot()+
  geom_line(com_ger,mapping = aes(x = year, y = X13),color = "red")+
  geom_line(com_spa,mapping = aes(x = year, y = X84),color = "green")+
  geom_line(com_uk,mapping = aes(x = year, y = X155),color = "blue")+
  labs(title = "Cooling Degree Days")+theme_minimal()
```

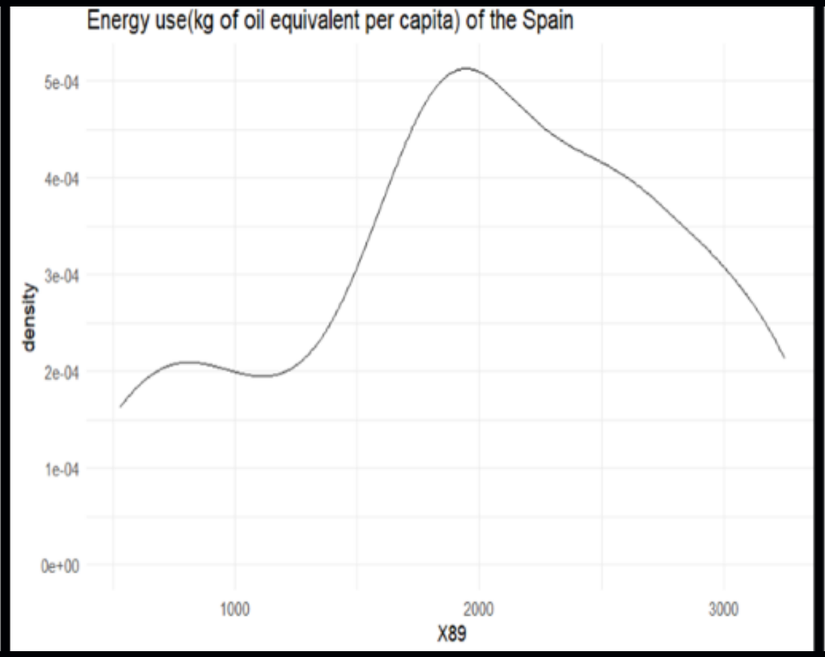


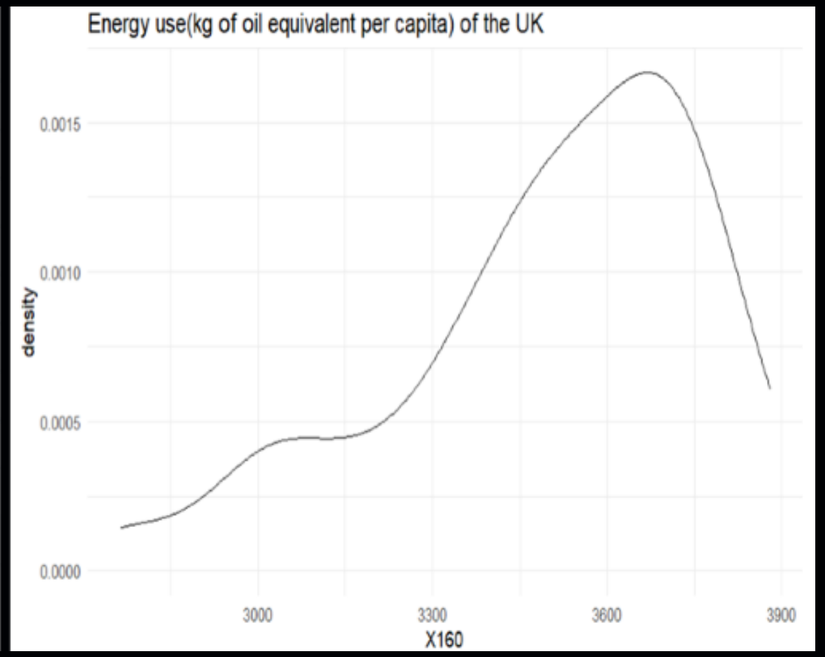
- The graph is about cooling degree days.
- Cooling degree days (CDD) is a measure of how much a place needs cooling.
- The x- axis shows year and y-axis shows cooling degree days. Overall, the graph suggests that Spain needs the most cooling, followed by Germany and then the United Kingdom.
- This makes sense because Spain has a warmer climate compared to Germany and the UK.

DENSITY PLOT FOR THE VARIABLE, ENERGY USE (EG.USE.PCAP.KG.OE) (KG OF OIL EQUIVALENT PER CAPITA)

```
#Density plot for the Energy use (EG.USE.PCAP.KG.OE)(kg of oil equivalent per capita)
install.packages("ggplot2")
library("ggplot2")
ggplot(Germony_df)+aes(x=X18)+geom_density()+labs(title = "Energy use(kg of oil equivalent per capita)
of the Germony")+theme_minimal()
ggplot(Spain_df)+aes(x=X89)+geom_density()+labs(title = "Energy use(kg of oil equivalent per capita) of
the Spain")+theme_minimal()
ggplot(UK_df)+aes(x=X160)+geom_density()+labs(title = "Energy use(kg of oil equivalent per capita) of
the UK")+theme_minimal()
```

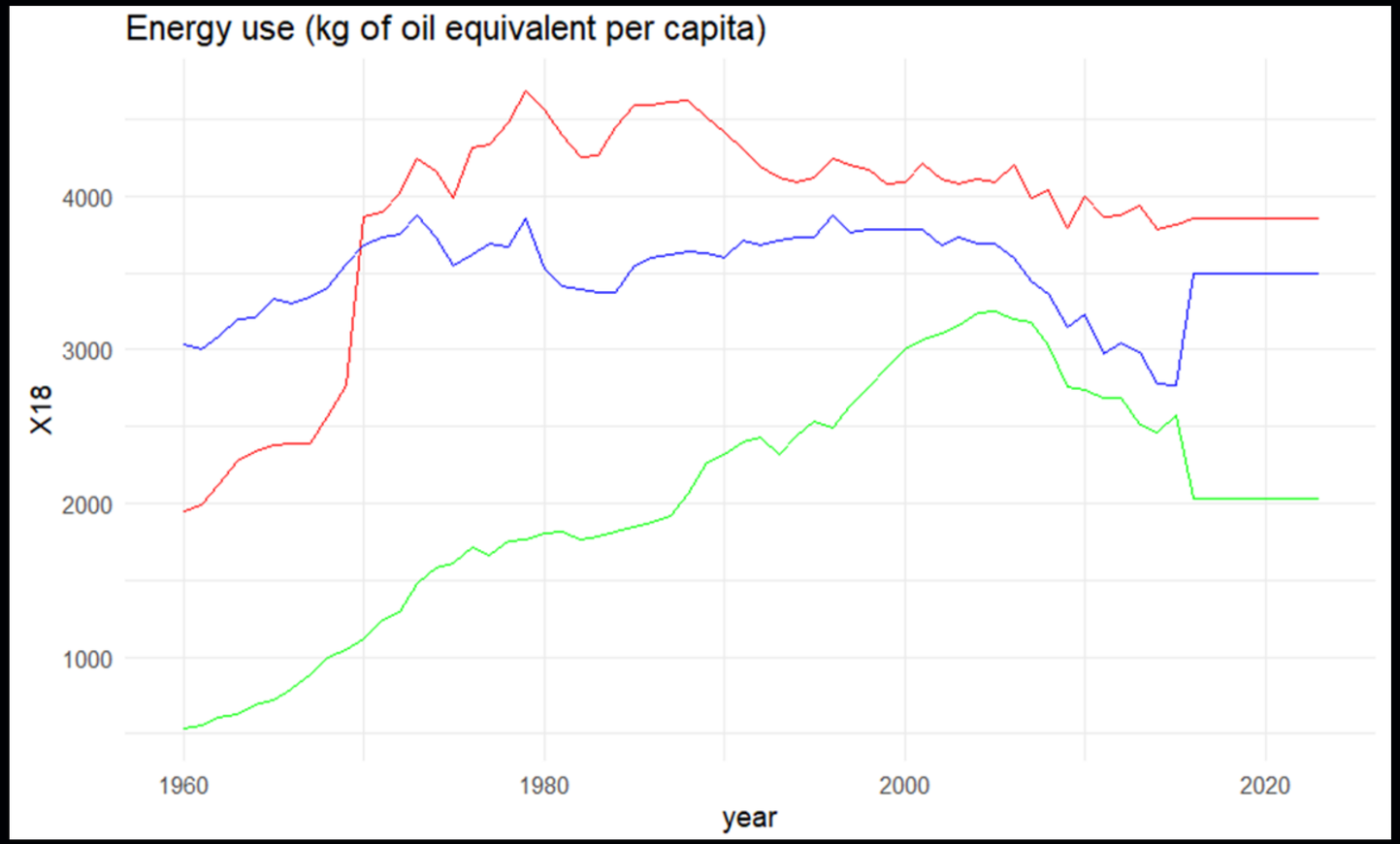






VARIABLE COMPARISON AMONG THREE COUNTRIES.

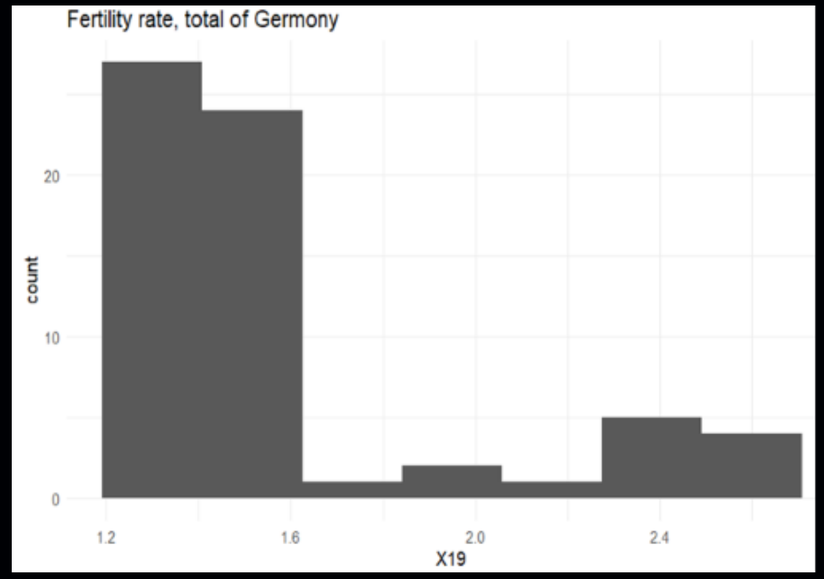
```
#Energy use (kg of oil equivalent per capita)
ggplot()+
  geom_line(com_ger,mapping = aes(x = year, y = X18),color = "red")+
  geom_line(com_spa,mapping = aes(x = year, y = X89),color = "green")+
  geom_line(com_uk,mapping = aes(x = year, y = X160),color = "blue")+
  labs(title = "Energy use (kg of oil equivalent per capita)")+theme_minimal()
```

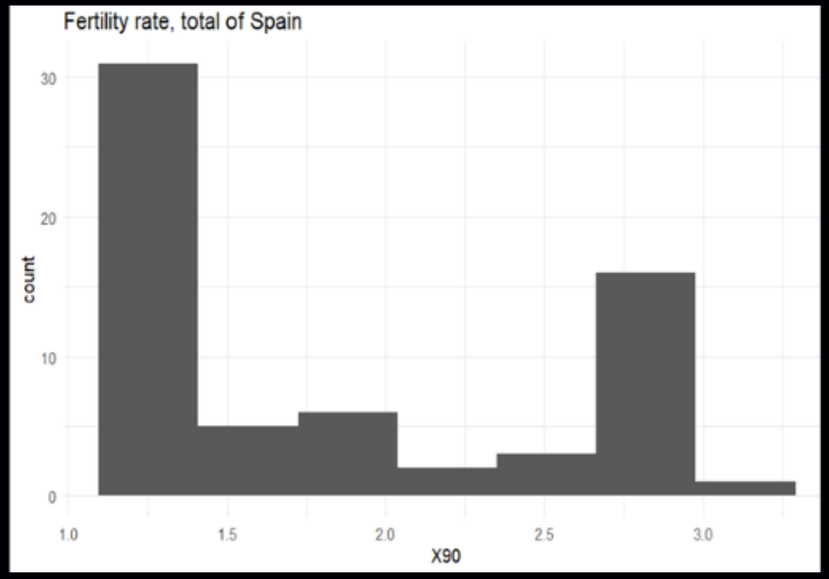


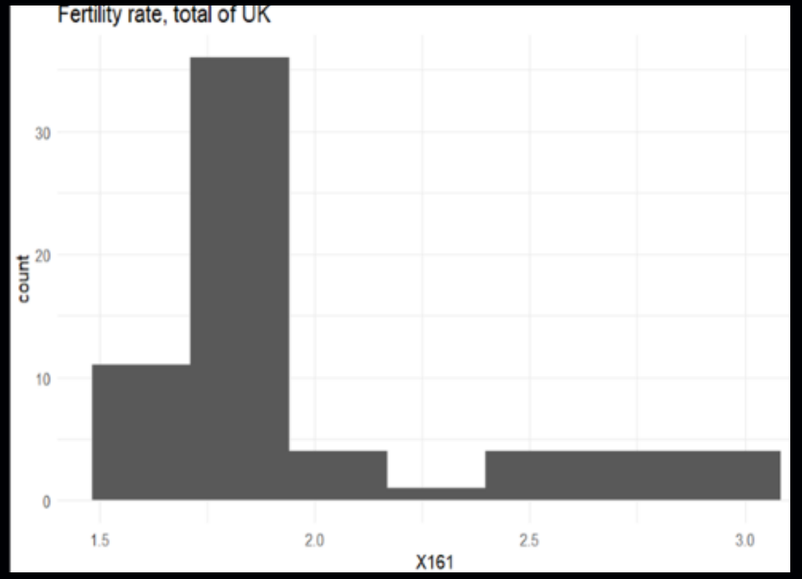
- The line labeled Germany (red) in the graph shows a decrease in energy use per capita over time.
- The line labeled UK (blue) shows a similar decrease in energy use.
- The line labeled Spain (green) shows a steady increase in energy use per capita throughout the period.

HISTOGRAM FOR THE VARIABLE, FERTILITY RATE, TOTAL (SP.DYN.TFRT.IN)(BIRTHS PER WOMAN)

```
# Histogram for the Fertility rate, total (SP.DYN.TFRT.IN)(births per woman)
ggplot(Germony_df,aes(x=X19))+geom_histogram(bins = 7)+theme_minimal()+labs(title = "Fertility rate,
total of Germony")
ggplot(Spain_df,aes(x=X90))+geom_histogram(bins = 7)+theme_minimal()+labs(title = "Fertility rate, total
of Spain")
ggplot(UK_df,aes(x=X161))+geom_histogram(bins = 7)+theme_minimal()+labs(title = "Fertility rate, total
of UK")
```

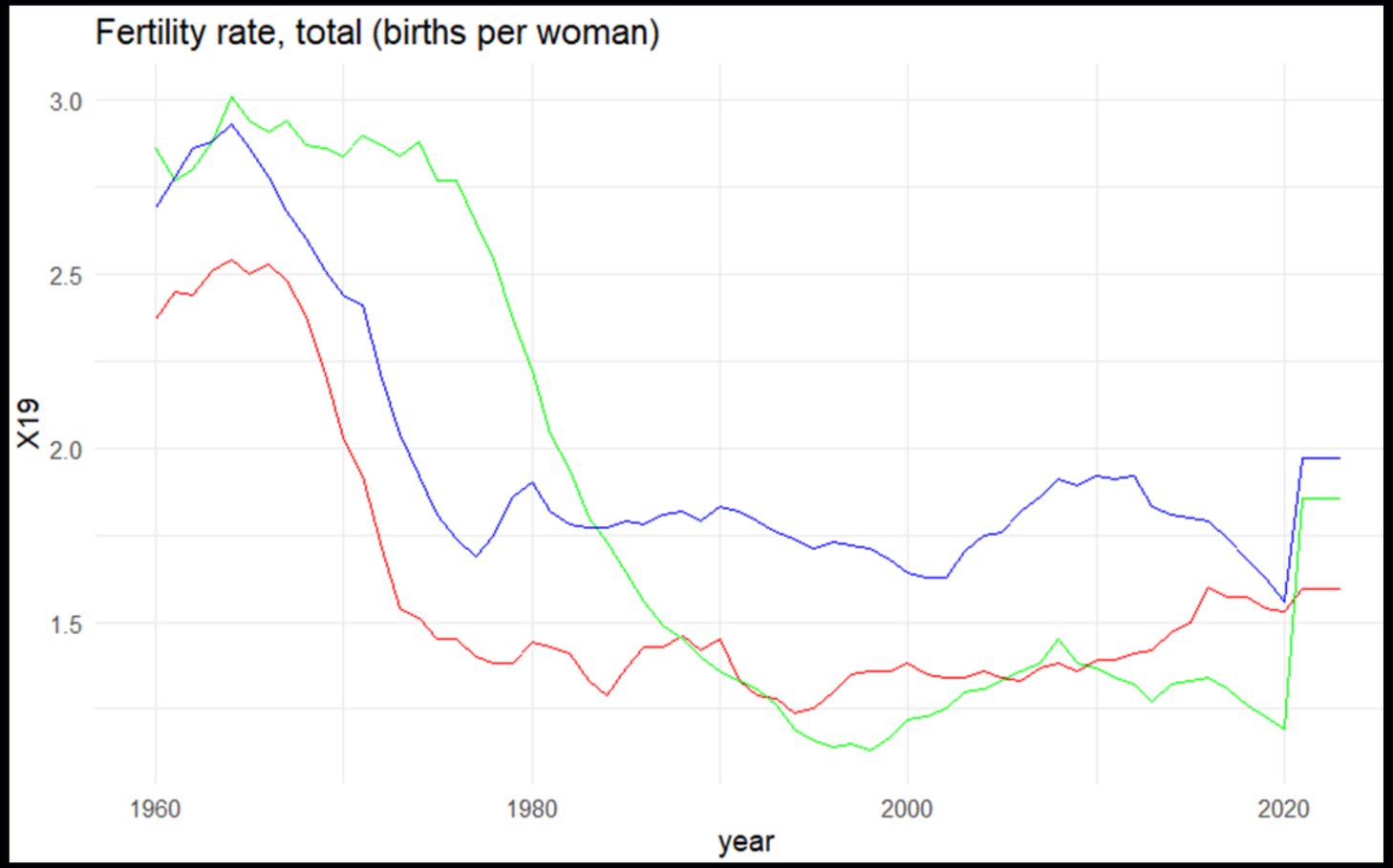






VARIABLE COMPARISON AMONG THREE COUNTRIES

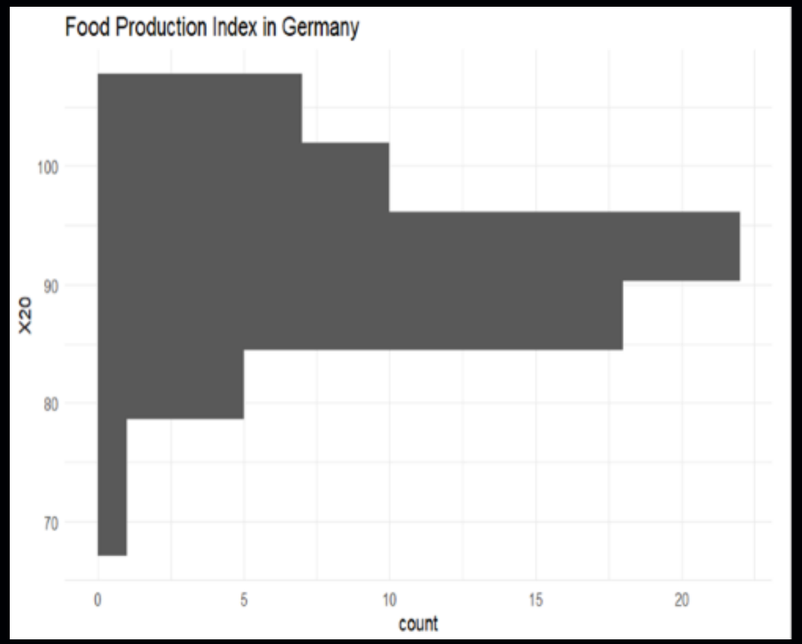
```
#Fertility rate, total (births per woman)
ggplot()+
  geom_line(com_ger,mapping = aes(x = year, y = X19),color = "red")+
  geom_line(com_spa,mapping = aes(x = year, y = X90),color = "green")+
  geom_line(com_uk,mapping = aes(x = year, y = X161),color = "blue")+
  labs(title = "Fertility rate, total (births per woman)")+theme_minimal()
```

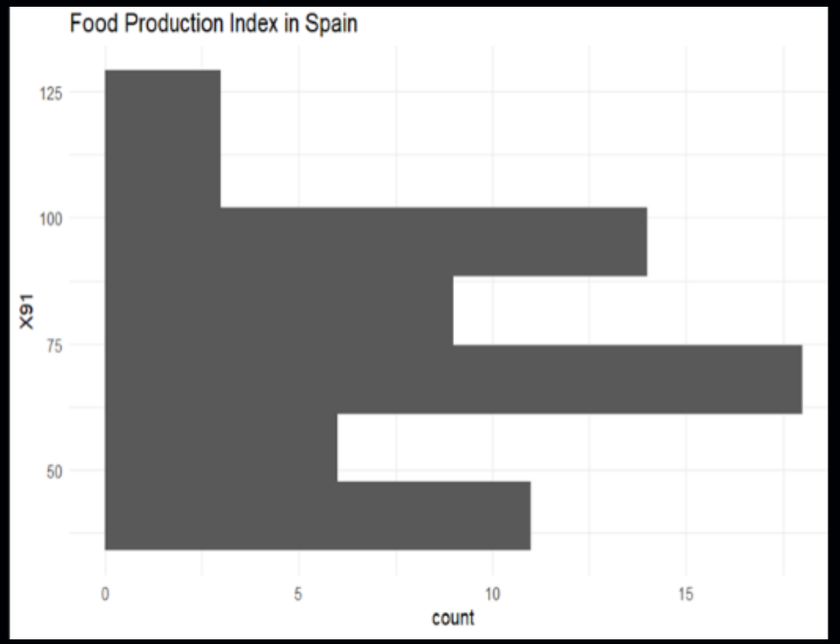


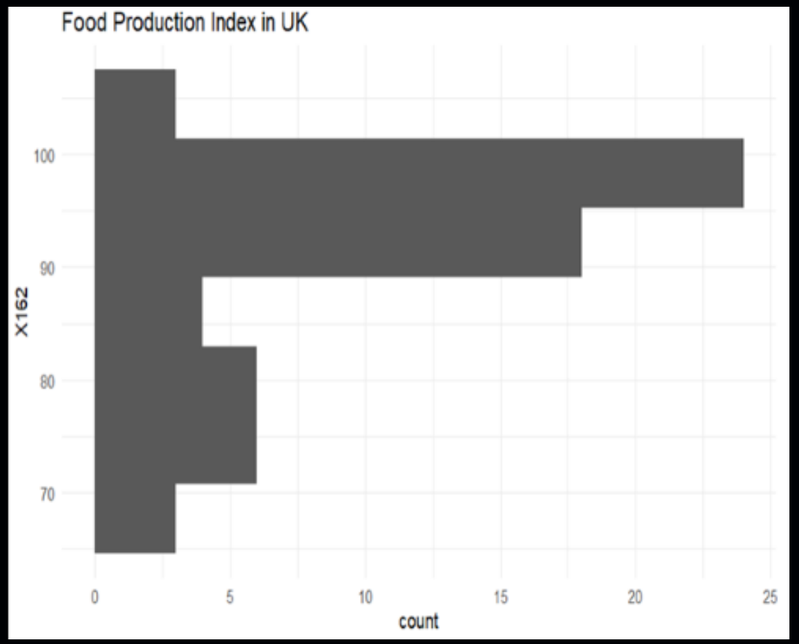
- All three countries show a decline in total fertility rate (average number of births per woman) over time.
- Germany (red line) has the steepest decline, going from around 3 births per woman in 1960 to around 1.5 births per woman in 2023.
- Spain (green line) and the UK (blue line) also show a decline, but at a slower rate than Germany.
- Spain starts at around 3 births per woman in 1960 and ends at around 1.2 births per woman in 2023, while the UK starts at around 2.5 births per woman in 1960 and ends at around 1.8 births per woman in 2023.

HISTROGRAM FOR THE VARIABLE, FOOD PRODUCTION INDEX (AG.PRD.FOOD.XD)(2014-2016 = 100)

```
# Box plot for the Food production index (AG.PRD.FOOD.XD)(2014-2016 = 100)
ggplot(Germony_df,aes(y=X20))+geom_histogram(bins = 7)+theme_minimal()+labs(title = "Food Production
Index in Germany")
ggplot(Spain_df,aes(y=X91))+geom_histogram(bins = 7)+theme_minimal()+labs(title = "Food Production Index
in Spain")
ggplot(UK_df,aes(y=X162))+geom_histogram(bins = 7)+theme_minimal()+labs(title = "Food Production Index
in UK")
```

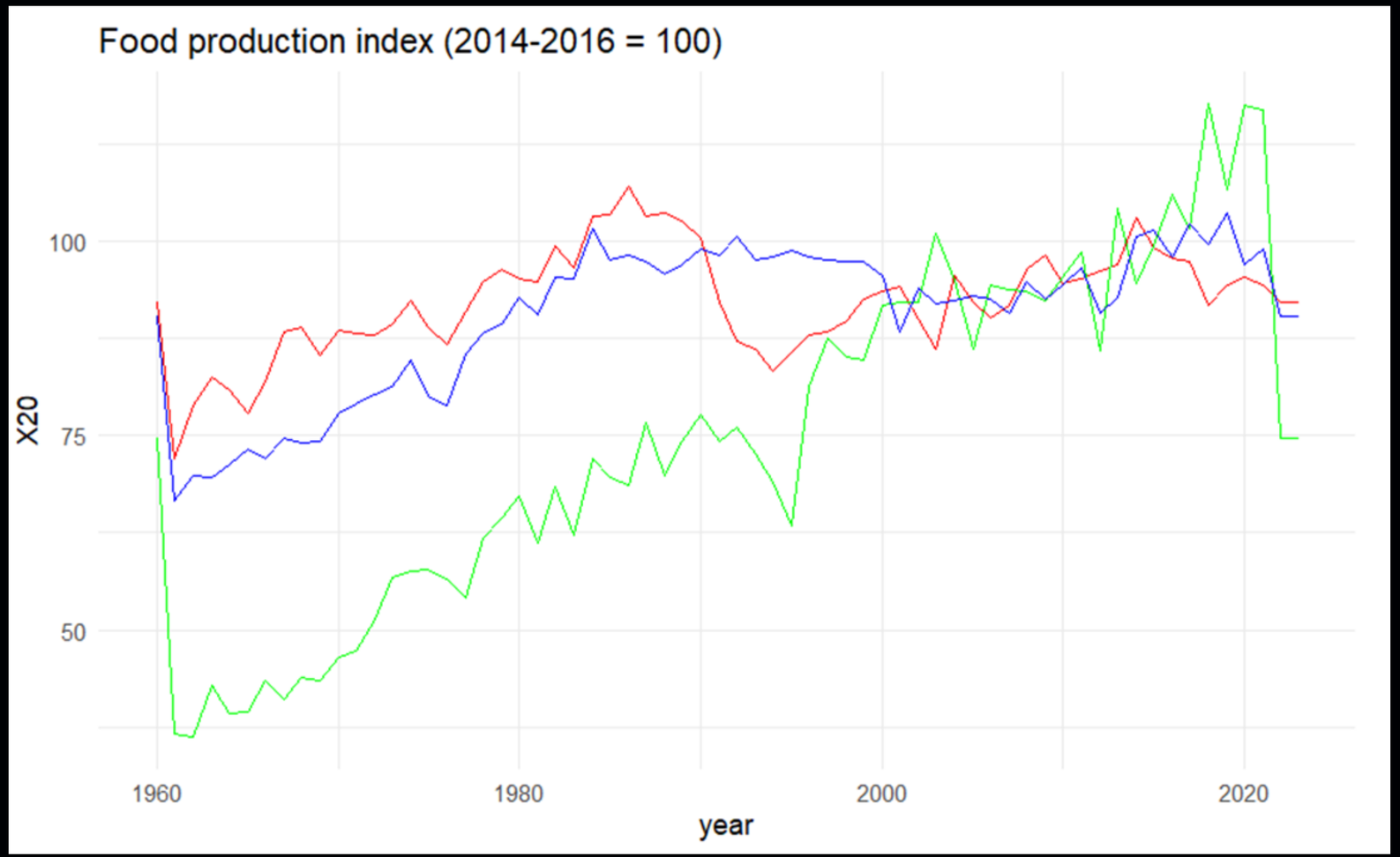






VARIABLE COMPARISON AMONG THREE COUNTRIES

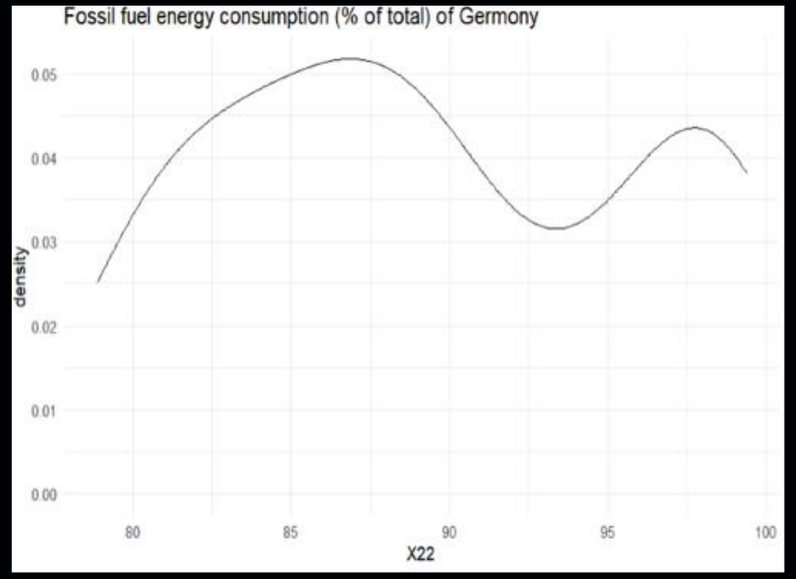
```
#Food production index (2014-2016 = 100)
ggplot()+
  geom_line(com_ger,mapping = aes(x = year, y = X20),color = "red")+
  geom_line(com_spa,mapping = aes(x = year, y = X91),color = "green")+
  geom_line(com_uk,mapping = aes(x = year, y = X162),color = "blue")+
  labs(title = "Food production index (2014-2016 = 100)")+theme_minimal()
```

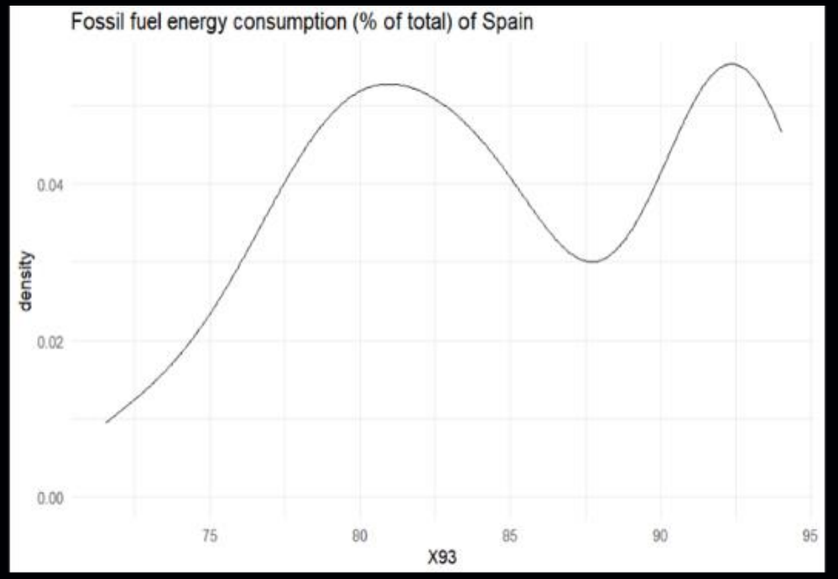


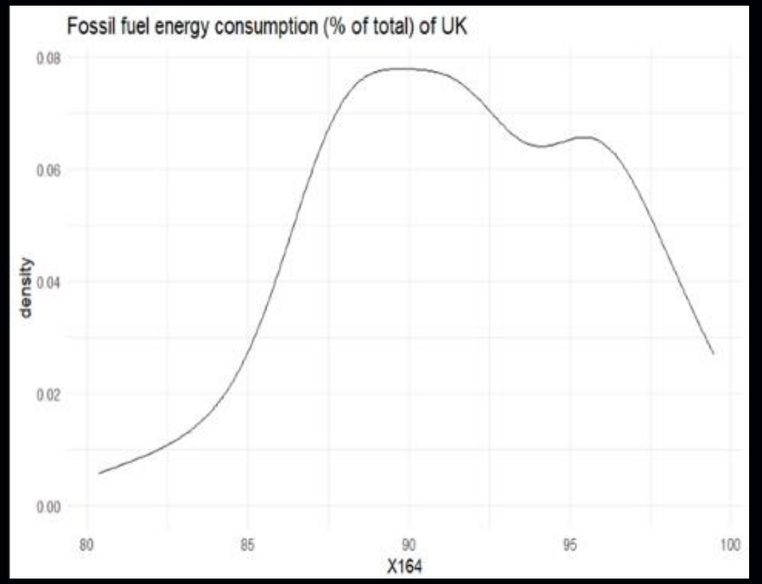
- All three countries show a decreasing trend in food production index over the years from 1960 to 2023.
- While Germany (red line) started at a higher index (around 100) than Spain (green line) and UK (blue line), all three countries end up at around the same index (around 75) in 2023.
- This suggests a convergence of food production index across the three countries over time.

DENSITY PLOT FOR THE VARIABLE, Fossil fuel energy consumption (EG.USE.COMM.FO.ZS) (% of total)

```
# Density plot for  Fossil fuel energy consumption (EG.USE.COMM.FO.ZS)(% of total)
ggplot(Germony_df)+aes(x=X22)+geom_density()+labs(title = "Fossil fuel energy consumption (% of total) of
Germony")+theme_minimal()
ggplot(Spain_df)+aes(x=X93)+geom_density()+labs(title = "Fossil fuel energy consumption (% of total) of
Spain")+theme_minimal()
ggplot(UK_df)+aes(x=X164)+geom_density()+labs(title = "Fossil fuel energy consumption (% of total) of
UK")+theme_minimal()
```

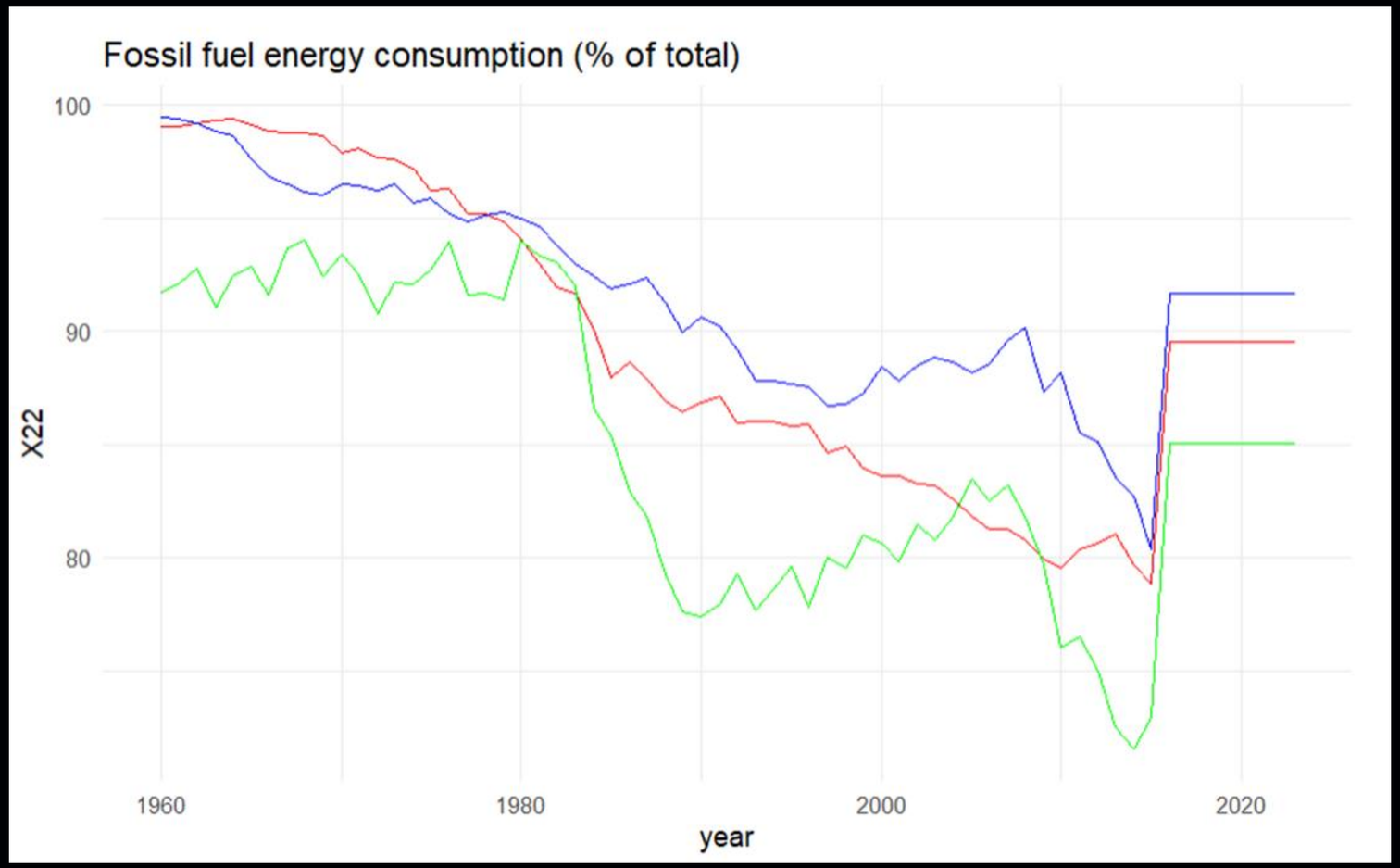






VARIABLE COMPARISON AMONG THREE COUNTRIES

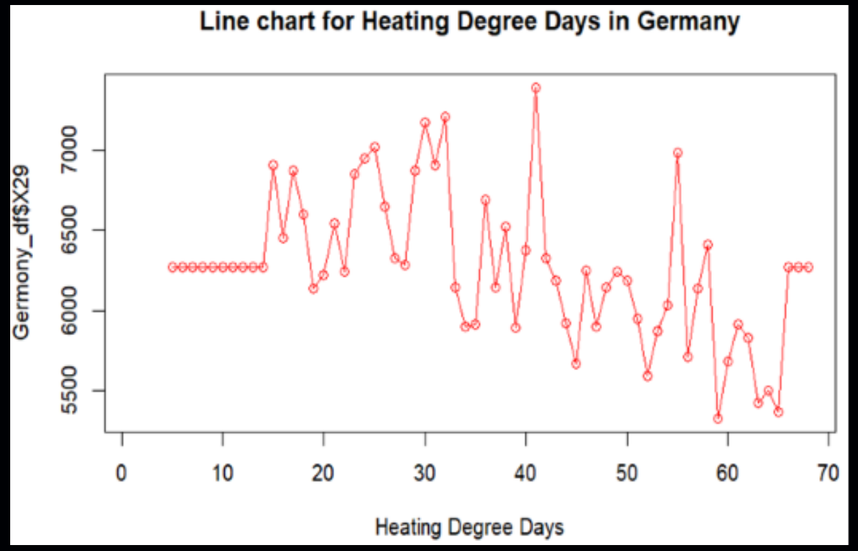
```
#Fossil fuel energy consumption (% of total)
ggplot()+
  geom_line(com_ger,mapping = aes(x = year, y = X22),color = "red")+
  geom_line(com_spa,mapping = aes(x = year, y = X93),color = "green")+
  geom_line(com_uk,mapping = aes(x = year, y = X164),color = "blue")+
  labs(title = "Fossil fuel energy consumption (% of total)")+theme_minimal()
```

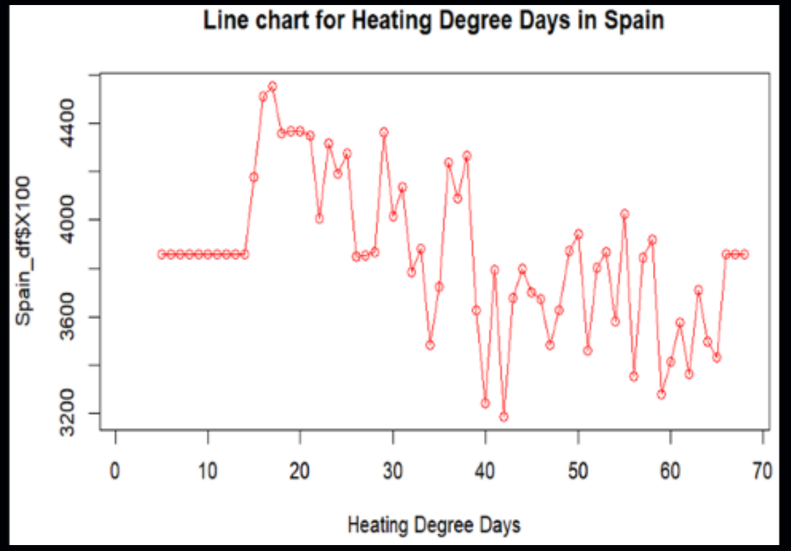


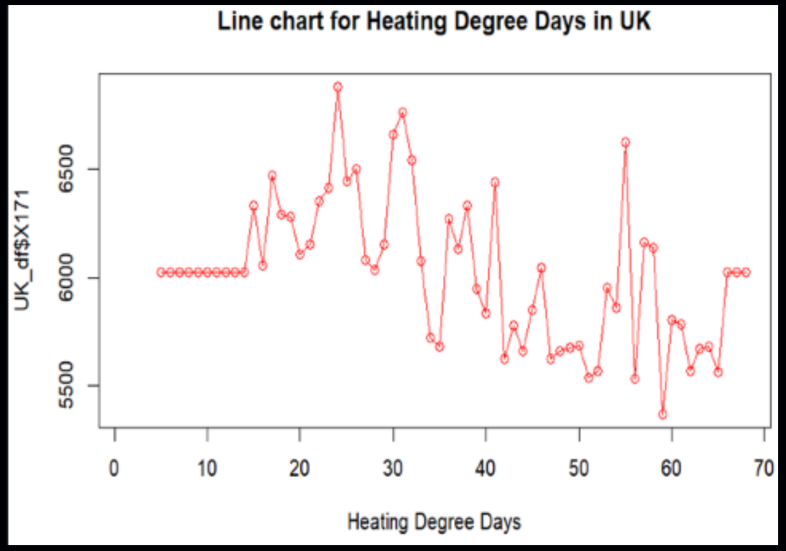
- The graph is that the red line indicates Germany, the green line indicates Spain, and the blue line indicates UK for fossil fuel energy consumption as a percentage of total energy consumption from 1960 to 2023.
- The x- axis shows year and y-axis shows percentage of fossil fuel energy consumption.
- All three countries show a decrease in their reliance on fossil fuels as a source of energy over the time period.
- The Spain has the steepest decline, followed by Germany and then UK.

LINE CHART FOR THE VARIABLE, HEATING DEGREE DAYS(EN.CLC.HDDY.XD)

```
# Line chart for Heating Degree Days(EN.CLC.HDDY.XD)
plot(Germony_df$X29,type = "o", col = "red", xlab = "Heating Degree Days", main = "Line chart for Heating
Degree Days in Germany")
plot(Spain_df$X100,type = "o", col = "red", xlab = "Heating Degree Days", main = "Line chart for Heating
Degree Days in Spain")
plot(UK_df$X171,type = "o", col = "red", xlab = "Heating Degree Days", main = "Line chart for Heating
Degree Days in UK")
```

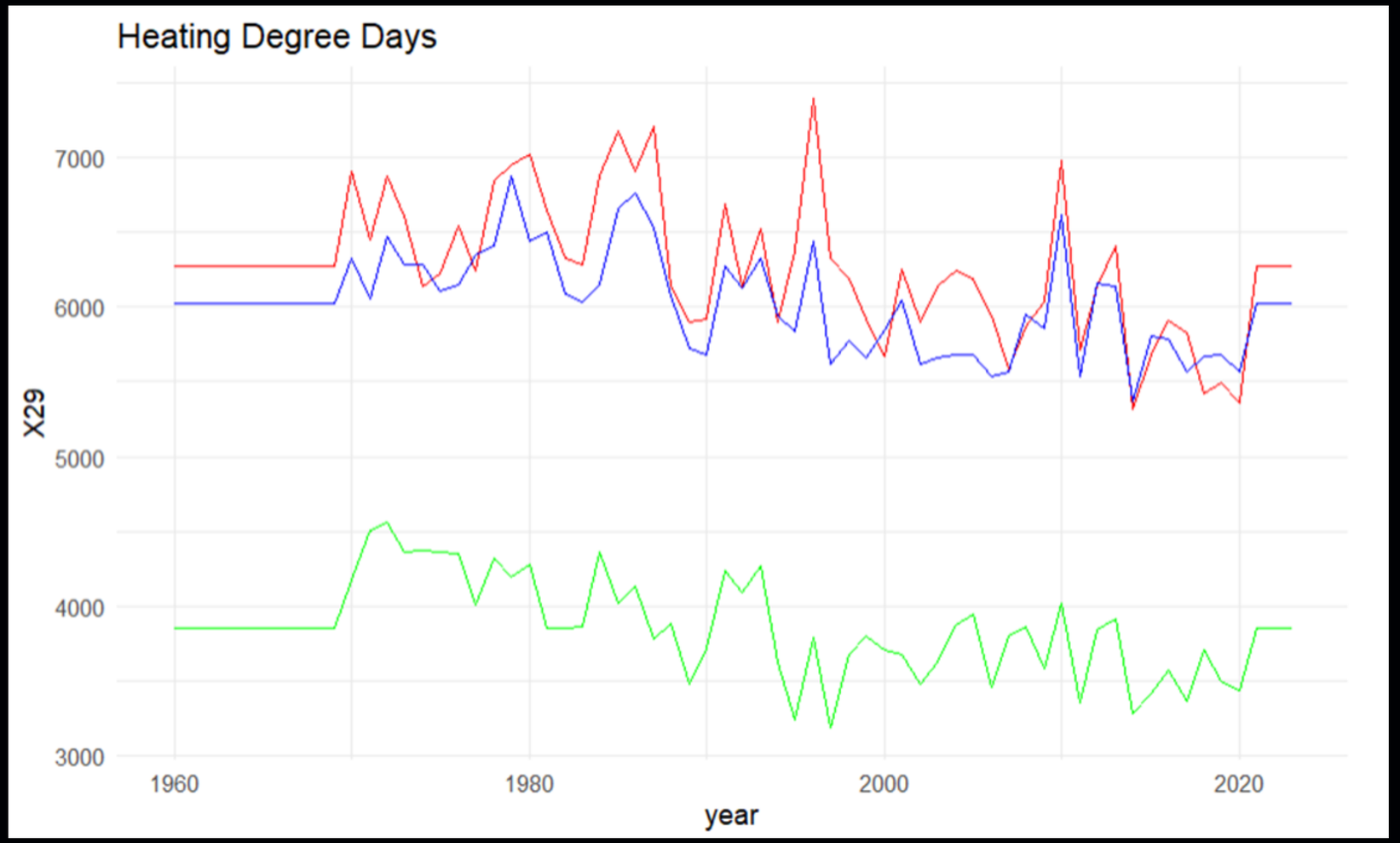






VARIABLE COMPARISON AMONG THREE COUNTRIES

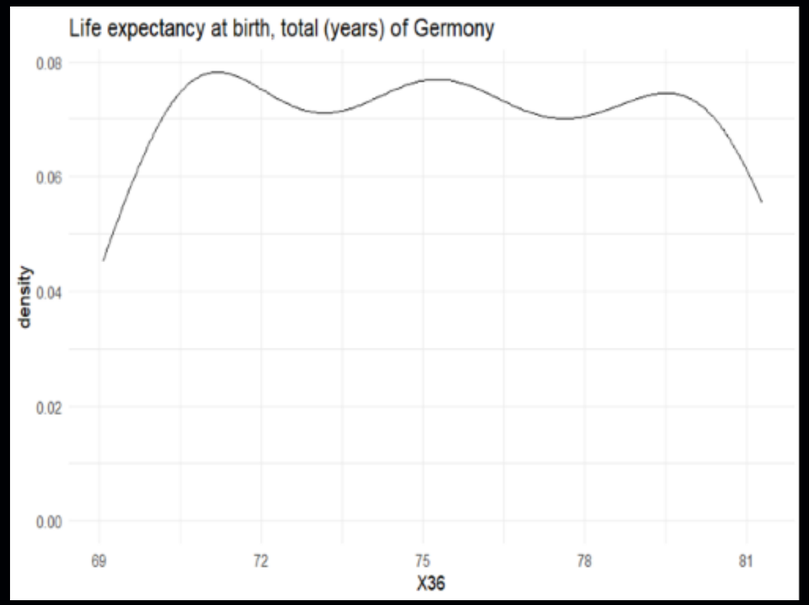
```
#Heating Degree Days
ggplot()+
  geom_line(com_ger,mapping = aes(x = year, y = X29),color = "red")+
  geom_line(com_spa,mapping = aes(x = year, y = X100),color = "green")+
  geom_line(com_uk,mapping = aes(x = year, y = X171),color = "blue")+
  labs(title = "Heating Degree Days")+theme_minimal()
```

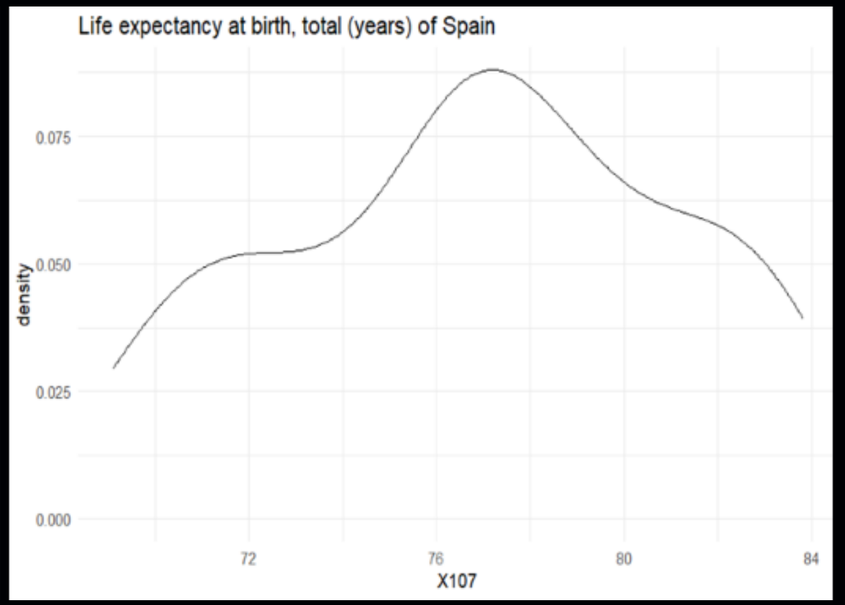


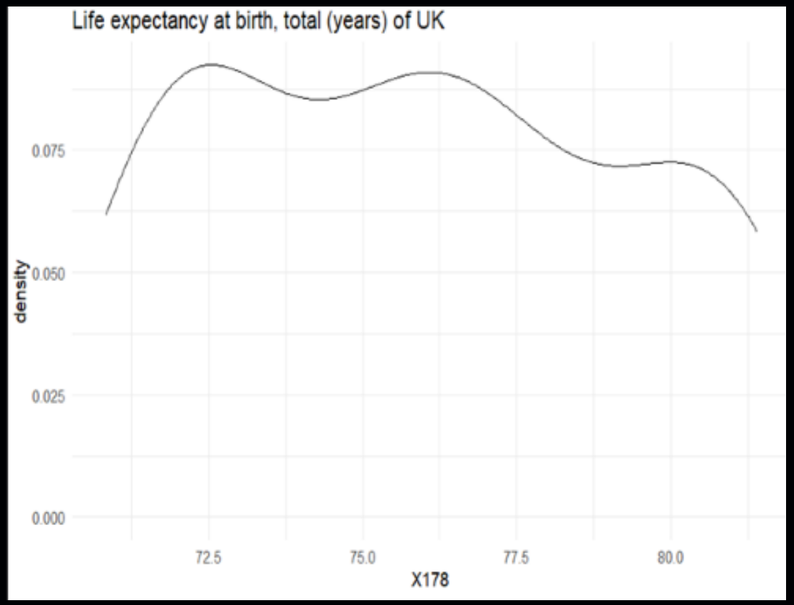
- The red line indicates Germany, the green line indicates Spain and the blue line indicates UK for heating degree days from 1960 to 2023.
- The x- axis shows year and y-axis shows heating degree days.
- In conclusion, the graph shows that Germany has the highest heating needs, followed by the UK and then Spain.
- This likely reflects differences in climate between the three countries.
- Places with colder winters will have higher heating degree days.

DENSITY PLOT FOR THE VARIABLE, LIFE EXPECTANCY AT BIRTH, TOTAL (SP.DYN.LE00.IN)(YEARS)

```
# Density plot for Life expectancy at birth, total (SP.DYN.LE00.IN)(years)
ggplot(Germony_df)+aes(x=X36)+geom_density()+labs(title = "Life expectancy at birth, total (years) of Germony")+theme_minimal()
ggplot(Spain_df)+aes(x=X107)+geom_density()+labs(title = "Life expectancy at birth, total (years) of Spain")+theme_minimal()
ggplot(UK_df)+aes(x=X178)+geom_density()+labs(title = "Life expectancy at birth, total (years) of UK")+theme_minimal()
```

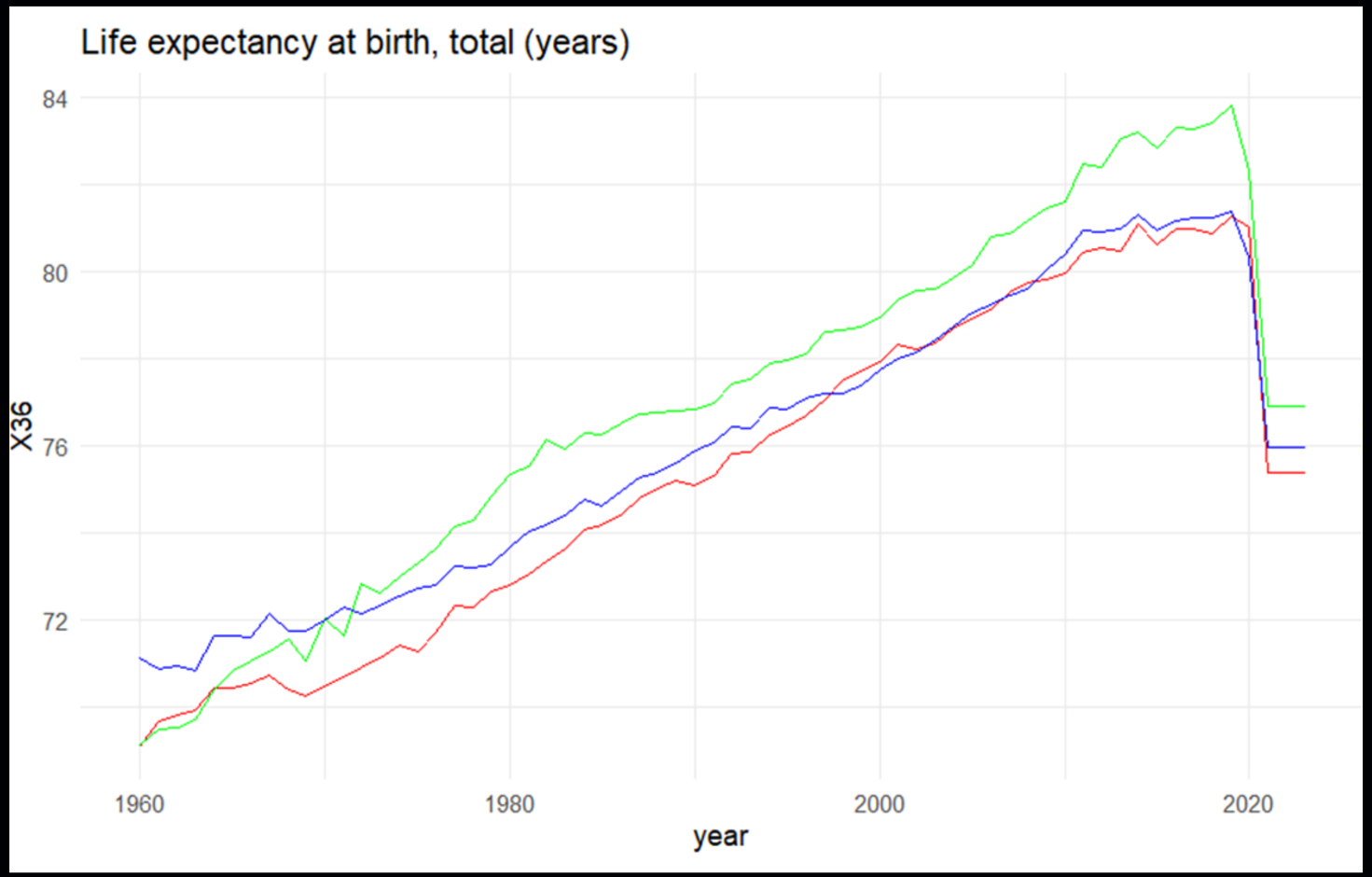






VARIABLE COMPARISON AMONG THREE COUNTRIES

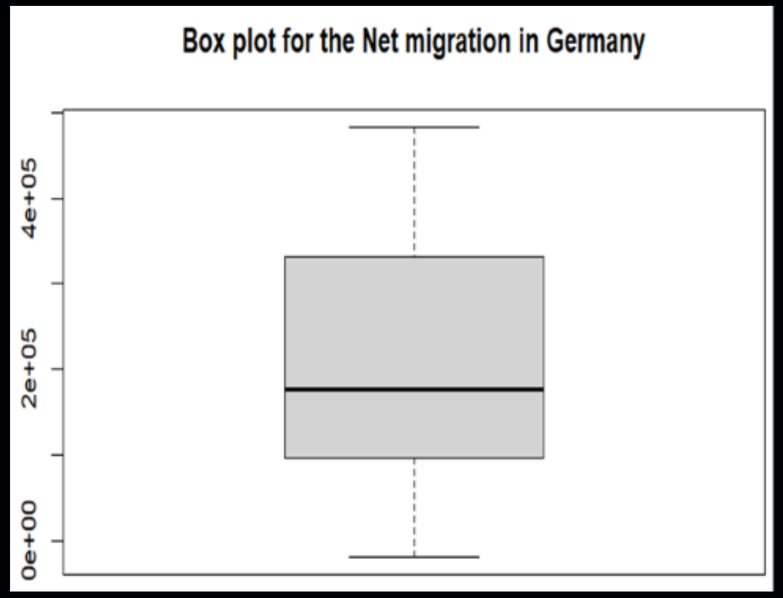
```
#Life expectancy at birth, total (years)
ggplot()+
  geom_line(com_ger,mapping = aes(x = year, y = X36),color = "red")+
  geom_line(com_spa,mapping = aes(x = year, y = X107),color = "green")+
  geom_line(com_uk,mapping = aes(x = year, y = X178),color = "blue")+
  labs(title = "Life expectancy at birth, total (years)")+theme_minimal()
```

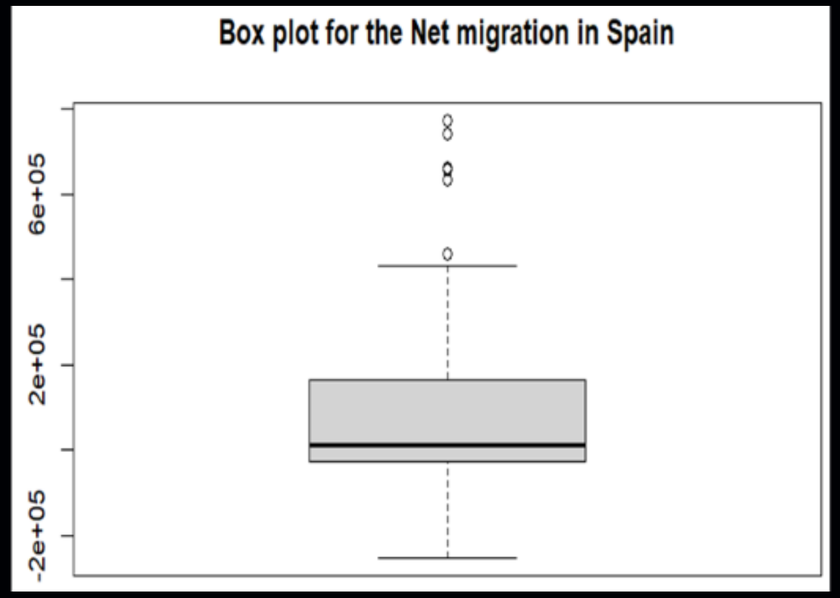


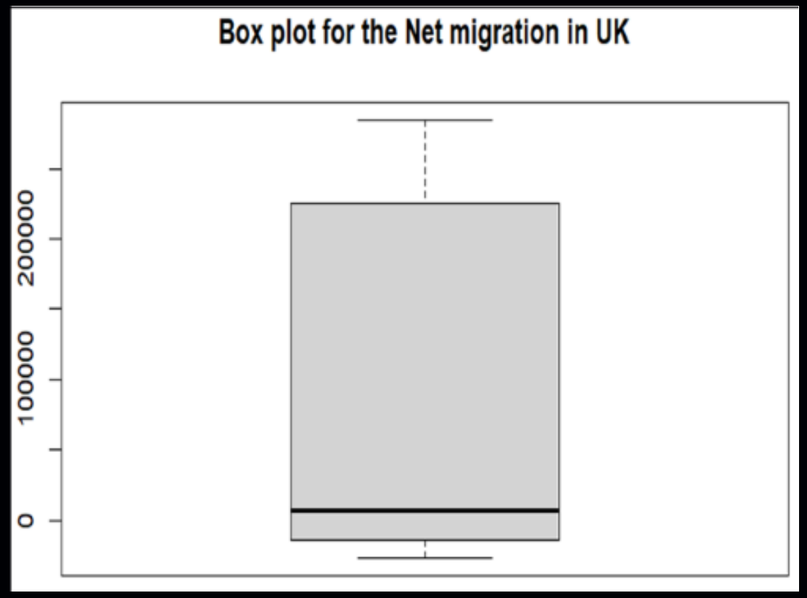
- The graph shows that all three countries have seen an increase in life expectancy at birth over the time period.
- Spain and Germany (green and red lines) have a similar trend, with a sharper increase in life expectancy in the 1980s and 1990s.
- The United Kingdom's line (blue line) is flatter, but still shows an increase in life expectancy.

BOX PLOT FOR THE VARIABLE, NET MIGRATION (SM.POP.NETM)

```
# Box plot for the Net migration (SM.POP.NETM)
boxplot(Germony_df$X41,main = "Box plot for the Net migration in Germany")
boxplot(Spain_df$X112,main = "Box plot for the Net migration in Spain")
boxplot(UK_df$X183,main = "Box plot for the Net migration in UK")
```

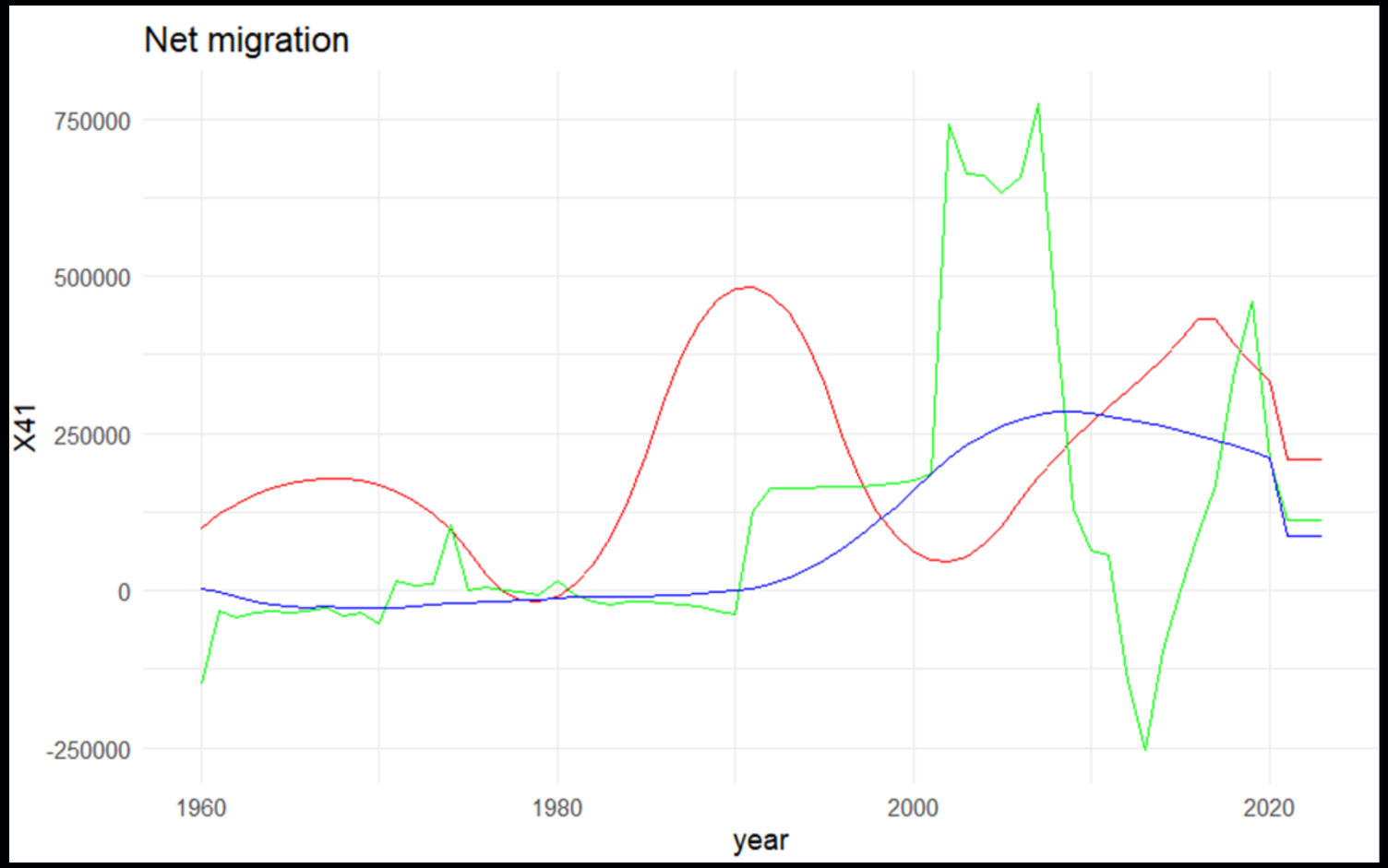






VARIABLE COMPARISON AMONG THREE COUNTRIES

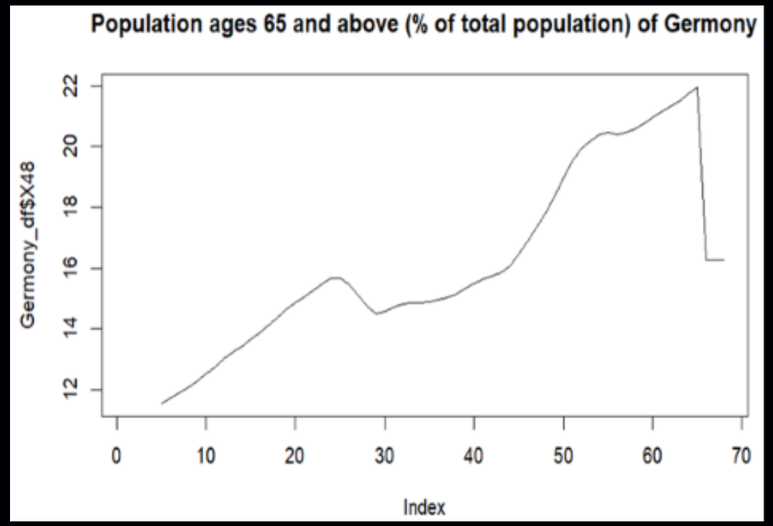
```
#Net migration
ggplot()+
  geom_line(com_ger,mapping = aes(x = year, y = X41),color = "red")+
  geom_line(com_spa,mapping = aes(x = year, y = X112),color = "green")+
  geom_line(com_uk,mapping = aes(x = year, y = X183),color = "blue")+
  labs(title = "Net migration")+theme_minimal()
```

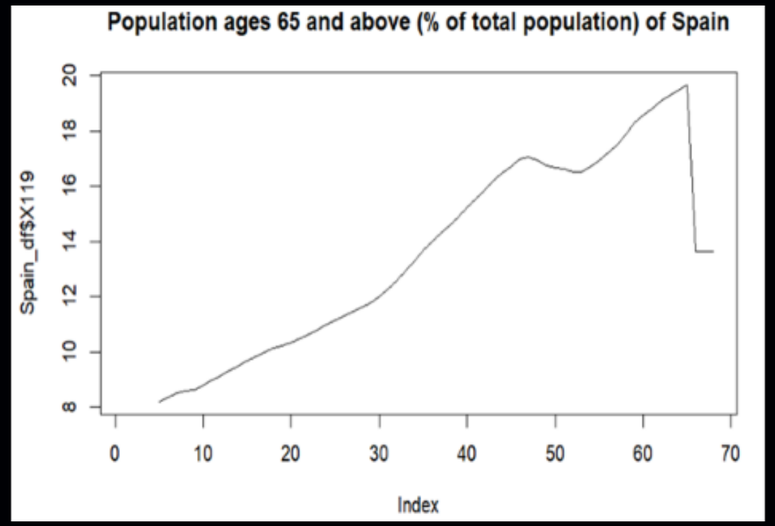


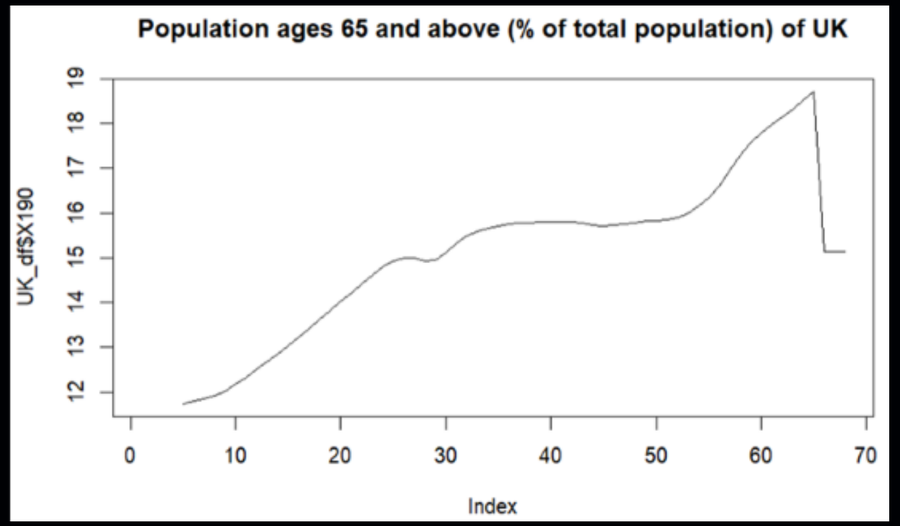
- Germany (red line) shows a steady increase in net migration from 1960 to 2023.
- Spain (green line) fluctuates more, with net migration going negative from 1960 to 1980, then positive from 1980 to 2000, before turning negative again in 2023.
- The UK (blue line) shows a similar pattern to Spain, with net migration being negative from 1960 to 1980, then positive from 1980 to 2000, before declining again in 2023.
- However, the scale of net migration in the UK appears lower than in both Germany and Spain.

LINE CHART FOR THE VARIABLE, POPULATION AGES 65 AND ABOVE (SP.POP.65UP.TO.ZS) (% of total population)

```
# Line chart for Population ages 65 and above (SP.POP.65UP.TO.ZS)(% of total population)
plot(Germony_df$X48,type = "l",main = "Population ages 65 and above (% of total population) of Germony")
plot(Spain_df$X119,type = "l",main = "Population ages 65 and above (% of total population) of Spain")
plot(UK_df$X190,type = "l",main = "Population ages 65 and above (% of total population) of UK")
```

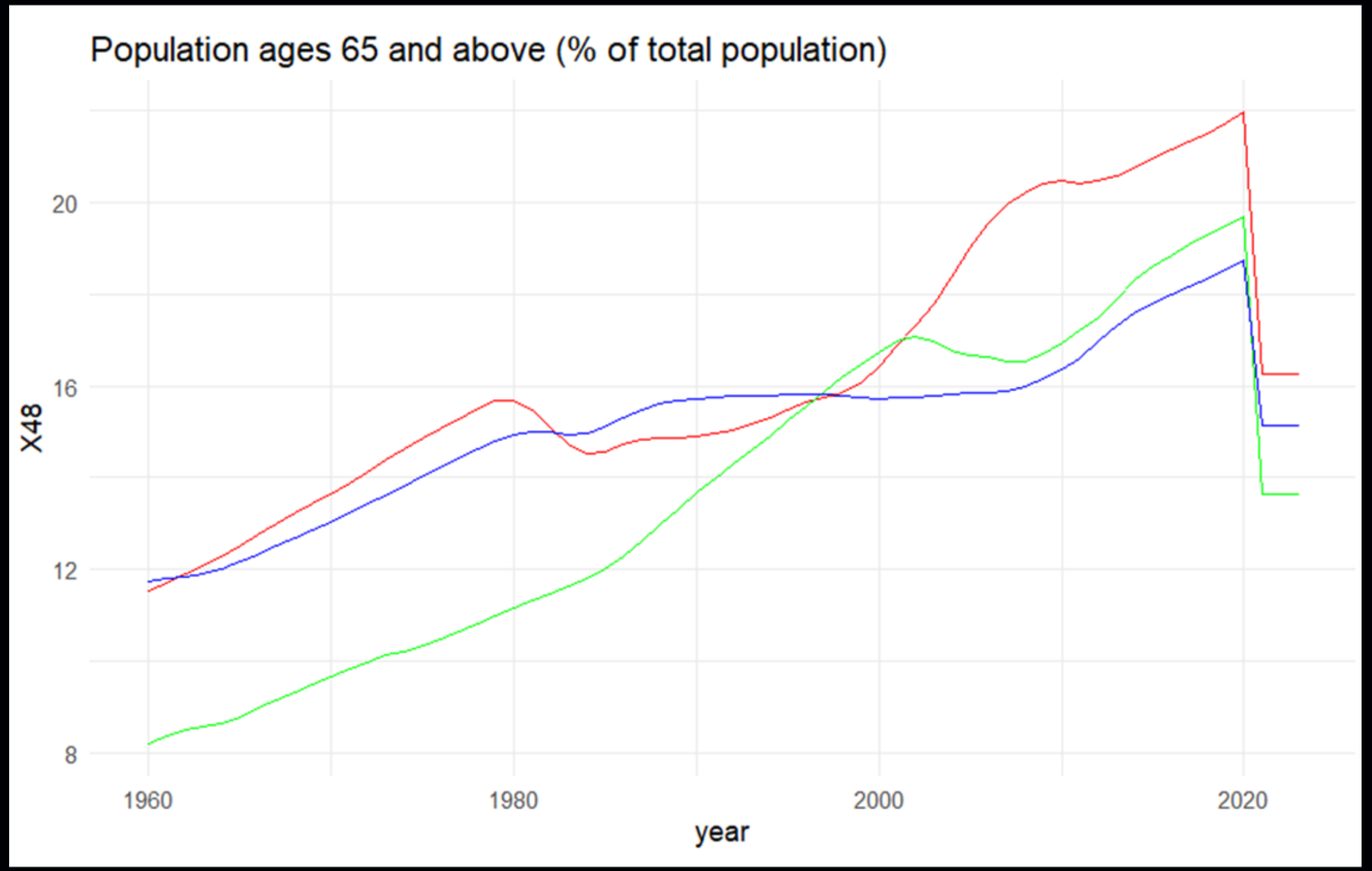






VARIABLE COMPARISON AMONG THREE COUNTRIES

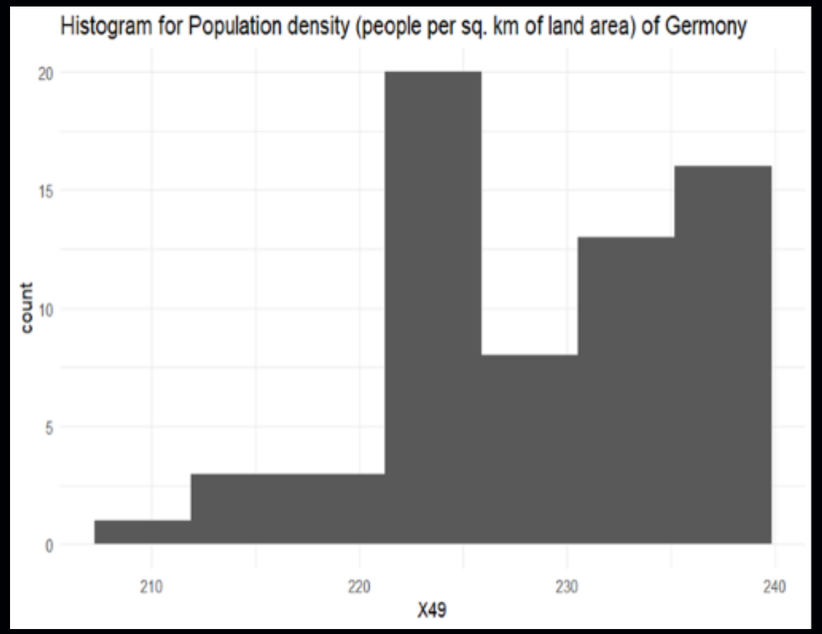
```
#Population ages 65 and above (% of total population)
ggplot()+
  geom_line(com_ger,mapping = aes(x = year, y = X48),color = "red")+
  geom_line(com_spa,mapping = aes(x = year, y = X119),color = "green")+
  geom_line(com_uk,mapping = aes(x = year, y = X190),color = "blue")+
  labs(title = "Population ages 65 and above (% of total population)")+theme_minimal()
```

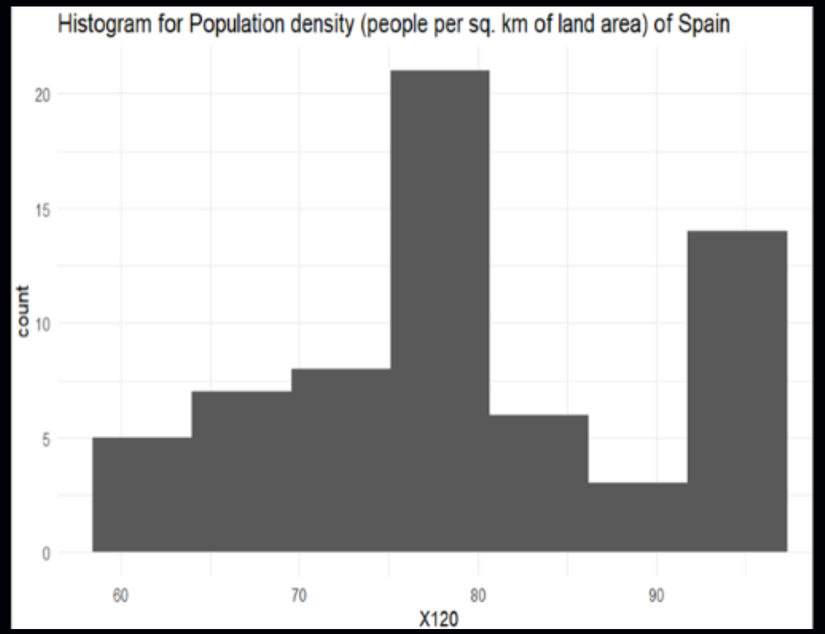


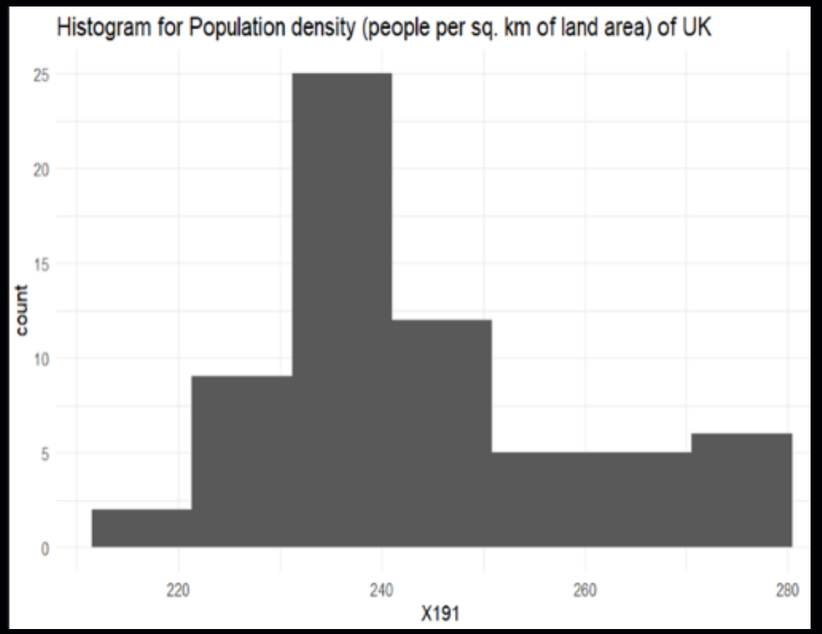
- All three lines show a decrease in fossil fuel consumption as a percentage of total energy consumption over the period.
- The red line shows the steepest decline in fossil fuel consumption, starting from around 95% in 1960 to around 75% in 2023.
- The green line shows a similar decline to Germany, but at a slower rate.
- Spain’s fossil fuel consumption started from around 90% in 1960 and down to around 80% in 2023.
- The blue line shows the most gradual decline in fossil fuel consumption.
- The UK’s consumption started at around 95% in 1960 and fell to around 85% in 2023.
- More recent data may show a continue decline in fossil fuel consumption in all three countries.

HISTOGRAM FOR THE VARIABLE, POPULATION DENSITY (EN.POP.DNST) (people per sq. km of land area)

```
#Histogram for the Population density (EN.POP.DNST)(people per sq. km of land area)
ggplot(Germony_df,aes(x=X49))+geom_histogram(bins = 7)+theme_minimal()+labs(title = "Histogram for
Population density (people per sq. km of land area) of Germony")
ggplot(Spain_df,aes(x=X120))+geom_histogram(bins = 7)+theme_minimal()+theme_minimal()+labs(title =
"Histogram for Population density (people per sq. km of land area) of Spain")
ggplot(UK_df,aes(x=X191))+geom_histogram(bins = 7)+theme_minimal()+theme_minimal()+labs(title =
"Histogram for Population density (people per sq. km of land area) of UK")
```

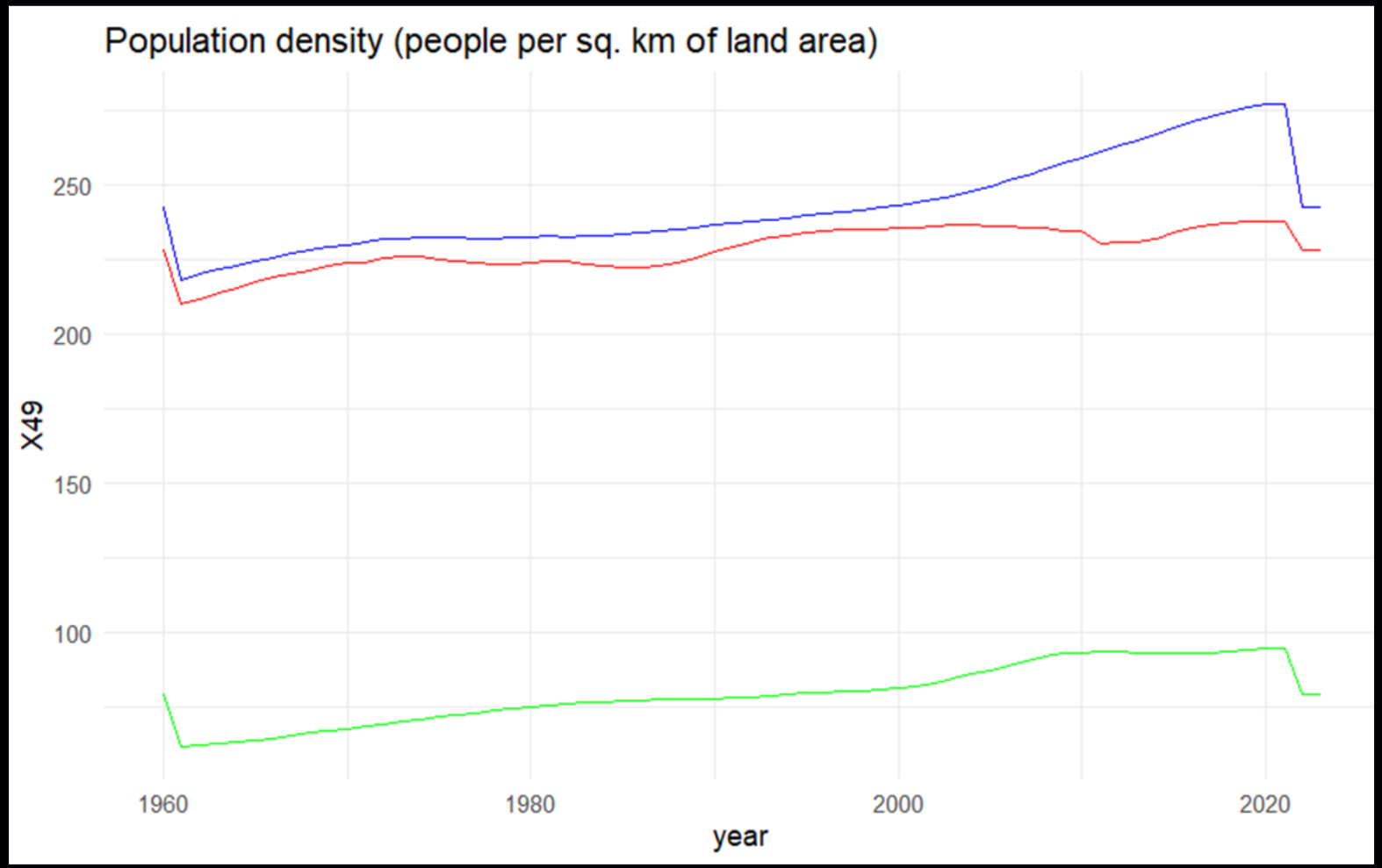






VARIABLE COMPARISON AMONG THREE COUNTRIES

```
#Population density (people per sq. km of land area)
ggplot()+
  geom_line(com_ger,mapping = aes(x = year, y = X49),color = "red")+
  geom_line(com_spa,mapping = aes(x = year, y = X120),color = "green")+
  geom_line(com_uk,mapping = aes(x = year, y = X191),color = "blue")+
  labs(title = "Population density (people per sq. km of land area)")+theme_minimal()
```



- The line graph shows the population density of Germany, Spain and the United Kingdom from 1960 to 2023
- All three countries show an increase in population density over the time.
- Germany has the highest population density throughout the entire period, followed by the United Kingdom and Spain.
- Spain’s population density has shown the most dramatic increase.

THE END

GROUP MEMBERS

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PS/2020/120 - A.H.P. Tharushika
PS/2020/150 - R.Y.W. Ekanayaka
PS/2020/154 - K.a.a.d. Rathnayaka
PS/2020/174 - j.a.d.n. jayakody
PS/2020/207 - p.k.m.d. wimarshana
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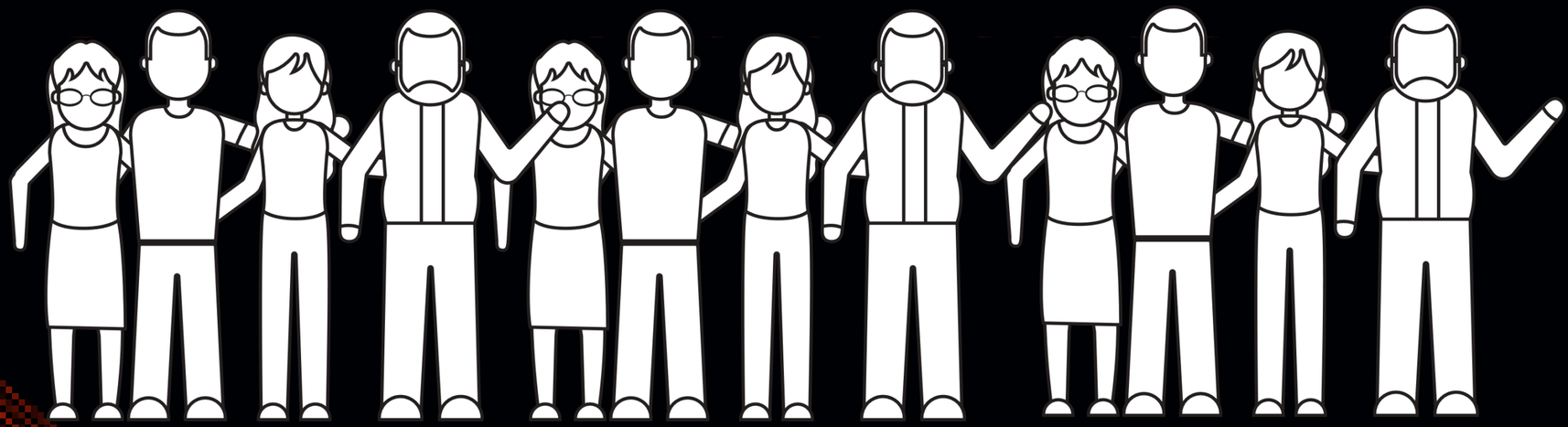
PS/2020/245 - r.m.g.l.i. rathnayaka
PS/2020/252 - r.v.p.i. sewwandi
PS/2020/314 - R.K.M. Prasadika



THANK YOU!