PROBABILITY AND STATISTICS

Course Code: BMAT202P - L43+L44

ECONOMIC AND DEMOGRAPHIC CONSEQUENCES OF WAR

A comparative study across multiple countries

Analyzing Russian – Ukraine War

CODE:

- Difference in Variance for 2014-2015 and 2021-2022 about Central Debt in Russia and Ukraine:

```
countr <- split(d,d$CountryCode)
rus=countr$RUS
ukr = countr$UKR
russplit=split(rus,rus$IndicatorCode)
ukrsplit = split(ukr, ukr$IndicatorCode)
cndb=russplit$GC.DOD.TOTL.GD.ZS
cndb
cndb1=ukrsplit$GC.DOD.TOTL.GD.ZS
cndb1
var(c(cndb$"2022",cndb$"2021"),na.rm = TRUE)
var(c(cndb$"2014",cndb$"2015"),na.rm = TRUE)
var(c(cndb1$"2014",cndb$"2015"),na.rm=TRUE)
```

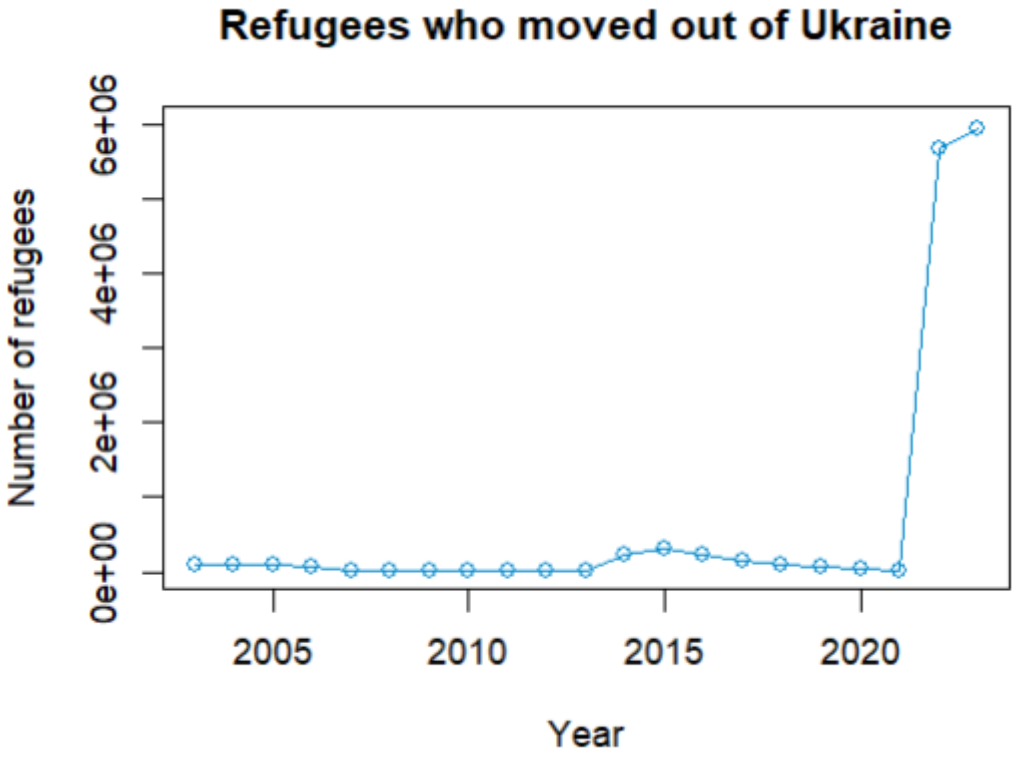
```
# A tibble: 1 × 68
  Country  CountryCode Indicator  IndicatorCode `1960` `1961` `1962` `1963` `1964`
  <chr>    <chr>       <chr>      <chr>          <dbl>  <dbl>  <dbl>  <dbl>  <dbl>
1 Russian… RUS         Central …  GC.DOD.TOTL.…     NA     NA     NA     NA     NA
# i 59 more variables: `1965` <dbl>, `1966` <dbl>, `1967` <dbl>, `1968` <dbl>,
#   `1969` <dbl>, `1970` <dbl>, `1971` <dbl>, `1972` <dbl>, `1973` <dbl>,
#   `1974` <dbl>, `1975` <dbl>, `1976` <dbl>, `1977` <dbl>, `1978` <dbl>,
#   `1979` <dbl>, `1980` <dbl>, `1981` <dbl>, `1982` <dbl>, `1983` <dbl>,
#   `1984` <dbl>, `1985` <dbl>, `1986` <dbl>, `1987` <dbl>, `1988` <dbl>,
#   `1989` <dbl>, `1990` <dbl>, `1991` <dbl>, `1992` <dbl>, `1993` <dbl>,
#   `1994` <dbl>, `1995` <dbl>, `1996` <dbl>, `1997` <dbl>, `1998` <dbl>, …
> cndb1 ukrsplit$GC.DOD.TOTL.GD.ZS
# A tibble: 1 × 68
  Country CountryCode Indicator  IndicatorCode `1960` `1961` `1962` `1963` `1964`
  <chr>   <chr>       <chr>      <chr>          <dbl>  <dbl>  <dbl>  <dbl>  <dbl>
1 Ukraine UKR         Central g… GC.DOD.TOTL.…     NA     NA     NA     NA     NA
# i 59 more variables: `1965` <dbl>, `1966` <dbl>, `1967` <dbl>, `1968` <dbl>,
#   `1969` <dbl>, `1970` <dbl>, `1971` <dbl>, `1972` <dbl>, `1973` <dbl>,
#   `1974` <dbl>, `1975` <dbl>, `1976` <dbl>, `1977` <dbl>, `1978` <dbl>,
#   `1979` <dbl>, `1980` <dbl>, `1981` <dbl>, `1982` <dbl>, `1983` <dbl>,
#   `1984` <dbl>, `1985` <dbl>, `1986` <dbl>, `1987` <dbl>, `1988` <dbl>,
#   `1989` <dbl>, `1990` <dbl>, `1991` <dbl>, `1992` <dbl>, `1993` <dbl>,
#   `1994` <dbl>, `1995` <dbl>, `1996` <dbl>, `1997` <dbl>, `1998` <dbl>, …
> var(c(cndb$"2022",cndb$"2021"),na.rm = TRUE)
[1] 1.31183
> var(c(cndb$"2014",cndb$"2015"),na.rm = TRUE)
[1] 0.6361718
> var(c(cndb1$"2014",cndb$"2015"),na.rm=TRUE)
[1] 1151.309
```

- Finding Covariance and Correlation for GDP growth and Unemployment Total:

```
gdpgr=russplit$NY.GDP.MKTP.KD.ZG
unemptot=russplit$SP.URB.TOTL.IN.ZS
gdpgr1=ukrsplit$NY.GDP.MKTP.KD.ZG
unemptot1=ukrsplit$SP.URB.TOTL.IN.ZS
cov(c(gdpgr$"2021",gdpgr$"2022"),c(unemptot$"2021",unemptot$"2022"))
cor(c(gdpgr$"2021",gdpgr$"2022"),c(unemptot$"2021",unemptot$"2022"))
cov(c(gdpgr$"2013",gdpgr$"2014"),c(unemptot$"2013",unemptot$"2014"))
cor(c(gdpgr$"2013",gdpgr$"2014"),c(unemptot$"2013",unemptot$"2014"))
cov(c(gdpgr1$"2013",gdpgr1$"2014"),c(unemptot1$"2013",unemptot1$"2014"))
cor(c(gdpgr1$"2013",gdpgr1$"2014"),c(unemptot1$"2013",unemptot1$"2014"))
```

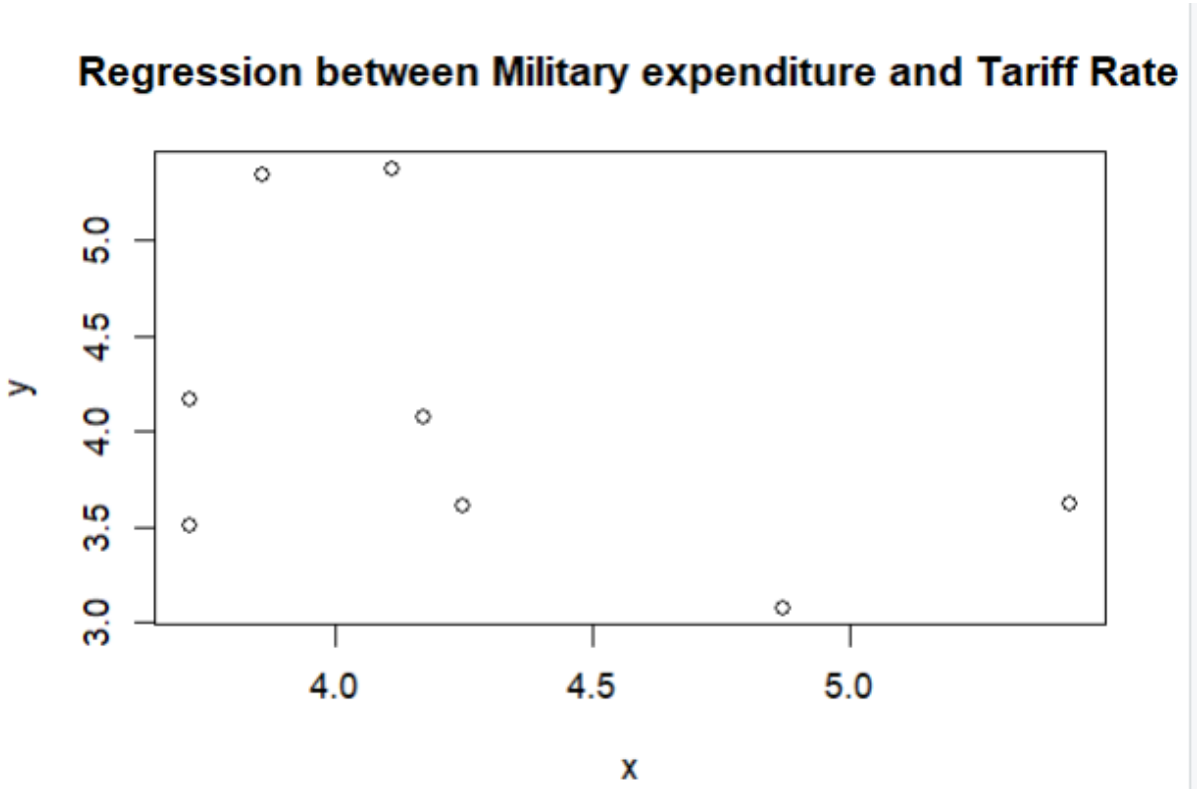
```
> cov(c(gdpgr$"2021",gdpgr$"2022"),c(unemptot$"2021",unemptot$"2022"))
[1] -0.7376642
> cor(c(gdpgr$"2021",gdpgr$"2022"),c(unemptot$"2021",unemptot$"2022"))
[1] -1
> cov(c(gdpgr$"2013",gdpgr$"2014"),c(unemptot$"2013",unemptot$"2014"))
[1] -0.04433324
> cor(c(gdpgr$"2013",gdpgr$"2014"),c(unemptot$"2013",unemptot$"2014"))
[1] -1
> cov(c(gdpgr1$"2021",gdpgr1$"2022"),c(unemptot1$"2021",unemptot1$"2022"))
[1] -2.608542
> cor(c(gdpgr1$"2021",gdpgr1$"2022"),c(unemptot1$"2021",unemptot1$"2022"))
[1] -1
> cov(c(gdpgr1$"2013",gdpgr1$"2014"),c(unemptot1$"2013",unemptot1$"2014"))
[1] -0.4707815
> cor(c(gdpgr1$"2013",gdpgr1$"2014"),c(unemptot1$"2013",unemptot1$"2014"))
[1] -1
```

- Refugees who moved out of Ukraine:
  plot(seq(2003,2023),refugee[c(48:68)], main='Refugees who moved out of Ukraine', xlab="Year", ylab="Number of refugees", ylim=c(0,6000000), type="o",col="#0088cc")



- Regression between Military expenditure and Tariff Rate for Russia:
  rusdata=data.frame(c(miltrate$"2020",miltrate$"2021"),c(tariff$"2020", tariff$"2021"))
  rusdata

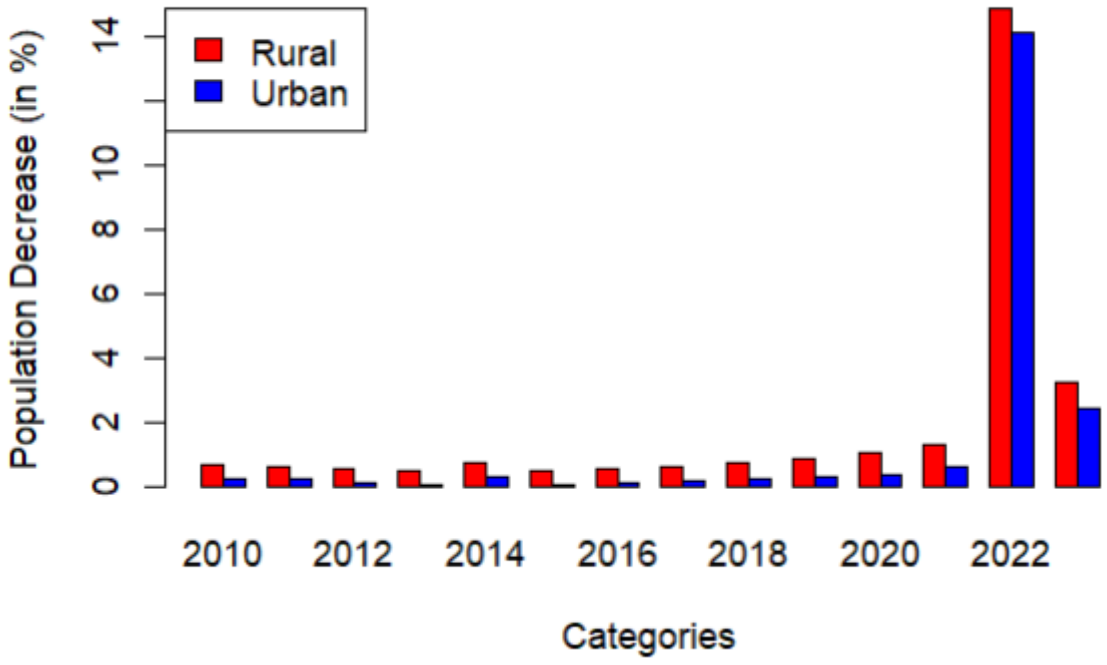
```
regr=lm(c(miltrate$"2020",miltrate$"2021")~c(tariff$"2020",tariff$"202
1"),data=rusdata)
regr
x=c(miltrate$"2014",miltrate$"2015",miltrate$"2016",miltrate$"2017",
miltrate$"2018",miltrate$"2019",miltrate$"2020",miltrate$"2021")
y=c(tariff$"2014",tariff$"2015",tariff$"2016",tariff$"2017",tariff$"2018",
tariff$"2019",tariff$"2020",tariff$"2021")
plot(x,y, main='Regression between Military expenditure and Tariff
Rate')
```



- Comparison of Uraban and Rural change during War Period of Ukraine

```
ukrrural = ukrsplit$SP.RUR.TOTL.ZG
ukrurban = ukrsplit$SP.URB.GROW
ukrrural_clean <- -as.numeric(ukrrural[c(55:68)])
ukrurban_clean <- -as.numeric(ukrurban[c(55:68)])
years <- 2010:2023
# Combine the data into a matrix
mat <- rbind(ukrrural_clean, ukrurban_clean)
barplot(mat, beside=TRUE, col=c("red", "blue"), xlab = "Categories",
ylab="Population Decrease (in %)",
```

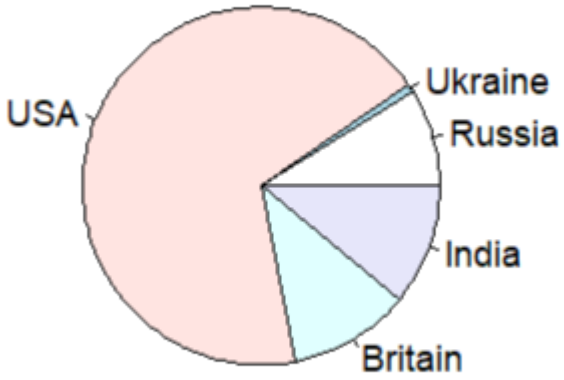
```
legend.text=c("Rural","Urban"),names.arg = years,args.legend = list(x =
"topleft"))
```

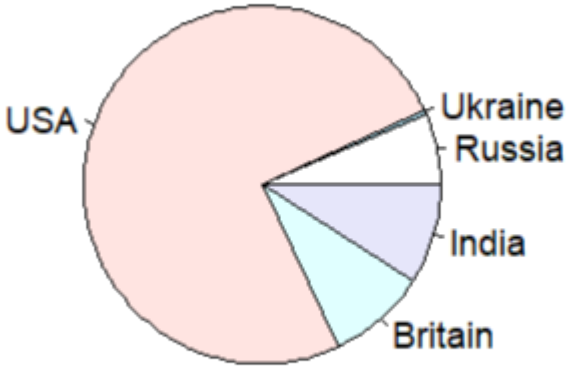


- GNI comparision over the years across different countries

```
infrus = russplit$NY.GNP.MKTP.CD
infukr = ukrsplit$NY.GNP.MKTP.CD
infusa = usasplit$NY.GNP.MKTP.CD
infgbr = gbrsplit$NY.GNP.MKTP.CD
infind = gbrsplit$NY.GNP.MKTP.CD
lstfind1 =
c(infrus$"2013",infukr$"2013",infusa$"2013",infgbr$"2013",infind$"201
3")/10^6
lstfind2 =
c(infrus$"2022",infukr$"2022",infusa$"2022",infgbr$"2022",infind$"202
2")/10^6
pie(lstfind1, labels = c('Russia','Ukraine','USA','Britain','India'))
```

- pie(lstfind2, labels = c('Russia','Ukraine','USA','Britain','India'))

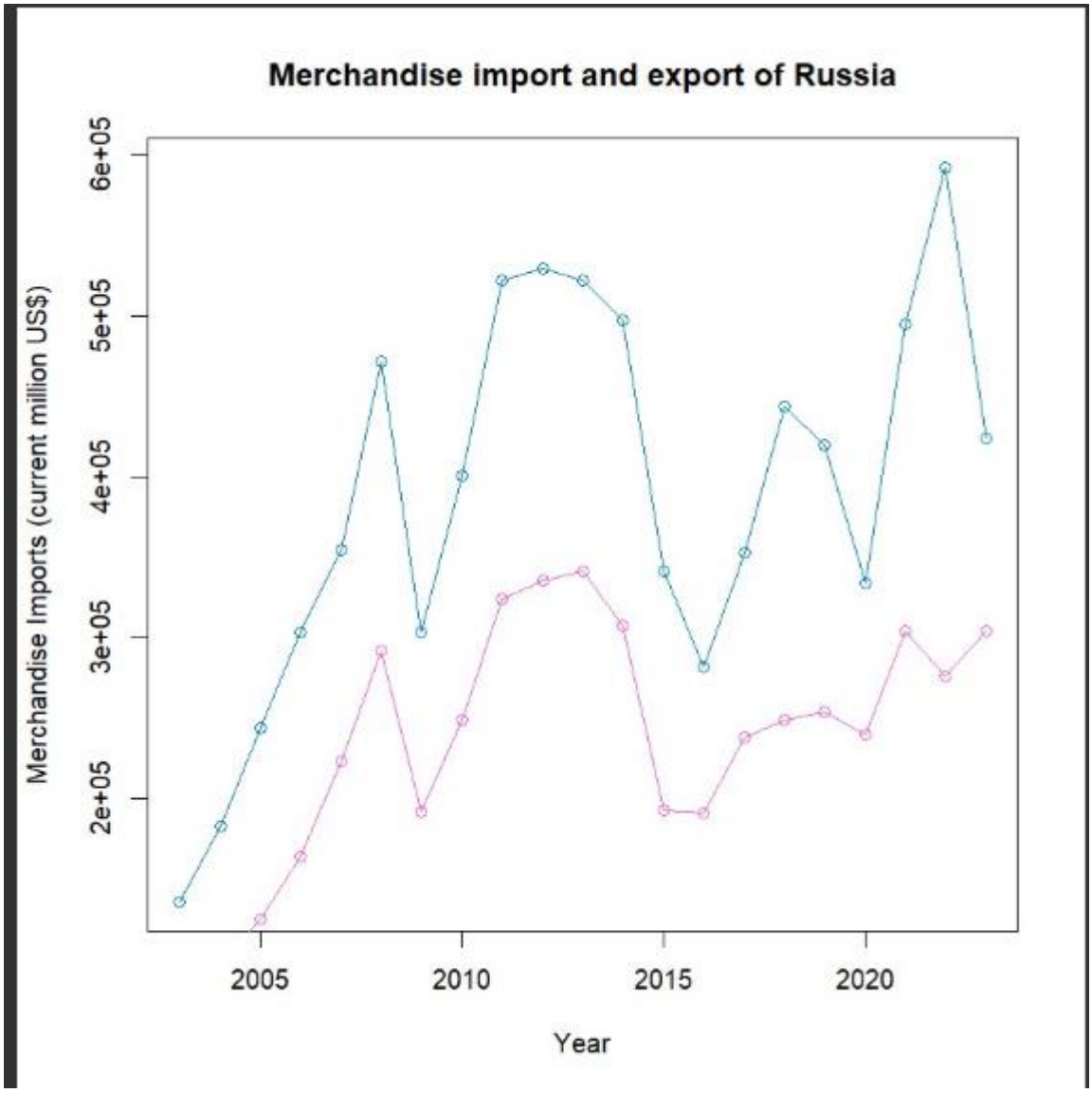


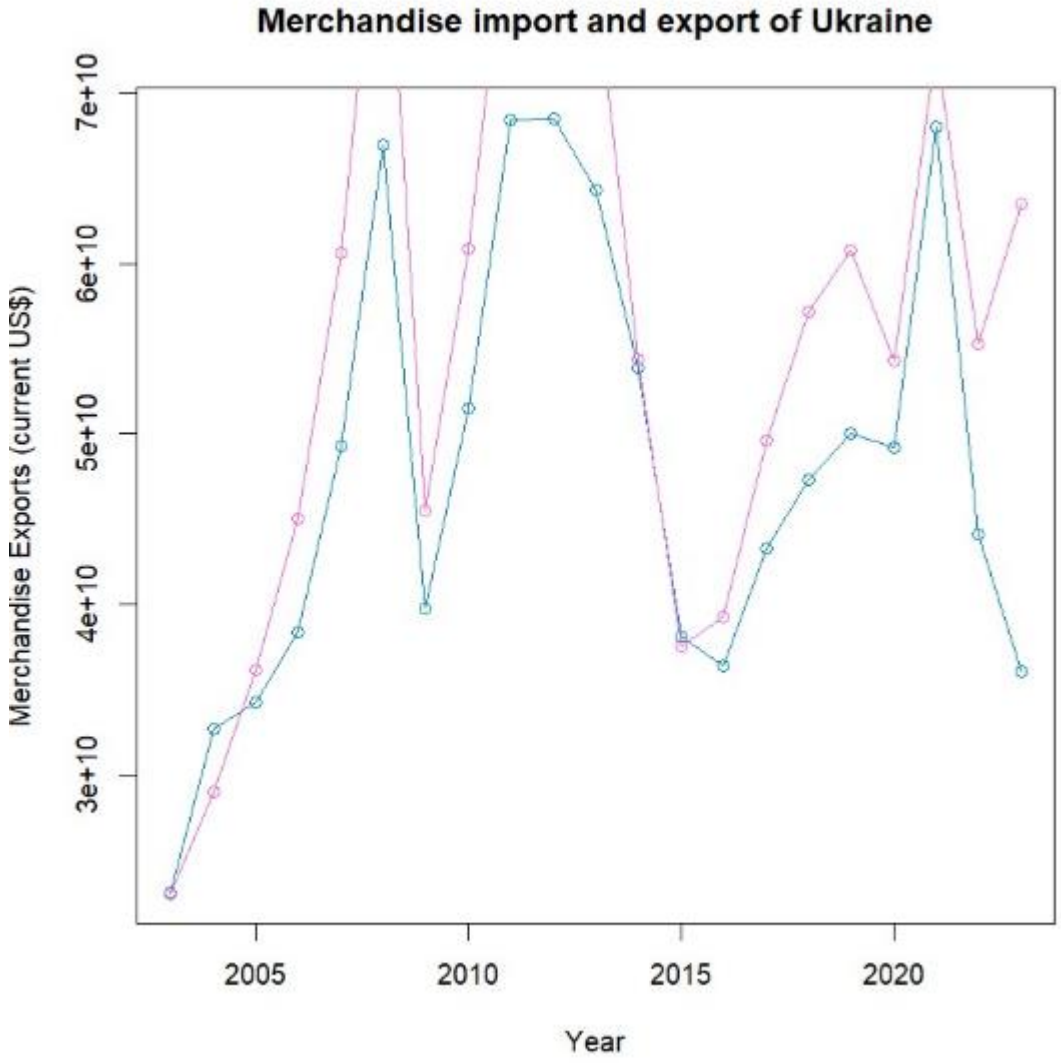


- Import and Export comparision of Ukraine and Russia

```
exprus = russplit$TX.VAL.MRCH.CD.WT
imprus = russplit$TM.VAL.MRCH.CD.WT
plot(seq(2003,2023),exprus[c(48:68)]/10^6, main='Merchandise import and export of Russia', xlab="Year", ylab="Merchandise Imports (current million US$)", type="o", col="#0088cc")
lines(seq(2003,2023),imprus[c(48:68)]/10^6,type="o", col="#ff66dd")
expukr = ukrsplit$TX.VAL.MRCH.CD.WT
impukr = ukrsplit$TM.VAL.MRCH.CD.WT
```

```
plot(seq(2003,2023),expukr[c(48:68)], main='Merchandise import and export of Ukraine', xlab="Year", ylab="Merchandise Exports (current US$)", type="o", col="#0088cc")
lines(seq(2003,2023),impukr[c(48:68)],type="o", col="#ff66dd")
```




Merchandise import and export of Ukraine
Merchandise Exports (current US$)
3e+10
4e+10
5e+10
6e+10
7e+10
2005
2010
2015
2020
Year