VAR

2022-11-25

```
library(tidyverse)
```

```
## ── Attaching packages ─────────────────────────────────────── tidyverse 1.3.2 ──
## ✔ ggplot2 3.4.0     ✔ purrr   0.3.4
## ✔ tibble  3.1.7     ✔ dplyr   1.0.9
## ✔ tidyr   1.2.0     ✔ stringr 1.4.1
## ✔ readr   2.1.2     ✔ forcats 0.5.2
## ── Conflicts ────────────────────────────────────────── tidyverse_conflicts() ──
## ✖ dplyr::filter() masks stats::filter()
## ✖ dplyr::lag()    masks stats::lag()
```

```
library(fpp)
```

```
## Loading required package: forecast
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
## Loading required package: fma
## Loading required package: expsmooth
## Loading required package: lattice
## Loading required package: zoo
##
## Attaching package: 'zoo'
##
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
##
## Loading required package: tseries
```

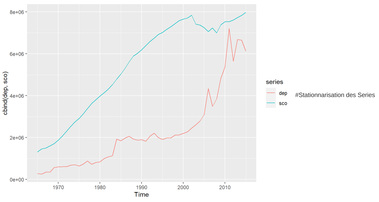
```
library(forecast)
library(tseries)
library(readxl)
library(vars)
```

```
## Loading required package: MASS
##
## Attaching package: 'MASS'
##
## The following objects are masked from 'package:fma':
##
##     cement, housing, petrol
##
## The following object is masked from 'package:dplyr':
##
##     select
##
## Loading required package: strucchange
## Loading required package: sandwich
##
## Attaching package: 'strucchange'
##
## The following object is masked from 'package:stringr':
##
##     boundary
##
## Loading required package: urca
```

```
data <- read_excel("D:/Python-R/Jupyter notrbook/VAR.xlsx")
data[27,5]=(data[26,5]+data[28,5])/2
data%>%head(10)
```

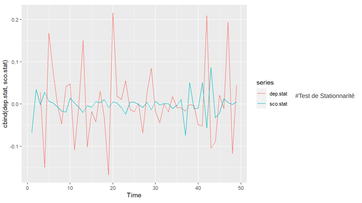
```
## # A tibble: 10 × 5
##       dep   bac   dip   pib   sco
##     <dbl> <dbl> <dbl> <dbl> <dbl>
##  1 284680.  1763   179  657. 1313617
##  2 256911.  1279   195  622. 1452360
##  3 342548.  1682   378  678. 1500336
##  4 347550.  2520   654  759. 1603702
##  5 569875.  4430   724  836. 1712975
##  6 596668.  5973   759  911. 1879851
##  7 607013.  6455  1244  805. 2078361
##  8 603922.  6077  1795 1030. 2302391
##  9 677291.  8268  2455 1067. 2533037
## 10 702781.  7592  2786 1153. 2741925
```

```
dep=ts(data$dep,start = 1965,end=2015)
sco=ts(data$sco,start = 1965,end=2015)
autoplot(cbind(dep,sco))
```




```
dep.stat<-ts((log(dep)-ma(log(dep),order=4,centre=T))%>%na.omit()
sco.stat<-ts((diff(log(sco),differences = 2))%>%na.omit()

autoplot(cbind(dep.stat,sco.stat))
```




```
adf.test(dep.stat)
```

```
## Warning in adf.test(dep.stat): p-value smaller than printed p-value
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  dep.stat
## Dickey-Fuller = -4.6463, Lag order = 3, p-value = 0.01
## alternative hypothesis: stationary
```

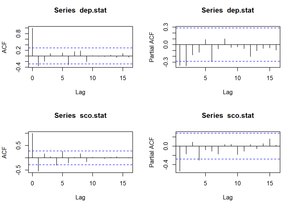
```
adf.test(sco.stat)
```

```
## Warning in adf.test(sco.stat): p-value smaller than printed p-value
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  sco.stat
## Dickey-Fuller = -4.6109, Lag order = 3, p-value = 0.01
## alternative hypothesis: stationary
```

```
par(mfrow=c(2,2))

acf(dep.stat)
pacf(dep.stat)
acf(sco.stat)
pacf(sco.stat)
```




```
VARselect(cbind(dep.stat,sco.stat[1:47]),lag.max = 8,type="const")
```

```
## $selection
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      2      2      2      2
##
## $criteria
##                1             2             3             4             5
## AIC(n) -1.264086e+01 -1.316264e+01 -1.301075e+01 -1.286682e+01 -1.275518e+01
## HQ(n)  -1.254904e+01 -1.300960e+01 -1.279648e+01 -1.261134e+01 -1.241848e+01
## SC(n)  -1.238493e+01 -1.273608e+01 -1.241357e+01 -1.211903e+01 -1.181676e+01
## FPE(n)  3.238969e-06  1.926508e-06  2.253823e-06  2.574401e-06  2.979516e-06
##                6             7             8
## AIC(n) -1.286699e+01 -1.271971e+01 -1.258377e+01
## HQ(n)  -1.246908e+01 -1.226058e+01 -1.206342e+01
## SC(n)  -1.175795e+01 -1.144055e+01 -1.113349e+01
## FPE(n)  2.722310e-06  3.251763e-06  3.883625e-06
```

```
VARselect(cbind(dep.stat,sco.stat[1:47]),lag.max = 8,type="const")[["selection"]]
```

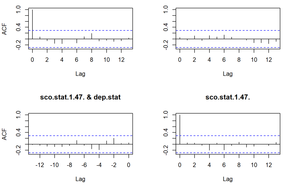
```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      2      2      2      2
```

```
#Estimation VAR 2
var1.stat=VAR(cbind(dep.stat,sco.stat[1:47]),p=2,type="const")

serial.test(var1.stat,lags.pt = 10,type="PT.asymptotic")
```

```
##
##  Portmanteau Test (asymptotic)
##
## data:  Residuals of VAR object var1.stat
## Chi-squared = 21.188, df = 32, p-value = 0.9275
```

```
var1.stat%>%residuals()%>%acf()
```




```
root.comp <- Im(roots(var1.stat, modulus=FALSE ))
root.real <- Re(roots(var1.stat, modulus=FALSE ))
x <- seq(-1, 1, length=1000)
y1 <- sqrt(1-x^2)
y2 <- -sqrt(1-x^2)
plot(c(x, x), c(y1, y2), xlab='Real part', ylab='Imaginary part', type='l', main='Unit Circle', ylim=c(-2, 2), xl
im=c (-2, 2))
abline(h=0)
abline(v=0)
points(root.comp, root.real, pch=19)
legend(-1.5, -1.5, legend= "Eigenvalues", pch=19)
```