R script

```
# CZ & D ----------------------------------------------------------------------
#Nacteni dat
data_CZ <- read.csv("~/Documents/OneDrive/Skola/
Diplomka/data_quterly_CZ.csv")
data_D <- read.csv("~/Documents/OneDrive/Skola/
Diplomka/data_quterly_D.csv")

#Rozdeleni datasetu
data_I_CZ <- data_CZ$I_cz
data_U_CZ <- data_CZ$U_cz
data_I_D <- data_D$I_d
data_U_D <- data_D$U_d

### Prevod na TS
Data_cas <- seq(as.Date("1993/01/01"), as.Date("2016/12/31"),
 by = "quarter")

# Inflation_CZ
I_cz <- ts(data_I_CZ, frequency = 4, start = c(1993))
```

```
plot_I_CZ <- cbind(Data_cas,I_cz)
p <- plot_ly(data = as.data.frame(plot_I_CZ), x = as.Date(Data_cas),
 y = I_cz, type = 'scatter', mode = 'lines') %>%
layout(xaxis = list(title = "Cas"), yaxis =
 list(title ="Mira_Inflace"))
p

# Inflation_D
I_d <- ts(data_I_D, frequency = 4, start = c(1993))
plot_I_D <- cbind(Data_cas,I_d)
f <- plot_ly(data = as.data.frame(plot_I_D), x = as.Date(Data_cas),
 y = I_d, type = 'scatter', mode = 'lines') %>%
layout(xaxis = list(title = "Cas"), yaxis =
list(title ="Mira_Inflace"))
f



# Unemployment_CZ
U_cz <- ts(data_U_CZ, frequency = 4, start = c(1993))
plot_U_CZ <- cbind(Data_cas,U_cz)
d <- plot_ly(data = as.data.frame(plot_U_CZ), x = as.Date(Data_cas),
 y = U_cz, type = 'scatter', mode = 'lines') %>%
layout(xaxis = list(title = "Cas"), yaxis = list(title ="Mira_Nezamest
d
U_cz_d <- decompose(U_cz)
plot(U_cz_d$seasonal)
U_cz   <- U_cz - U_cz_d$seasonal
```

```
plot_U_CZ <- cbind(Data_cas,U_cz)
d <- plot_ly(data = as.data.frame(plot_U_CZ), x = as.Date(Data_cas),
 y = U_cz, type = 'scatter', mode = 'lines') %>%
layout(xaxis = list(title = "Cas"), yaxis = list(title ="Mira_Nezamest
d


# Unemployment_D
U_d <- ts(data_U_D, frequency = 4, start = c(1993))
s <- plot_ly(data = as.data.frame(U_d), x = as.Date(Data_cas),
y = U_d, type = 'scatter', mode = 'lines') %>%
layout(xaxis = list(title = "Cas"), yaxis = list(title ="Mira_Nezamest
s

U_d_d <- decompose(U_d)
plot(U_d_d$seasonal)
U_d   <- U_d - U_d_d$seasonal
plot_U_D <- cbind(Data_cas,U_d)
s <- plot_ly(data = as.data.frame(plot_U_D), x = as.Date(Data_cas),
 y = U_d, type = 'scatter', mode = 'lines') %>%
layout(xaxis = list(title = "Cas"), yaxis = list(title ="Mira_Nezamest
s


#Obe rady
s <- plot_ly(data = as.data.frame(plot_U_D), x = as.Date(Data_cas),
 y = U_d, type = 'scatter', mode = 'lines') %>%
```

```
add_trace(data = as.data.frame(plot_I_D), x = as.Date(Data_cas),
 y = I_d, type = 'scatter', mode = 'lines') %>%
layout(xaxis = list(title = "Cas"), yaxis = list(title ="Procenta"))
s



#Union - Vytvorit zpatky jeden dataset
Data_CZ <- ts.union(I_cz,U_cz)
Data_CZ_base <- Data_CZ
plot.ts(Data_CZ)
Data_D <- ts.union(I_d,U_d)
Data_D_base <- Data_D
plot.ts(Data_D)

#ACF & PACF
acf(Data_CZ)
acf(Data_D[,2])
#Obe rady - klejici acf
pacf(Data_CZ)
pacf(Data_D[,2])
# obe rady. Prvni hodnota vysoka, zbytek uchazi



#DF test
#Unemployment
DF_Une_cz <- adf.test(Data_CZ[,2], alternative = 'stationary')
```

```
DF_Une_d <- adf.test(Data_D[,2], alternative = 'stationary')
DF_Une_cz #Casova rad je nestacionarni
DF_Une_d  #Casova rad je nestacionarni


#Inflation
DF_Inf_cz <- adf.test(Data_CZ[,1], alternative = 'stationary')
DF_Inf_d <- adf.test(Data_D[,1], alternative = 'stationary')
DF_Inf_cz #Casova rad je nestacionarni
DF_Inf_d  #Casova rad je nestacionarni

#Because all TS are nonStationary, we need to find whether
# residuals of their linear combination are stationary as well.
fm_CZ <- lm(Data_CZ[,1] ~ Data_CZ[,2])
adf.test(fm_CZ$residuals,k =1)
durbinWatsonTest(fm_CZ)
acf(fm_CZ$residuals)
pacf(fm_CZ$residuals)

#Residua jsou stacionarni!
fm_D <- lm(Data_D[,1] ~ Data_D[,2])
plot(fm_D$residuals, type = "l")
adf.test(fm_D$residuals, k =1)
acf(fm_D$residuals)
durbinWatsonTest(fm_D)
pacf(fm_D$residuals)
```

```
#Lags
DF_Une_cz_l1 <- lag(Data_CZ[,2], k = -1)
DF_Une_cz_l2 <- lag(Data_CZ[,2], k = -2)
DF_Une_cz_l3 <- lag(Data_CZ[,2], k = -3)
DF_Inf_cz_l1 <- lag(Data_CZ[,1], k = -1)
DF_Inf_cz_l2 <- lag(Data_CZ[,1], k = -2)
DF_Inf_cz_l3 <- lag(Data_CZ[,1], k = -3)

Data_CZ_b <- cbind(Data_CZ,DF_Inf_cz_l1 ,DF_Une_cz_l1 ,DF_Une_cz_l2 ,DF_I
Data_CZ <- Data_CZ_b[3:96,]

#Lags
DF_Une_d_l1 <- lag(Data_D[,2], k = -1)
DF_Une_d_l2 <- lag(Data_D[,2], k = -2)
DF_Une_d_l3 <- lag(Data_D[,2], k = -3)
DF_Inf_d_l1 <- lag(Data_D[,1], k = -1)
DF_Inf_d_l2 <- lag(Data_D[,1], k = -2)
DF_Inf_d_l3 <- lag(Data_D[,1], k = -3)

Data_D_b <- cbind(Data_D,DF_Inf_d_l1 ,DF_Une_d_l1 ,DF_Une_d_l2 ,
DF_Inf_d_l2)
Data_D <- Data_D_b[3:96,]


# Exogenity modeling ----------------------------------------------------
#### Modely ####
```

```
##########Inflation _ CZ
# Pripustne modely, mezi kterym se musime rozhodnout
#Inflation = c + Unemployment + Inflation.l1 + Inflation.l2 <-
Tenhle model je lepsi
fm_ex_I <- lm(Data_CZ[,1] ~ Data_CZ[,2] + Data_CZ[,3] + Data_CZ[,6])
dwtest(fm_ex_I)
bgtest(fm_ex_I)
FinTS::ArchTest(fm_ex_I$residuals, lags = 4)
jb.norm.test(fm_ex_I$residuals, nrepl = 2000)
AIC(fm_ex_I) # 319.1281
summary(fm_ex_I)

##########Inflation _ D
# Pripustne modely, mezi kterym se musime rozhodnout
fm_ex_I <- lm(Data_D[,1] ~ Data_D[,2] + Data_D[,3] +  Data_D[,6])
durbinWatsonTest(fm_ex_I)
FinTS::ArchTest(fm_ex_I$residuals, lags = 4)
jb.norm.test(fm_ex_I$residuals, nrepl = 2000)
AIC(fm_ex_I)
BIC(fm_ex_I)
summary(fm_ex_I)


#Inflation = c + Unemployment + Inflation.l1
fm_ex_I <- lm(Data_CZ[,1] ~ Data_CZ[,2] + Data_CZ[,3])
durbinWatsonTest(fm_ex_I)
```

```
bgtest(fm_ex_I)
FinTS::ArchTest(fm_ex_I$residuals, lags = 4)
jb.norm.test(fm_ex_I$residuals, nrepl = 2000)
AIC(fm_ex_I)
summary(fm_ex_I)


##########Unemployment
# Unemployment =  Inflation.l1 + Unemployment.l1 + Unemployment.l2
 <- Tenhle model je lepsi
fm_cz_U <- lm(Data_CZ[,2] ~ Data_CZ[,3] + Data_CZ[,4] +
Data_CZ[,5] - 1)
durbinWatsonTest(fm_cz_U)
bgtest(fm_cz_U)
FinTS::ArchTest(fm_cz_U$residuals, lags = 4)
jb.norm.test(fm_cz_U$residuals, nrepl = 2000)
AIC(fm_cz_U) # 79.53749
BIC(fm_cz_U)
summary(fm_cz_U)

# Unemployment =  Inflation.l1 + Unemployment.l1 + Unemployment.l2
 <- Tenhle model je lepsi
fm_d_U <- lm(Data_D[,2] ~ Data_D[,4] + Data_D[,6] -1)
durbinWatsonTest(fm_d_U)
bgtest(fm_d_U)
FinTS::ArchTest(fm_d_U$residuals, lags = 4)
jb.norm.test(fm_d_U$residuals, nrepl = 2000)
```

```
AIC(fm_d_U)
BIC(fm_d_U)
summary(fm_d_U)



##Var model
# CZ
var_cz <- VAR(Data_CZ_base, p = 2, type = 'none')
var_cz
summary(var_cz, equation = "U_cz")
#Unemployment ma oba parametry dulezite. Jak Un.l1, tak In.l1
summary(var_cz, equation = "I_cz")
# D
var_d <- VAR(Data_D_base, p = 2, type = 'none')
var_d
summary(var_d, equation = "U_d")
#Unemployment ma oba parametry dulezite. Jak Un.l1, tak In.l1
summary(var_d, equation = "I_d")

#Model _ Test Exogenity
fm_ex_I <- lm(Data_CZ[,1] ~ Data_CZ[,2] + Data_CZ[,3] +
Data_CZ[,6] + var_cz$varresult$U_cz$residuals)
summary(fm_ex_I)
AIC(fm_ex_I)
```

```
#V obou pripadech rezidua jsou signifikatni v modelu.
# Obe promenne jsou endogeni.
fm_ex_U_Vres <- lm(Data_CZ[,2] ~ Data_CZ[,3] + Data_CZ[,4] +
 Data_CZ[,5] - 1 + var_cz$varresult$I_cz$residuals)
summary(fm_ex_U_Vres)
AIC(fm_ex_U_Vres)


# Obe promenne jsou Exogeni

# DDD
fm_ex_I_D <- lm(Data_D[,1] ~ Data_D[,2] + Data_D[,3] +
 Data_D[,6] -1 + var_d$varresult$U_d$residuals)
summary(fm_ex_I_D)
AIC(fm_ex_I_D)

fm_ex_U_D <- lm(Data_D[,2] ~ Data_D[,4] + Data_D[,6] -1 +
var_d$varresult$U_d$residuals)
summary(fm_ex_U_D)
AIC(fm_ex_U_D)


#ADL Model
head(Data_CZ)
#Inflace
fm1 <- lm(Data_CZ[,1] ~ Data_CZ[,4] + Data_CZ[,3] + Data_CZ[,6])
 # Tohle je muj model Inf ~ c + Une.l1 + Inf.l1 + Inf.l2
```

```
fm2 <- lm(Data_CZ[,1] ~ Data_CZ[,4] + Data_CZ[,3])
fm3 <- lm(Data_CZ[,1] ~ Data_CZ[,4])
WT_I_CZ <- waldtest(fm1,fm2,fm3, test = "Chisq")
#Unemployment
fm4 <- lm(Data_CZ[,2] ~ Data_CZ[,4] + Data_CZ[,5] + Data_CZ[,6] -1)
  # Tohle je muj model Une ~ Une.l1 + Une.l2 + Inf.l2
fm5 <- lm(Data_CZ[,2] ~ Data_CZ[,4] + Data_CZ[,5])
fm6 <- lm(Data_CZ[,2] ~ Data_CZ[,4])
WT_U_CZ <- waldtest(fm6,fm5,fm4, test = "Chisq")

#Kontrola rezidui, zda je model v poradku
plot.ts(fm1$residuals, col = 'blue')
plot.ts(fm1$residuals, col = 'blue')
#Breuch - Godfrey test
# Une
BG_fm4 <-  bgtest(fm4)
BG_fm4
# Inf
BG_fm1 <-  bgtest(fm1)
BG_fm1
#ARCH test
# Une
ARCH_fm4 <- FinTS::ArchTest(fm4$residuals, lags = 4)
ARCH_fm4
# Inf
ARCH_fm4 <- FinTS::ArchTest(fm4$residuals, lags = 4)
ARCH_fm4
```

```
#Jarque - Berra
# Une
JB_fm4 <- jb.norm.test(fm4$residuals, nrepl = 2000)
JB_fm4
# Inf
JB_fm1 <- jb.norm.test(fm1$residuals, nrepl = 2000)
JB_fm1
```