Econometria IV - Trabalho Final

Lucas Daniel Duarte

2023-12-12

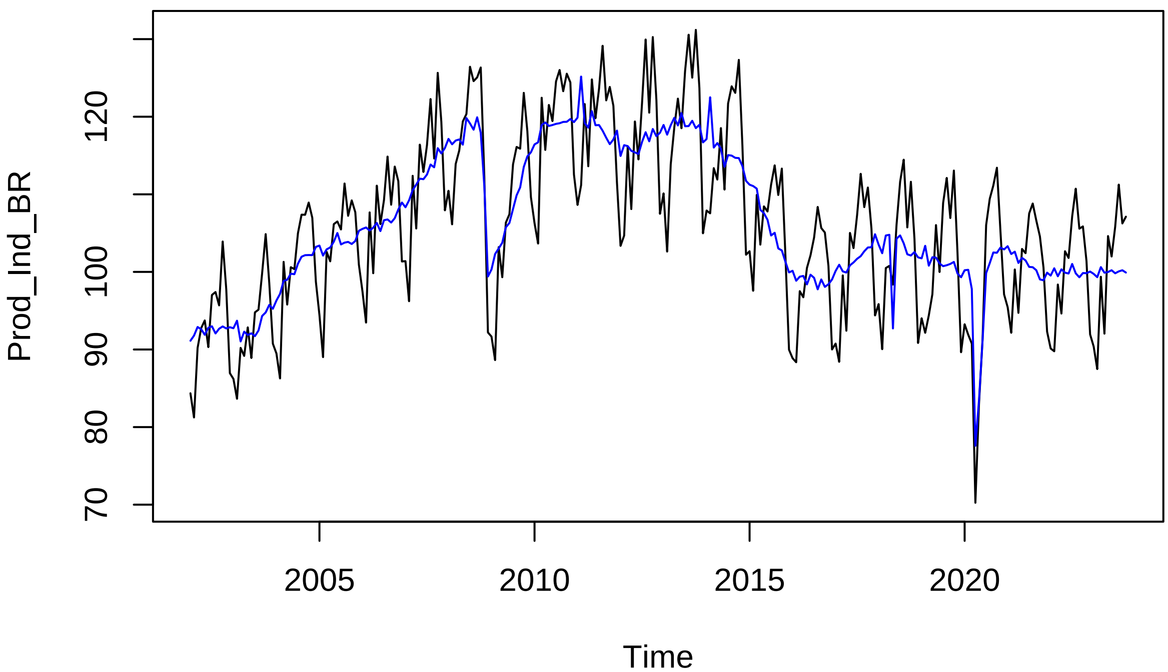
Carregando o ambiente necessário para análise:

Carregando a base de dados a ser utilizada:

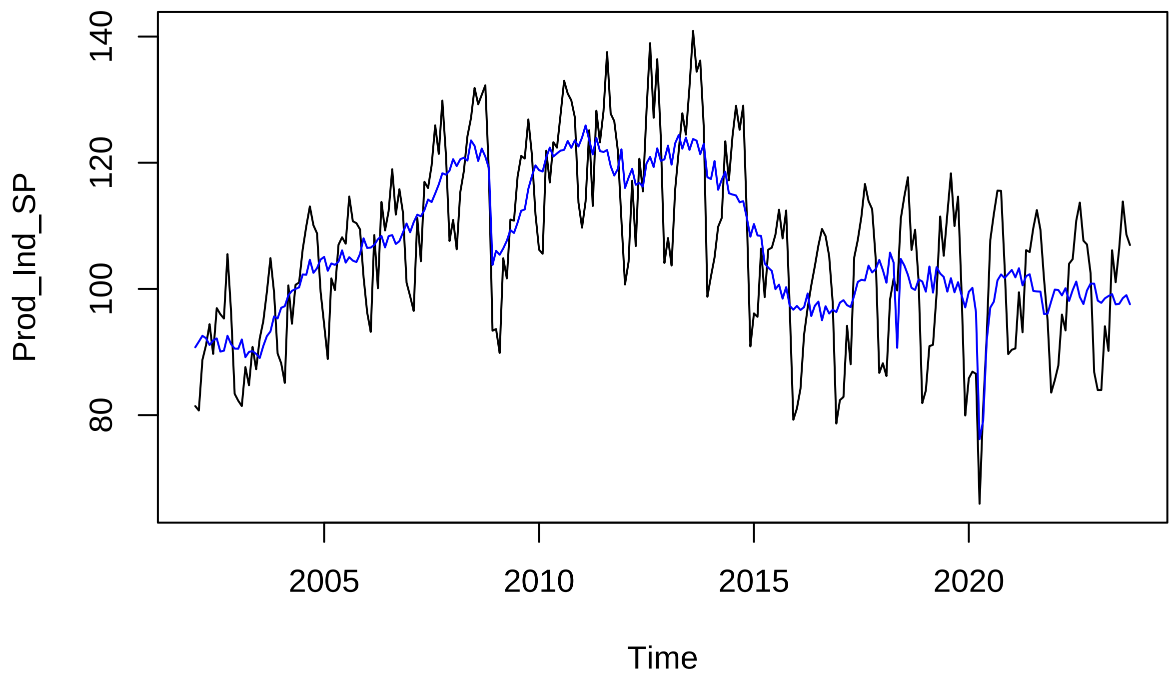
```
setwd("D:/")
base_SVAR <- read_excel("D:/Base_Trabalho ECIV.xlsx")
base_SVAR_ts <- ts(base_SVAR[,-1], start = c(2002,1), frequency = 12)
```

Tratando a base de dados a ser utilizada: 1. dessazonalizando as séries de produção industrial 2. aplicando logaritmo natural em todas colunas menos selic-over 3. tomando a primeira diferença para estacionarizar as séries

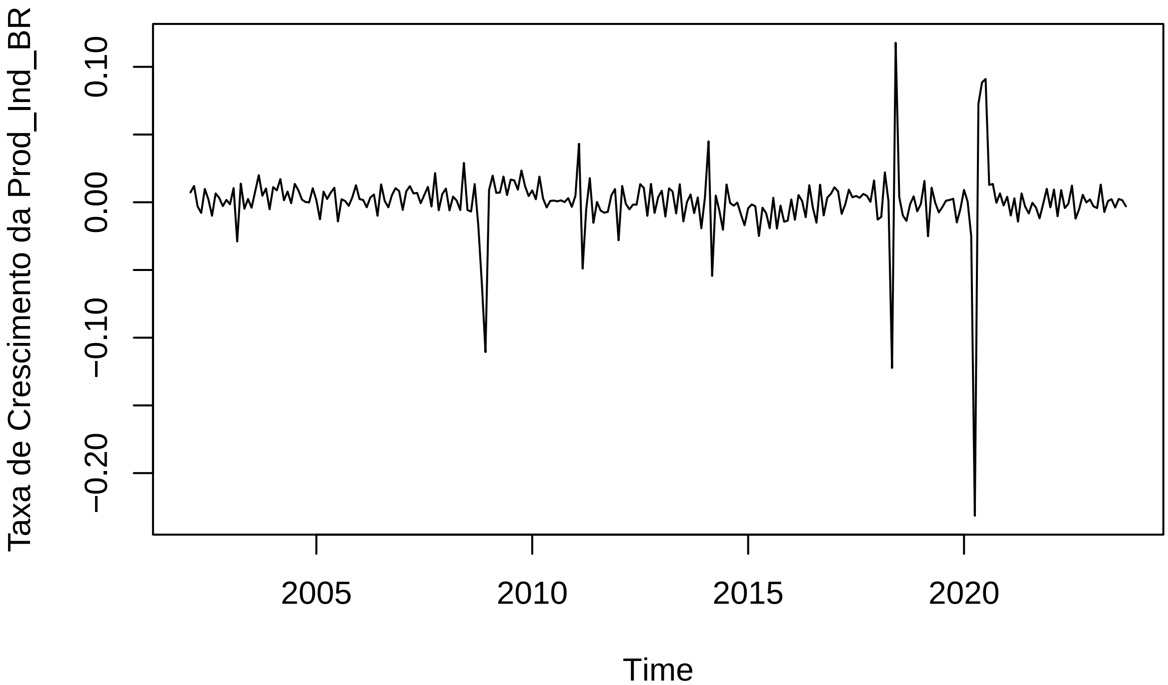
```
#Dessazonaliando as séries de produção industrial
dessaz <- seas(base_SVAR_ts[,1:14])
base_SVAR_ts_dessaz <- final(dessaz)
ts.plot(base_SVAR_ts[,1],base_SVAR_ts_dessaz [,1], gpars = list(ylab ="Prod_Ind_BR", col = c ("black","
```



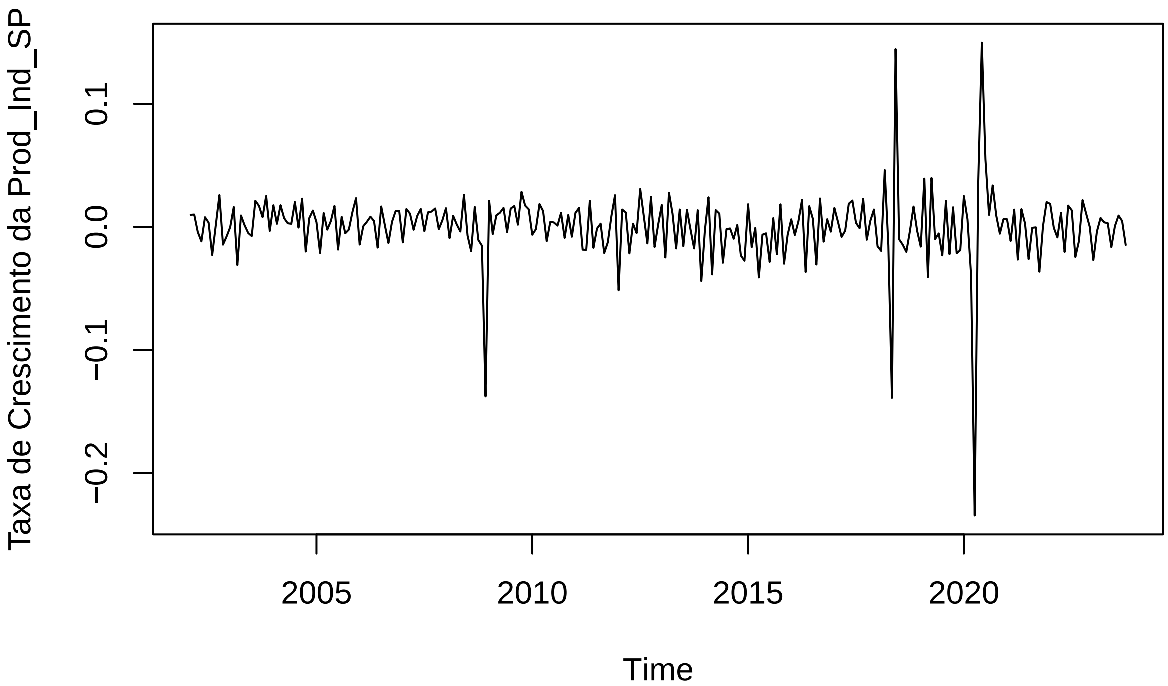
```r
ts.plot(base_SVAR_ts[,14],base_SVAR_ts_dessaz [,14], gpars = list(ylab ="Prod_Ind_SP", col = c ("black"
```




```r
#Juntando os dados de IPCA
base_SVAR_ts_dessaz <- cbind(base_SVAR_ts_dessaz, base_SVAR_ts[,15])

#aplicando logaritmo em todos os dados (com exceção da taxa de juros selic-over)
base_SVAR_ts_dessaz_ln <- log(base_SVAR_ts_dessaz)

#Tomando a primeira diferença do log dos dados (com exceção da taxa de juros selic-over)

base_SVAR_ts_dessaz_ln_diff <- diff(base_SVAR_ts_dessaz_ln)

ts.plot(base_SVAR_ts_dessaz_ln_diff[,1],gpars = list(ylab = "Taxa de Crescimento da Prod_Ind_BR", col =
```




```
ts.plot(base_SVAR_ts_dessaz_ln_diff[,14],gpars = list(ylab = "Taxa de Crescimento da Prod_Ind_SP", col =
```




```
#dif_selic <- diff(base_SVAR_ts[,16])

selic_over <- base_SVAR_ts[-1,16]

#base de dados final após tratamentos
base_SVAR_final <- cbind(base_SVAR_ts_dessaz_ln_diff, selic_over)
colnames(base_SVAR_final) <- cbind ("g_BR","g_AM","g_BA","g_CE","g_ES", "g_GO", "g_MG","g_PA","g_PE","g
#ts.plot(base_SVAR_final[,15],gpars = list(ylab = "Taxa de Juros Selic Over", col = c("black")))
```

Verificando a estacionariedade das séries

```
adf.test(base_SVAR_final[,1], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 1]
## Dickey-Fuller = -7.1136, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```
adf.test(base_SVAR_final[,2], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 2]
## Dickey-Fuller = -9.2582, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,3], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 3]
## Dickey-Fuller = -9.0257, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,4], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 4]
## Dickey-Fuller = -8.5445, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,5], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 5]
## Dickey-Fuller = -6.9899, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,6], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 6]
## Dickey-Fuller = -9.6125, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,7], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 7]
## Dickey-Fuller = -7.1026, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,8], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 8]
## Dickey-Fuller = -9.0733, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,9], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
```

```
##
## data:  base_SVAR_final[, 9]
## Dickey-Fuller = -9.2832, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,10], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 10]
## Dickey-Fuller = -7.493, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,11], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 11]
## Dickey-Fuller = -7.7711, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,12], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 12]
## Dickey-Fuller = -7.2981, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,13], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 13]
## Dickey-Fuller = -7.7467, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,14], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 14]
## Dickey-Fuller = -6.6528, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,15], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 15]
## Dickey-Fuller = -5.2698, Lag order = 6, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[,16], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[, 16]
## Dickey-Fuller = -3.0612, Lag order = 6, p-value = 0.129
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[1:106,16], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[1:106, 16]
## Dickey-Fuller = -4.1021, Lag order = 4, p-value = 0.01
## alternative hypothesis: stationary
```

```r
adf.test(base_SVAR_final[107:261,16], alternative = 'stationary')
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  base_SVAR_final[107:261, 16]
## Dickey-Fuller = -2.4957, Lag order = 5, p-value = 0.3698
## alternative hypothesis: stationary
```

Agora, iremos estimar o modelo VAR estrutural. Lembrando que temos que estimar um VAR para cada estado para os quais temos dados e iremos impor a restrição de Cholesky seguindo a ordem BR-Estado-IPCA-Juros das variáveis

Primeiro, criando a restrição de Cholesky

```r
#Restrição - Cholesky
amat <- diag (4)
amat [2,1] <- NA
amat [3,1] <- NA
amat [4,1] <- NA
amat [3,2] <- NA
amat [4,2] <- NA
amat [4,3] <- NA
amat
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    0    0    0
## [2,]   NA    1    0    0
## [3,]   NA   NA    1    0
## [4,]   NA   NA   NA    1
```

Agora, vamos estimar o SVAR para cada estado, considerando:

1) Toda amostra
2) Período dos Autores
3) Período estendido (de dezembro 2010 até outurbro de 2023)

```r
##########################################
################AMAZONAS#################
##########################################
#Selecionando o Lag
```

```r
lagselect_AM <- VARselect(base_SVAR_final[,c(1,2,15,16)],lag.max=10, type="both")
lagselect_AM$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```r
lagselect_AM$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -2.920815e+01 -2.954923e+01 -2.956284e+01 -2.963024e+01 -2.961025e+01
## HQ(n)  -2.907250e+01 -2.932314e+01 -2.924631e+01 -2.922328e+01 -2.911284e+01
## SC(n)  -2.887106e+01 -2.898740e+01 -2.877629e+01 -2.861896e+01 -2.837423e+01
## FPE(n)  2.065743e-13  1.468948e-13  1.449513e-13  1.355743e-13  1.384259e-13
##                    6             7             8             9            10
## AIC(n) -2.958992e+01 -2.958746e+01 -2.952443e+01 -2.948516e+01 -2.943300e+01
## HQ(n)  -2.900208e+01 -2.890919e+01 -2.875572e+01 -2.862601e+01 -2.848342e+01
## SC(n)  -2.812918e+01 -2.790199e+01 -2.761423e+01 -2.735022e+01 -2.707334e+01
## FPE(n)  1.414345e-13  1.420112e-13  1.515695e-13  1.580640e-13  1.670813e-13
```

```r
#Estimando o VAR Reduzido
VAR_AM <- VAR(base_SVAR_final[-261,c(1,2,15,16)],p=5, season = NULL, exog = NULL, type = "both")
VAR_AM
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_AM.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_AM.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_AM.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -2.302016e-01  5.441923e-02  3.807603e-01 -1.087479e-02 -1.701960e-01
##       g_AM.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_AM.l3
## -2.035160e-03 -3.528290e-01  1.485380e-03  1.465316e-02 -4.343662e-02
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_AM.l4       IPCA.l4
##  3.717517e-01 -1.184162e-02  6.167391e-02 -4.554015e-02 -1.187370e+00
## Selic.Over.l4       g_BR.l5       g_AM.l5       IPCA.l5 Selic.Over.l5
##  8.674594e-03  3.520210e-02 -3.247112e-02  1.621523e-01  1.110495e-02
##         const         trend
##  8.821540e-03 -2.926016e-05
##
##
## Estimated coefficients for equation g_AM:
## =========================================
## Call:
## g_AM = g_BR.l1 + g_AM.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_AM.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_AM.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  9.788117e-01 -3.712107e-01  2.718921e+00 -4.560965e-03 -1.502431e-02
##       g_AM.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_AM.l3
## -3.053491e-01 -3.696897e+00  6.807303e-02  5.232980e-01 -3.177889e-01
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_AM.l4       IPCA.l4
##  9.055906e-01 -7.324536e-02  4.543694e-01 -2.475100e-01 -1.408222e+00
```

```
## Selic.Over.l4        g_BR.l5        g_AM.l5        IPCA.l5 Selic.Over.l5
## -3.123772e-02  1.843982e-02 -6.952064e-02  5.325946e-02  4.211988e-02
##         const         trend
##  1.000504e-02 -1.434046e-05
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_AM.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_AM.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_AM.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -2.129862e-02  8.455681e-03  6.641692e-01 -5.713561e-04 -4.477467e-03
##       g_AM.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_AM.l3
## -9.530582e-04 -7.449304e-03  4.884434e-03  1.500004e-02 -2.123427e-03
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_AM.l4       IPCA.l4
##  4.242447e-02  4.762374e-04  2.375596e-03 -7.629183e-04 -3.176358e-02
## Selic.Over.l4       g_BR.l5       g_AM.l5       IPCA.l5 Selic.Over.l5
##  2.312946e-03 -1.612388e-02  3.236457e-03 -1.606127e-01 -7.252050e-03
##         const         trend
##  3.342730e-03 -5.359446e-06
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_AM.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_AM.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_AM.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  6.192326e-03  5.859813e-02  2.346182e+00  3.273548e-01 -1.043312e-01
##       g_AM.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_AM.l3
##  3.717761e-02  2.351678e+00  5.669463e-01 -5.762913e-04  7.075741e-02
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_AM.l4       IPCA.l4
##  3.946351e+00  3.800501e-01  2.259619e-01 -7.534420e-02 -8.369834e-01
## Selic.Over.l4       g_BR.l5       g_AM.l5       IPCA.l5 Selic.Over.l5
## -2.605672e-01  2.310004e-01 -5.024437e-02  3.624162e+00 -8.349351e-02
##         const         trend
##  1.659985e-02 -9.385015e-05
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_AM, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_AM
## Chi-squared = 104.87, df = 80, p-value = 0.03258
```

```r
arch.test(VAR_AM, multivariate.only = FALSE)
```

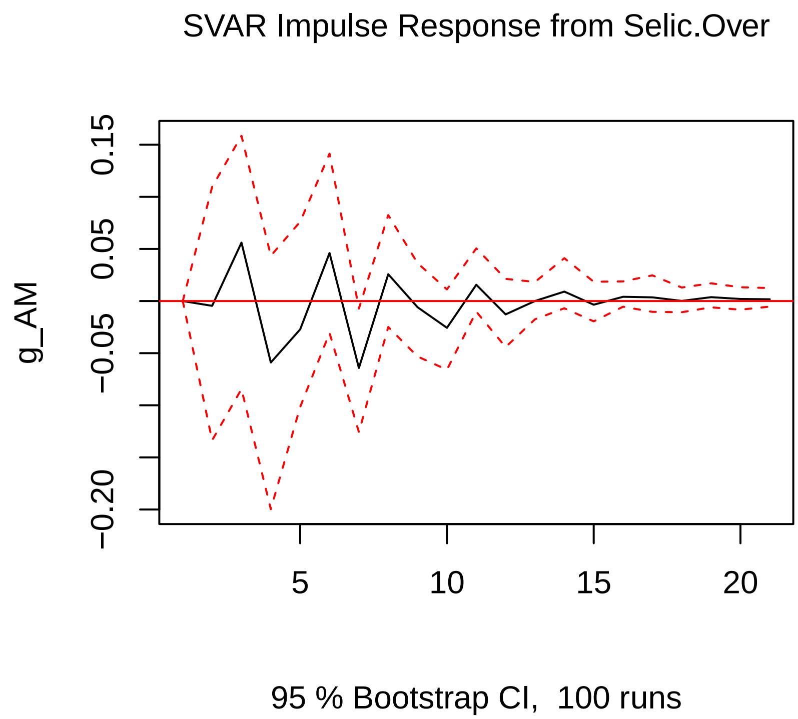
```
## $g_BR
##
##  ARCH test (univariate)
##
```

```
## data:  Residual of g_BR equation
## Chi-squared = 3.7565, df = 16, p-value = 0.9993
##
##
## $g_AM
##
##  ARCH test (univariate)
##
## data:  Residual of g_AM equation
## Chi-squared = 9.9923, df = 16, p-value = 0.867
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 22.477, df = 16, p-value = 0.1284
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 56.207, df = 16, p-value = 2.249e-06
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_AM
## Chi-squared = 739.05, df = 500, p-value = 1.691e-11
```

```
#Estimando o VAR Estrutural
SVAR_AM <- SVAR(VAR_AM, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_AM
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR     g_AM    IPCA Selic.Over
## g_BR        1.00000 0.000000 0.00000          0
## g_AM       -0.01754 1.000000 0.00000          0
## IPCA        0.08374 0.047061 1.00000          0
## Selic.Over  0.07816 0.009562 0.09047          1
```

```
#Função Impulso-Resposta
SVAR_AM_irf <- irf(SVAR_AM, impulse = "Selic.Over", response = "g_AM", n.ahead=20, ortho = TRUE)
plot(SVAR_AM_irf)
```




```
###Comparando Diferentes Períodos###

#----------------Período dos Autores - 01-01-2002 até 01-11-2010----------------#

#Selecionando o Lag
lagselect_AM_pa <- VARselect(base_SVAR_final[1:106,c(1,2,15,16)],lag.max=10, type="both")
lagselect_AM_pa$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      2      1      1      2
```

```
lagselect_AM_pa$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.046568e+01 -3.049102e+01 -3.042297e+01 -3.034911e+01 -3.028624e+01
## HQ(n)  -3.020654e+01 -3.005913e+01 -2.981832e+01 -2.957169e+01 -2.933607e+01
## SC(n)  -2.982459e+01 -2.942254e+01 -2.892710e+01 -2.842584e+01 -2.793559e+01
## FPE(n)  5.877695e-14  5.744272e-14  6.181722e-14  6.719701e-14  7.265184e-14
##                    6             7             8             9            10
## AIC(n) -3.019320e+01 -3.012869e+01 -3.010217e+01 -3.020499e+01 -3.009941e+01
## HQ(n)  -2.907027e+01 -2.883300e+01 -2.863372e+01 -2.856378e+01 -2.828545e+01
## SC(n)  -2.741516e+01 -2.692326e+01 -2.646934e+01 -2.614477e+01 -2.561180e+01
## FPE(n)  8.153313e-14  8.971088e-14  9.605036e-14  9.153385e-14  1.091192e-13
```

```
#Estimando o VAR Reduzido
VAR_AM_pa <- VAR(base_SVAR_final[1:106,c(1,2,15,16)], p = 3, season = NULL, exog = NULL, type = "const"
VAR_AM_pa
```

```
##
## VAR Estimation Results:
## ========================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_AM.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_AM.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_AM.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.339673302  -0.013993643   0.109067204  -0.021252421  -0.151916350
##       g_AM.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_AM.l3
##   0.041868458  -0.054211893   0.000445711   0.059512653  -0.030594611
##       IPCA.l3 Selic.Over.l3         const
##   0.114775596   0.017394211   0.004900439
##
##
## Estimated coefficients for equation g_AM:
## =========================================
## Call:
## g_AM = g_BR.l1 + g_AM.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_AM.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_AM.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  0.9216735744 -0.5220229787  1.5657017886 -0.0685445892  0.0624508934
##       g_AM.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_AM.l3
## -0.1145278120 -1.6648037040  0.0557088789  0.7526137096 -0.2334383598
##       IPCA.l3 Selic.Over.l3         const
##  0.7767888598  0.0124862344 -0.0008121605
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_AM.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_AM.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_AM.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -2.528530e-03  3.656259e-03  7.578883e-01  1.255903e-03 -2.551473e-02
##       g_AM.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_AM.l3
##  3.199261e-05 -6.614555e-03  1.653334e-05  2.541489e-02 -4.464235e-03
##       IPCA.l3 Selic.Over.l3         const
## -6.361579e-02 -6.213736e-04  8.757014e-04
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_AM.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_AM.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_AM.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   -0.46644438    0.23085253    4.31830402    0.29479373   -0.49373624
##       g_AM.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_AM.l3
##    0.17295466    3.82621235    0.38762727    0.40474981    0.08692257
##       IPCA.l3 Selic.Over.l3         const
##    5.78165054    0.21873890    0.03309143
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_AM_pa, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_AM_pa
## Chi-squared = 102.78, df = 80, p-value = 0.04407
```

```r
arch.test(VAR_AM_pa, multivariate.only = FALSE)
```

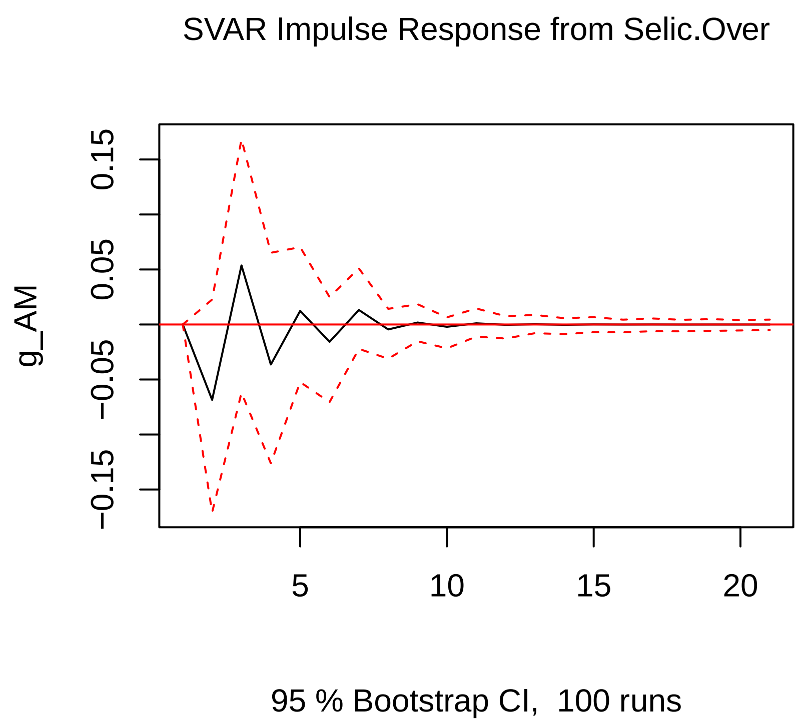
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 15.583, df = 16, p-value = 0.4824
##
##
## $g_AM
##
##  ARCH test (univariate)
##
## data:  Residual of g_AM equation
## Chi-squared = 17.777, df = 16, p-value = 0.3371
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 12.494, df = 16, p-value = 0.7094
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 23.751, df = 16, p-value = 0.09509
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_AM_pa
## Chi-squared = 619.89, df = 500, p-value = 0.000196
```

```r
#Estimando o VAR Estrutural
SVAR_AM_pa <- SVAR(VAR_AM_pa, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_AM_pa
```

```
##
```

```
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_AM    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_AM       0.07114 1.00000 0.00000          0
## IPCA       0.09276 0.07115 1.00000          0
## Selic.Over 0.09302 0.04580 0.09197          1
```

```
#Função Impulso-Resposta
SVAR_AM_irf_pa <- irf(SVAR_AM_pa, impulse = "Selic.Over", response = "g_AM", n.ahead=20, ortho = TRUE)
plot(SVAR_AM_irf_pa)
```




```
#----------------Período Estendido - 01-12-2010 até 01-10-2023----------------#

lagselect_AM_pe <- VARselect(base_SVAR_final[107:261,c(1,2,15,16)],lag.max=10, type="both")
lagselect_AM_pe$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```
lagselect_AM_pe$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -2.882047e+01 -2.924502e+01 -2.928007e+01 -2.930525e+01 -2.923350e+01
## HQ(n)  -2.862027e+01 -2.891135e+01 -2.881293e+01 -2.870464e+01 -2.849943e+01
```

```
## SC(n)  -2.832777e+01 -2.842385e+01 -2.813043e+01 -2.782715e+01 -2.742693e+01
## FPE(n)  3.044459e-13  1.992654e-13  1.926973e-13  1.884208e-13  2.033072e-13
##                    6             7             8             9            10
## AIC(n) -2.922505e+01 -2.922856e+01 -2.909455e+01 -2.897886e+01 -2.885833e+01
## HQ(n)  -2.835752e+01 -2.822756e+01 -2.796008e+01 -2.771092e+01 -2.745692e+01
## SC(n)  -2.709002e+01 -2.676506e+01 -2.630258e+01 -2.585843e+01 -2.540943e+01
## FPE(n)  2.063144e-13  2.073604e-13  2.397953e-13  2.731414e-13  3.137897e-13
```

```
#Estimando o VAR Reduzido
VAR_AM_pe <- VAR(base_SVAR_final[107:261,c(1,2,15,16)], p = lagselect_AM_pe$selection[1], season = NULL
VAR_AM_pe
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_AM.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_AM.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_AM.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.521619409   0.127313837   0.615213994  -0.004759807  -0.397704186
##       g_AM.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_AM.l3
##   0.035531735  -0.621294294   0.016347891  -0.118259826   0.002912650
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_AM.l4       IPCA.l4
##   0.388932758  -0.008539746  -0.030105535  -0.032525295  -2.039678208
## Selic.Over.l4         const
##  -0.008124699   0.009443917
##
##
## Estimated coefficients for equation g_AM:
## =========================================
## Call:
## g_AM = g_BR.l1 + g_AM.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_AM.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_AM.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.80208594   -0.24316908    4.10736702    0.04316201   -0.17392372
##       g_AM.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_AM.l3
##   -0.34808050   -6.18965259    0.09294132    0.27458924   -0.17242510
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_AM.l4       IPCA.l4
##    1.35461227   -0.11302819    0.22364231   -0.22114305   -3.05172280
## Selic.Over.l4         const
##   -0.03663464    0.02812336
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_AM.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_AM.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_AM.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.020822706   0.009226820   0.601672856   0.001003592   0.003053378
##       g_AM.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_AM.l3
##  -0.003553527  -0.017074369   0.006703345   0.019207349  -0.001074159
```

```
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_AM.l4       IPCA.l4
##   0.096055577  -0.004369091   0.010387750  -0.002946113  -0.190614229
## Selic.Over.l4         const
##  -0.003688553   0.002677512
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_AM.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_AM.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_AM.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   -0.18199569    0.09142564    2.37300440    0.31568894   -0.43807184
##       g_AM.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_AM.l3
##    0.09831419    1.24756682    0.62216759   -0.64956980    0.22861484
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_AM.l4       IPCA.l4
##    4.55001601    0.31583538   -0.33806731    0.07450517    3.14977839
## Selic.Over.l4         const
##   -0.29184722   -0.02754447
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_AM_pe, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_AM_pe
## Chi-squared = 98.612, df = 80, p-value = 0.07745
```

```r
arch.test(VAR_AM_pe, multivariate.only = FALSE)
```

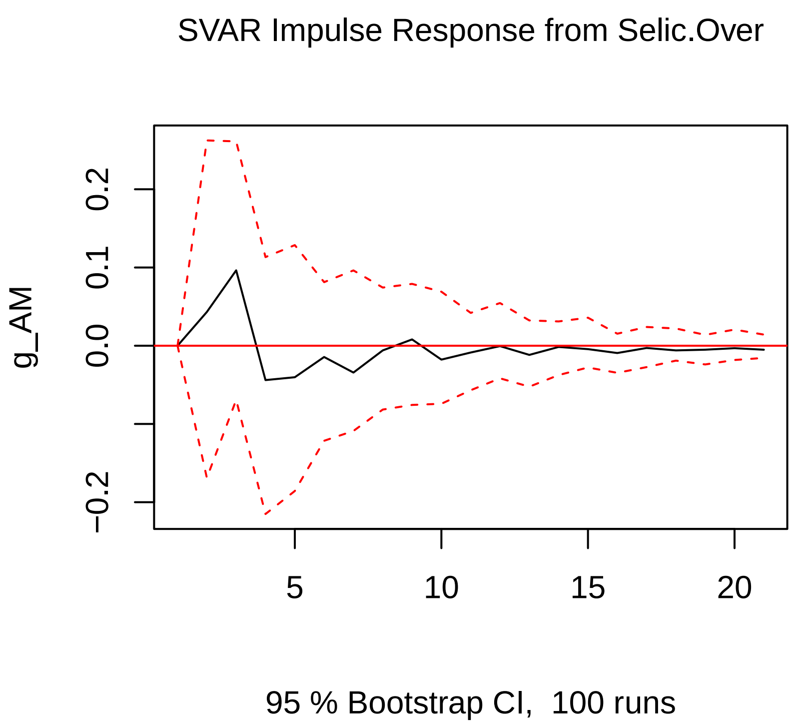
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 1.1644, df = 16, p-value = 1
##
##
## $g_AM
##
##  ARCH test (univariate)
##
## data:  Residual of g_AM equation
## Chi-squared = 3.246, df = 16, p-value = 0.9997
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 14.532, df = 16, p-value = 0.5591
##
```

```
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 41.641, df = 16, p-value = 0.0004462
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_AM_pe
## Chi-squared = 587.2, df = 500, p-value = 0.004238
```

```r
#Estimando o VAR Estrutural
SVAR_AM_pe <- SVAR(VAR_AM_pe, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_AM_pe
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                 g_BR      g_AM  IPCA Selic.Over
## g_BR        1.00000  0.000000 0.000          0
## g_AM       -0.06967  1.000000 0.000          0
## IPCA        0.08112  0.035789 1.000          0
## Selic.Over  0.07677 -0.003225 0.092          1
```

```r
#Função Impulso-Resposta
SVAR_AM_irf_pe <- irf(SVAR_AM_pe, impulse = "Selic.Over", response = "g_AM", n.ahead=20, ortho = TRUE)
plot(SVAR_AM_irf_pe)
```




```
############################################
################BAHIA#################
############################################
#Selecionando o Lag
lagselect_BA <- VARselect(base_SVAR_final[,c(1,3,15,16)],lag.max=10, type="both")
lagselect_BA$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```
lagselect_BA$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -2.955785e+01 -2.987436e+01 -2.987219e+01 -2.992931e+01 -2.991058e+01
## HQ(n)  -2.942219e+01 -2.964827e+01 -2.955566e+01 -2.952234e+01 -2.941318e+01
## SC(n)  -2.922075e+01 -2.931254e+01 -2.908563e+01 -2.891802e+01 -2.867457e+01
## FPE(n)  1.456148e-13  1.061212e-13  1.063836e-13  1.005301e-13  1.025140e-13
##                     6             7             8             9            10
## AIC(n) -2.986459e+01 -2.979820e+01 -2.979060e+01 -2.976301e+01 -2.970408e+01
## HQ(n)  -2.927675e+01 -2.911992e+01 -2.902188e+01 -2.890386e+01 -2.875449e+01
## SC(n)  -2.840385e+01 -2.811272e+01 -2.788039e+01 -2.762807e+01 -2.734441e+01
## FPE(n)  1.074649e-13  1.150276e-13  1.161498e-13  1.197193e-13  1.274093e-13
```

```
#Estimando o VAR Reduzido
VAR_BA <- VAR(base_SVAR_final[,c(1,3,15,16)], p = 5, season = NULL, exog = NULL, type = "const")
VAR_BA
```

```
##
```

```
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_BA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_BA.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_BA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.108914169   0.001896894   0.352250173  -0.008622137  -0.138688744
##       g_BA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_BA.l3
##  -0.012097337  -0.268616192  -0.005442204  -0.088264600  -0.027036577
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_BA.l4       IPCA.l4
##   0.268507353  -0.009236810  -0.036730283  -0.001692393  -1.179068572
## Selic.Over.l4       g_BR.l5       g_BA.l5       IPCA.l5 Selic.Over.l5
##   0.008573894  -0.026740835   0.019755040   0.309651235   0.016848260
##         const
##   0.001001320
##
##
## Estimated coefficients for equation g_BA:
## =========================================
## Call:
## g_BA = g_BR.l1 + g_BA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_BA.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_BA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.194031493  -0.348105354   1.485908673  -0.045115290   0.367248905
##       g_BA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_BA.l3
##  -0.350492656   0.308452238   0.007590089   0.022123793  -0.204071630
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_BA.l4       IPCA.l4
##  -0.895390465   0.029049729   0.185848982  -0.107025754   1.568112611
## Selic.Over.l4       g_BR.l5       g_BA.l5       IPCA.l5 Selic.Over.l5
##  -0.009724018  -0.018741795  -0.048329082  -1.587155861   0.023850668
##         const
##  -0.010539369
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_BA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_BA.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_BA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0049331368  0.0001341405  0.6550001041 -0.0003041579  0.0016209284
##       g_BA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_BA.l3
## -0.0058700534  0.0198373854  0.0045017551  0.0057577273  0.0014501312
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_BA.l4       IPCA.l4
##  0.0202880366  0.0005569764  0.0049691909 -0.0002743999 -0.0131840991
## Selic.Over.l4       g_BR.l5       g_BA.l5       IPCA.l5 Selic.Over.l5
##  0.0024145819 -0.0123022931  0.0050753002 -0.1710497976 -0.0065961109
##         const
##  0.0019450834
##
##
```

```
## Estimated coefficients for equation Selic.Over:
## ==============================================
## Call:
## Selic.Over = g_BR.l1 + g_BA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_BA.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_BA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.125779769   0.055101116   2.534260001   0.325652318  -0.046524442
##       g_BA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_BA.l3
##   0.102691972   2.493757324   0.572941152   0.025181975   0.095129084
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_BA.l4       IPCA.l4
##   3.098061611   0.386810859   0.089414609  -0.008327395  -0.364062495
## Selic.Over.l4       g_BR.l5       g_BA.l5       IPCA.l5 Selic.Over.l5
##  -0.265031002   0.126020103  -0.081299778   3.608887085  -0.077769545
##         const
##  -0.006827107
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_BA, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_BA
## Chi-squared = 101.03, df = 80, p-value = 0.0562
```

```r
arch.test(VAR_BA, multivariate.only = FALSE)
```

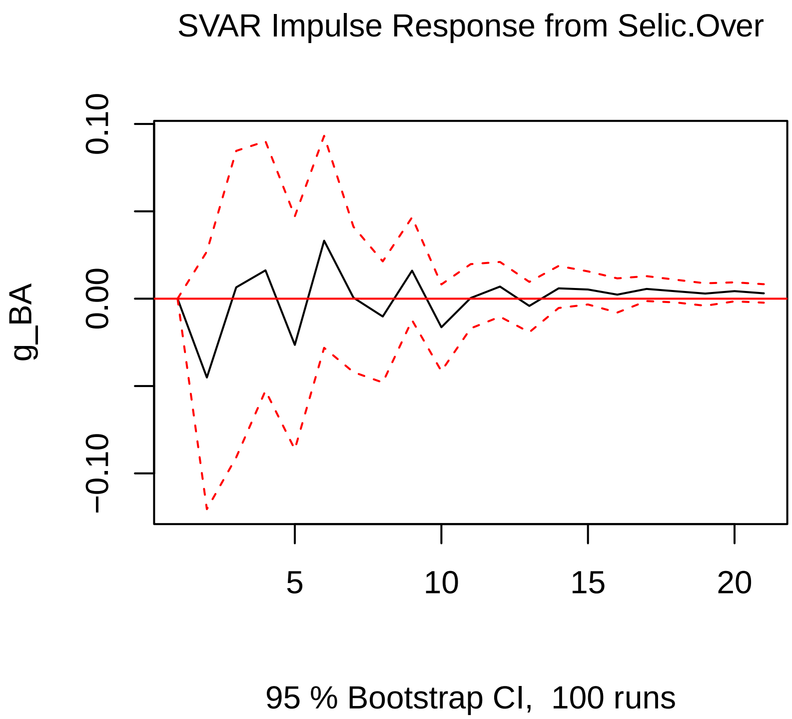
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 4.8378, df = 16, p-value = 0.9965
##
##
## $g_BA
##
##  ARCH test (univariate)
##
## data:  Residual of g_BA equation
## Chi-squared = 35.5, df = 16, p-value = 0.003393
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 17.523, df = 16, p-value = 0.3526
##
##
## $Selic.Over
##
##  ARCH test (univariate)
```

```
##
## data:  Residual of Selic.Over equation
## Chi-squared = 53.831, df = 16, p-value = 5.525e-06
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_BA
## Chi-squared = 637.26, df = 500, p-value = 2.941e-05
```

```r
#Estimando o VAR Estrutural
SVAR_BA <- SVAR(VAR_BA, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_BA
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##               g_BR    g_BA    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_BA       0.05144 1.00000 0.00000          0
## IPCA       0.08780 0.07032 1.00000          0
## Selic.Over 0.07617 0.03720 0.09111          1
```

```r
#Função Impulso-Resposta
SVAR_BA_irf <- irf(SVAR_BA, impulse = "Selic.Over", response = "g_BA", n.ahead=20, ortho = TRUE)
plot(SVAR_BA_irf)
```




```r
###Comparando Diferentes Períodos###

#----------------Período dos Autores - 01-01-2002 até 01-11-2010----------------#

#Selecionando o Lag
lagselect_BA_pa <- VARselect(base_SVAR_final[1:106,c(1,3,15,16)],lag.max=10, type="both")
lagselect_BA_pa$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      9      2      1      2
```

```r
lagselect_BA_pa$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.059156e+01 -3.091119e+01 -3.080477e+01 -3.081507e+01 -3.082705e+01
## HQ(n)  -3.033242e+01 -3.047930e+01 -3.020012e+01 -3.003766e+01 -2.987687e+01
## SC(n)  -2.995047e+01 -2.984272e+01 -2.930890e+01 -2.889181e+01 -2.847639e+01
## FPE(n)  5.182497e-14  3.773606e-14  4.219839e-14  4.216819e-14  4.230370e-14
##                    6             7             8             9            10
## AIC(n) -3.079766e+01 -3.081546e+01 -3.094593e+01 -3.102468e+01 -3.098492e+01
## HQ(n)  -2.967473e+01 -2.951977e+01 -2.947748e+01 -2.938347e+01 -2.917095e+01
## SC(n)  -2.801962e+01 -2.761002e+01 -2.731310e+01 -2.696446e+01 -2.649731e+01
## FPE(n)  4.454725e-14  4.514274e-14  4.131048e-14  4.032696e-14  4.501233e-14
```

```r
#Estimando o VAR Reduzido
VAR_BA_pa <- VAR(base_SVAR_final[1:106,c(1,3,15,16)], p = 2, season = NULL, exog = NULL, type = "const"
VAR_BA_pa
```

```
##
## VAR Estimation Results:
## ========================
##
## Estimated coefficients for equation g_BR:
## ============================================
## Call:
## g_BR = g_BR.l1 + g_BA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_BA.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_BA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.269622882   0.014398070   0.015640657  -0.012939215  -0.095606147
##       g_BA.l2       IPCA.l2 Selic.Over.l2         const
##   0.037995147  -0.078914134   0.009891732   0.005803841
##
##
## Estimated coefficients for equation g_BA:
## ============================================
## Call:
## g_BA = g_BR.l1 + g_BA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_BA.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_BA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.965724265  -0.343277104   2.883318630  -0.036855216  -0.304723889
##       g_BA.l2       IPCA.l2 Selic.Over.l2         const
##  -0.456757649  -2.829003556   0.032084609   0.006769642
##
##
## Estimated coefficients for equation IPCA:
## ============================================
## Call:
## IPCA = g_BR.l1 + g_BA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_BA.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_BA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.002954226   0.003370470   0.761964157   0.001491596  -0.013288206
##       g_BA.l2       IPCA.l2 Selic.Over.l2         const
##  -0.010740895  -0.040739209  -0.001093684   0.001062620
##
##
## Estimated coefficients for equation Selic.Over:
## ==================================================
## Call:
## Selic.Over = g_BR.l1 + g_BA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_BA.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_BA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   -0.13462060    0.27533585    2.61679875    0.44742314   -0.48924441
##       g_BA.l2       IPCA.l2 Selic.Over.l2         const
##    0.05599305    7.26579028    0.47038176    0.03936732
```

```
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_BA_pa, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_BA_pa
```

```
## Chi-squared = 116.4, df = 80, p-value = 0.004931
```

```r
arch.test(VAR_BA_pa, multivariate.only = FALSE)
```

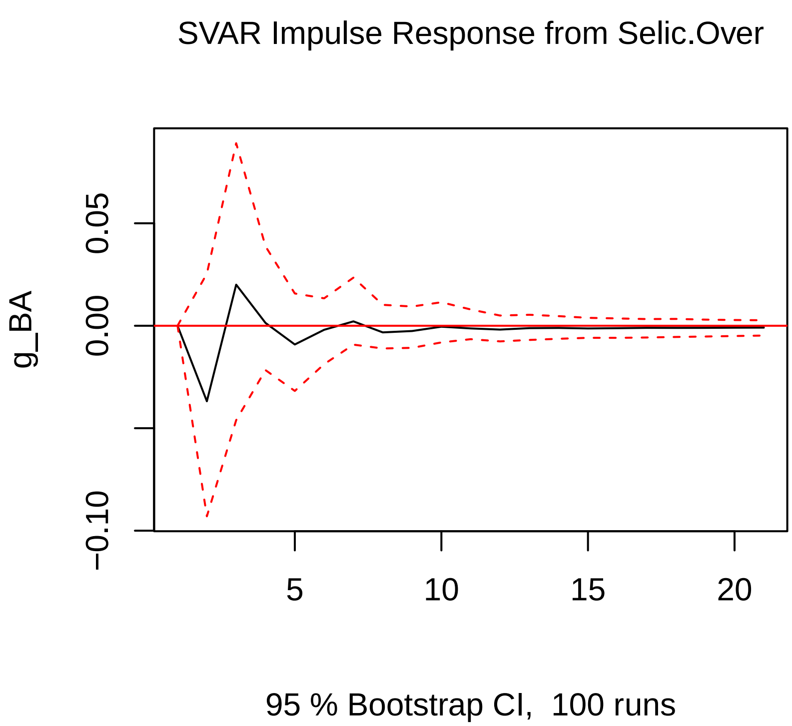
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 13.806, df = 16, p-value = 0.6132
##
##
## $g_BA
##
##  ARCH test (univariate)
##
## data:  Residual of g_BA equation
## Chi-squared = 17.902, df = 16, p-value = 0.3297
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 19.259, df = 16, p-value = 0.2555
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 28.68, df = 16, p-value = 0.02618
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_BA_pa
## Chi-squared = 596.83, df = 500, p-value = 0.001837
```

```r
#Estimando o VAR Estrutural
SVAR_BA_pa <- SVAR(VAR_BA_pa, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_BA_pa
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##               g_BR    g_BA    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_BA       0.08588 1.00000 0.00000          0
```

```
## IPCA       0.09430 0.07840 1.00000         0
## Selic.Over 0.09505 0.08543 0.09494         1
```

```
#Função Impulso-Resposta
SVAR_BA_irf_pa <- irf(SVAR_BA_pa, impulse = "Selic.Over", response = "g_BA", n.ahead=20, ortho = TRUE)
plot(SVAR_BA_irf_pa)
```




```
#----------------Período Estendido - 01-12-2010 até 01-10-2023----------------#

lagselect_BA_pe <- VARselect(base_SVAR_final[107:261,c(1,3,15,16)],lag.max=10, type="both")
lagselect_BA_pe$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      3      2      1      3
```

```
lagselect_BA_pe$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -2.923550e+01 -2.949477e+01 -2.951957e+01 -2.950186e+01 -2.941669e+01
## HQ(n)  -2.903530e+01 -2.916110e+01 -2.905243e+01 -2.890126e+01 -2.868262e+01
## SC(n)  -2.874280e+01 -2.867360e+01 -2.836994e+01 -2.802376e+01 -2.761012e+01
## FPE(n)  2.010327e-13  1.552262e-13  1.516567e-13  1.547893e-13  1.692769e-13
##                    6             7             8             9            10
## AIC(n) -2.942175e+01 -2.933025e+01 -2.925985e+01 -2.916960e+01 -2.904551e+01
## HQ(n)  -2.855421e+01 -2.832924e+01 -2.812538e+01 -2.790166e+01 -2.764410e+01
## SC(n)  -2.728672e+01 -2.686674e+01 -2.646788e+01 -2.604917e+01 -2.559661e+01
## FPE(n)  1.694744e-13  1.873115e-13  2.032603e-13  2.257098e-13  2.602237e-13
```

```r
#Estimando o VAR Reduzido
VAR_BA_pe <- VAR(base_SVAR_final[107:261,c(1,3,15,16)], p = lagselect_BA_pe$selection[1], season = NULL
VAR_BA_pe
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_BA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_BA.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_BA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.240181162   0.037774870   0.317945372  -0.025573898  -0.184500759
##       g_BA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_BA.l3
##  -0.024874564  -0.312329027   0.017388136  -0.139034354  -0.042320936
##       IPCA.l3 Selic.Over.l3         const
##  -0.957424311   0.001668794   0.007286306
##
##
## Estimated coefficients for equation g_BA:
## =========================================
## Call:
## g_BA = g_BR.l1 + g_BA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_BA.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_BA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.02480197   -0.26566676    1.34231385   -0.08329909    0.31005657
##       g_BA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_BA.l3
##   -0.19772032    2.48065579    0.02055305   -0.01032493   -0.19935772
##       IPCA.l3 Selic.Over.l3         const
##   -1.47994286    0.06804381   -0.01730712
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_BA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_BA.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_BA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  0.0001835422 -0.0025767828  0.5778387055 -0.0016971095  0.0042502014
##       g_BA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_BA.l3
## -0.0046368622  0.0304449467  0.0051031911  0.0081868483 -0.0006105636
##       IPCA.l3 Selic.Over.l3         const
## -0.0046358761 -0.0039050957  0.0022334480
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_BA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_BA.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_BA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.20455721   -0.17373763    2.88623908    0.33764642   -0.05631983
```

```
##       g_BA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_BA.l3
##   -0.05740184    1.34132665    0.48291490   -0.13602290    0.11734557
##       IPCA.l3 Selic.Over.l3         const
##    7.37383783    0.15564712   -0.03735475
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_BA_pe, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_BA_pe
## Chi-squared = 99.602, df = 80, p-value = 0.06807
```

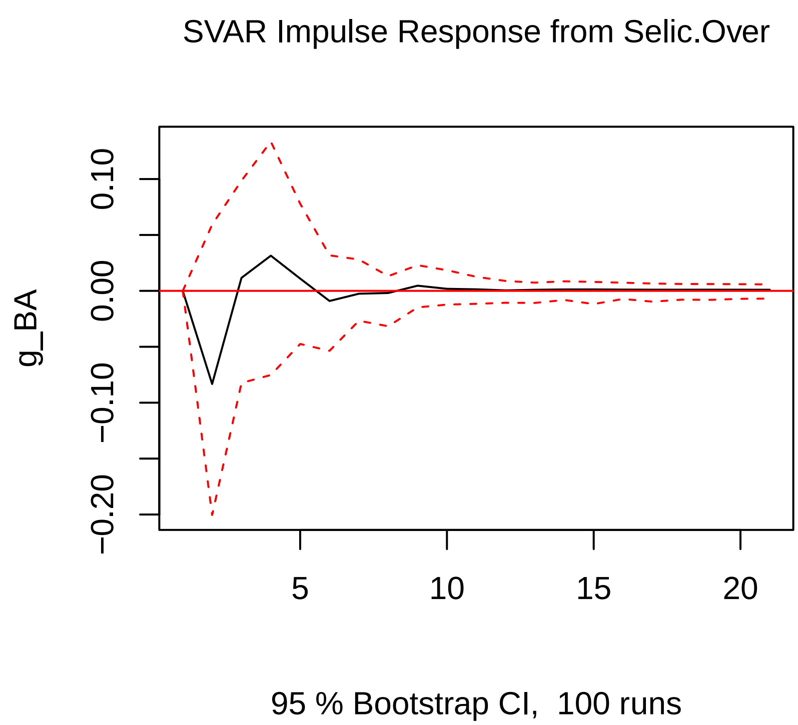
```r
arch.test(VAR_BA_pe, multivariate.only = FALSE)
```

```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 1.6152, df = 16, p-value = 1
##
##
## $g_BA
##
##  ARCH test (univariate)
##
## data:  Residual of g_BA equation
## Chi-squared = 29.587, df = 16, p-value = 0.02027
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 12.945, df = 16, p-value = 0.6768
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 20.81, df = 16, p-value = 0.1859
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_BA_pe
## Chi-squared = 547.4, df = 500, p-value = 0.07013
```

```r
#Estimando o VAR Estrutural
SVAR_BA_pe <- SVAR(VAR_BA_pe, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_BA_pe
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_BA    IPCA Selic.Over
## g_BR        1.00000 0.00000 0.00000          0
## g_BA        0.02854 1.00000 0.00000          0
## IPCA        0.08432 0.06657 1.00000          0
## Selic.Over 0.07529 0.01897 0.09202          1
```

```r
#Função Impulso-Resposta
SVAR_BA_irf_pe <- irf(SVAR_BA_pe, impulse = "Selic.Over", response = "g_BA", n.ahead=20, ortho = TRUE)
plot(SVAR_BA_irf_pe)
```




```r
###########################################
################CEARÁ################
###########################################
#Selecionando o Lag
lagselect_CE <- VARselect(base_SVAR_final[,c(1,4,15,16)],lag.max=10, type="both")
lagselect_CE$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      5      2      2      5
```

```r
lagselect_CE$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -2.994918e+01 -3.022596e+01 -3.023991e+01 -3.031836e+01 -3.031956e+01
## HQ(n)  -2.981352e+01 -2.999987e+01 -2.992338e+01 -2.991139e+01 -2.982216e+01
## SC(n)  -2.961208e+01 -2.966413e+01 -2.945336e+01 -2.930708e+01 -2.908355e+01
## FPE(n)  9.845866e-14  7.466303e-14  7.365017e-14  6.812893e-14  6.810276e-14
##                    6             7             8             9            10
## AIC(n) -3.027048e+01 -3.020063e+01 -3.023319e+01 -3.021545e+01 -3.015889e+01
## HQ(n)  -2.968264e+01 -2.952235e+01 -2.946447e+01 -2.935630e+01 -2.920930e+01
## SC(n)  -2.880973e+01 -2.851516e+01 -2.832298e+01 -2.808052e+01 -2.779923e+01
## FPE(n)  7.161319e-14  7.691778e-14  7.461136e-14  7.615005e-14  8.084982e-14
```

```r
#Estimando o VAR Reduzido
VAR_CE <- VAR(base_SVAR_final[,c(1,4,15,16)], p = 5, season = NULL, exog = NULL, type = "const")
VAR_CE
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_CE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_CE.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_CE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.2859022883  0.1121063886  0.3112156076 -0.0177018400 -0.1162074254
##       g_CE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_CE.l3
## -0.0429613127 -0.0952380590 -0.0005237096  0.0172349628 -0.0459031259
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_CE.l4       IPCA.l4
##  0.1505921972 -0.0075120235  0.0909984342 -0.0394355476 -1.0591002638
## Selic.Over.l4       g_BR.l5       g_CE.l5       IPCA.l5 Selic.Over.l5
##  0.0132778418  0.1089108941 -0.0649632269  0.4857171365  0.0135425191
##         const
##  0.0002923780
##
##
## Estimated coefficients for equation g_CE:
## =========================================
## Call:
## g_CE = g_BR.l1 + g_CE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_CE.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_CE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.135189536   0.052033120   0.387531083  -0.065737493  -0.136889932
##       g_CE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_CE.l3
##  -0.183593532   0.940018411   0.028922767   0.064668006  -0.236653861
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_CE.l4       IPCA.l4
##   0.685061367   0.008176148   0.115411082  -0.103765448  -4.402850932
## Selic.Over.l4       g_BR.l5       g_CE.l5       IPCA.l5 Selic.Over.l5
##   0.056572411   0.268087717  -0.182591765   1.818597768  -0.029743571
##         const
```

```
##   0.003402265
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_CE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_CE.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_CE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0192406581  0.0095612573  0.6418854059 -0.0008470346  0.0003457700
##       g_CE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_CE.l3
## -0.0022522819  0.0475578216  0.0049969653  0.0193665163 -0.0061894010
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_CE.l4       IPCA.l4
## -0.0098201797  0.0013042521  0.0027906034  0.0035517655 -0.0181636304
## Selic.Over.l4       g_BR.l5       g_CE.l5       IPCA.l5 Selic.Over.l5
##  0.0020653445 -0.0123220720  0.0018930546 -0.1421930253 -0.0069757229
##         const
##  0.0019351289
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_CE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_CE.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_CE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.123934138   0.014631888   2.416587723   0.325305511   0.150103417
##       g_CE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_CE.l3
##  -0.049216174   2.977630113   0.566277283   0.380494681  -0.138099419
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_CE.l4       IPCA.l4
##   3.532729954   0.386565242   0.344021513  -0.089164673  -0.505034487
## Selic.Over.l4       g_BR.l5       g_CE.l5       IPCA.l5 Selic.Over.l5
##  -0.265390094   0.260938008  -0.102323937   3.494610960  -0.071037115
##         const
##  -0.009257879
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_CE, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_CE
## Chi-squared = 107.85, df = 80, p-value = 0.0207
```

```r
arch.test(VAR_CE, multivariate.only = FALSE)
```

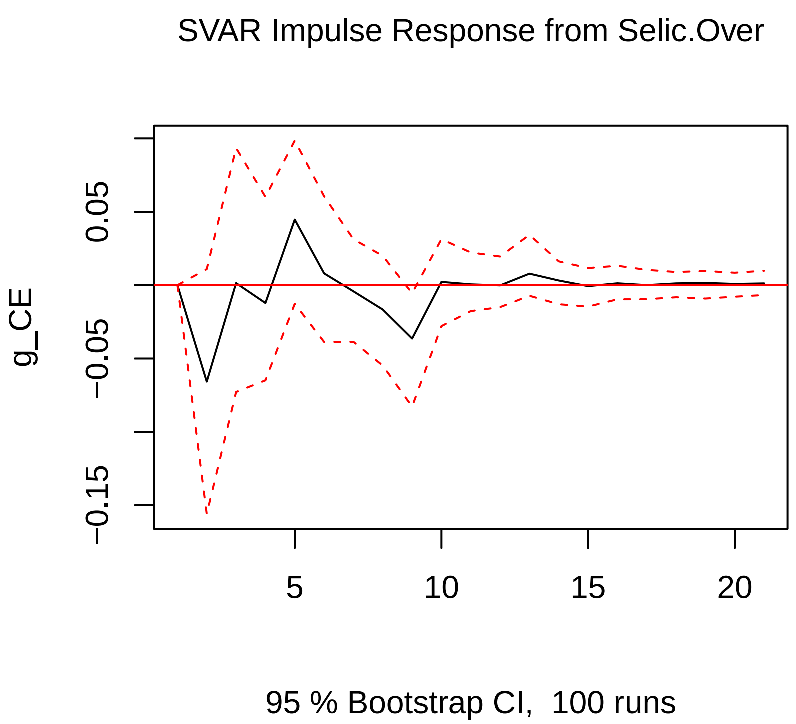
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 4.153, df = 16, p-value = 0.9986
##
```

```
##
## $g_CE
##
##  ARCH test (univariate)
##
## data:  Residual of g_CE equation
## Chi-squared = 17.922, df = 16, p-value = 0.3285
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 13.856, df = 16, p-value = 0.6094
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 51.555, df = 16, p-value = 1.292e-05
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_CE
## Chi-squared = 773, df = 500, p-value = 4.752e-14
```

```
#Estimando o VAR Estrutural
SVAR_CE <- SVAR(VAR_CE, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_CE
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_CE    IPCA Selic.Over
## g_BR       1.000000 0.00000 0.00000          0
## g_CE       0.009694 1.00000 0.00000          0
## IPCA       0.085317 0.06342 1.00000          0
## Selic.Over 0.079761 0.03954 0.09201          1
```

```
#Função Impulso-Resposta
SVAR_CE_irf <- irf(SVAR_CE, impulse = "Selic.Over", response = "g_CE", n.ahead=20, ortho = TRUE)
plot(SVAR_CE_irf)
```




```
###Comparando Diferentes Períodos###

#----------------Período dos Autores - 01-01-2002 até 01-11-2010----------------#

#Selecionando o Lag
lagselect_CE_pa <- VARselect(base_SVAR_final[1:106,c(1,4,15,16)],lag.max=10, type="both")
lagselect_CE_pa$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      1      1      1      1
```

```
lagselect_CE_pa$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -3.127292e+01 -3.126474e+01 -3.124222e+01 -3.121927e+01 -3.119591e+01
## HQ(n)  -3.101378e+01 -3.083284e+01 -3.063756e+01 -3.044185e+01 -3.024574e+01
## SC(n)  -3.063183e+01 -3.019626e+01 -2.974635e+01 -2.929601e+01 -2.884526e+01
## FPE(n)  2.621975e-14  2.649806e-14  2.724686e-14  2.814778e-14  2.925390e-14
##                     6             7             8             9            10
## AIC(n) -3.111468e+01 -3.103123e+01 -3.108368e+01 -3.110754e+01 -3.104169e+01
## HQ(n)  -2.999175e+01 -2.973554e+01 -2.961523e+01 -2.946634e+01 -2.922772e+01
## SC(n)  -2.833664e+01 -2.782580e+01 -2.745085e+01 -2.704733e+01 -2.655408e+01
## FPE(n)  3.244446e-14  3.638124e-14  3.599451e-14  3.711989e-14  4.252811e-14
```

```
#Estimando o VAR Reduzido
VAR_CE_pa <- VAR(base_SVAR_final[1:106,c(1,4,15,16)], p = 2, season = NULL, exog = NULL, type = "const")
VAR_CE_pa
```

```
##
## VAR Estimation Results:
## ========================
##
## Estimated coefficients for equation g_BR:
## ==========================================
## Call:
## g_BR = g_BR.l1 + g_CE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_CE.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##        g_BR.l1       g_CE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.282962426  -0.010659407   0.127412995  -0.011831128  -0.056417087
##        g_CE.l2       IPCA.l2 Selic.Over.l2         const
##   -0.016146604  -0.100065984   0.008175820   0.006059588
##
##
## Estimated coefficients for equation g_CE:
## ==========================================
## Call:
## g_CE = g_BR.l1 + g_CE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_CE.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##        g_BR.l1       g_CE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.275204691  -0.364265706   0.983906090  -0.021919583   0.331305155
##        g_CE.l2       IPCA.l2 Selic.Over.l2         const
##   -0.040473562  -0.687650747   0.017297672   0.004263365
##
##
## Estimated coefficients for equation IPCA:
## ==========================================
## Call:
## IPCA = g_BR.l1 + g_CE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_CE.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##        g_BR.l1       g_CE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.0017819828 -0.0044004293  0.7637595190  0.0011586232 -0.0159692997
##        g_CE.l2       IPCA.l2 Selic.Over.l2         const
## -0.0021533681 -0.0512537644 -0.0007198308  0.0010545567
##
##
## Estimated coefficients for equation Selic.Over:
## ================================================
## Call:
## Selic.Over = g_BR.l1 + g_CE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_CE.l2 + IPCA.l2 + Selic.Over.l
##
##        g_BR.l1       g_CE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    -0.06561108    0.02747619    3.40914022    0.44590231   -0.23430321
##        g_CE.l2       IPCA.l2 Selic.Over.l2         const
##    -0.08706206    6.83240190    0.46879461    0.04117180
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_CE_pa, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_CE_pa
```

```
## Chi-squared = 101.24, df = 80, p-value = 0.05464
```

```r
arch.test(VAR_CE_pa, multivariate.only = FALSE)
```

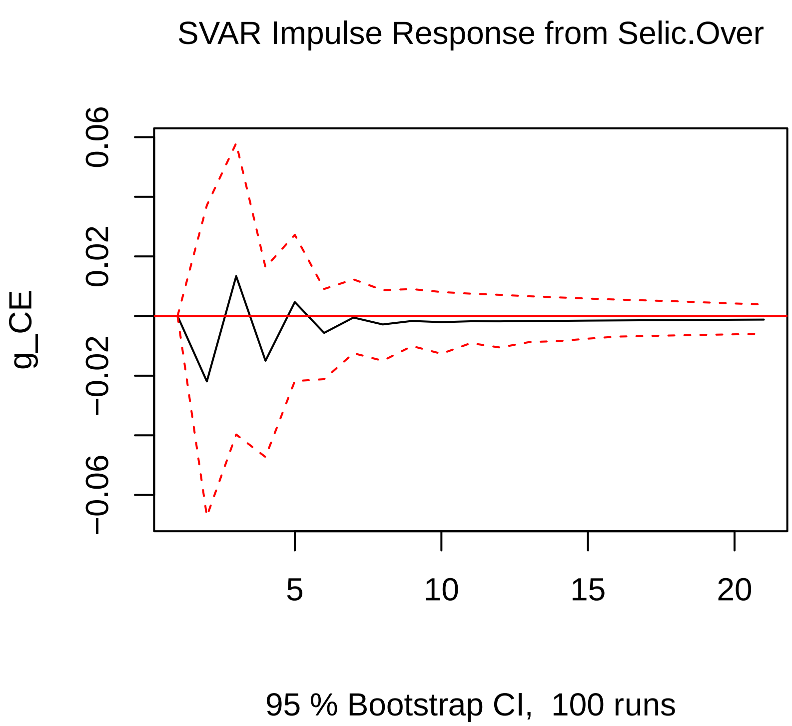
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 15.288, df = 16, p-value = 0.5037
##
##
## $g_CE
##
##  ARCH test (univariate)
##
## data:  Residual of g_CE equation
## Chi-squared = 16.231, df = 16, p-value = 0.437
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 17.147, df = 16, p-value = 0.3762
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 27.859, df = 16, p-value = 0.03287
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_CE_pa
## Chi-squared = 599.72, df = 500, p-value = 0.001414
```

```r
#Estimando o VAR Estrutural
SVAR_CE_pa <- SVAR(VAR_CE_pa, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_CE_pa
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_CE    IPCA Selic.Over
## g_BR        1.00000 0.00000 0.00000          0
## g_CE        0.07743 1.00000 0.00000          0
```

```
## IPCA       0.09402 0.08227 1.00000         0
## Selic.Over 0.09146 0.06217 0.09237         1
```

```
#Função Impulso-Resposta
SVAR_CE_irf_pa <- irf(SVAR_CE_pa, impulse = "Selic.Over", response = "g_CE", n.ahead=20, ortho = TRUE)
plot(SVAR_CE_irf_pa)
```




```
#----------------Período Estendido - 01-12-2010 até 01-10-2023----------------#

lagselect_CE_pe <- VARselect(base_SVAR_final[107:261,c(1,4,15,16)],lag.max=10, type="both")
lagselect_CE_pe$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```
lagselect_CE_pe$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -2.964345e+01 -2.999724e+01 -3.003026e+01 -3.007778e+01 -2.998744e+01
## HQ(n)  -2.944325e+01 -2.966357e+01 -2.956313e+01 -2.947717e+01 -2.925337e+01
## SC(n)  -2.915075e+01 -2.917607e+01 -2.888063e+01 -2.859967e+01 -2.818087e+01
## FPE(n)  1.336885e-13  9.391736e-14  9.100608e-14  8.702104e-14  9.565860e-14
##                    6             7             8             9            10
## AIC(n) -2.991954e+01 -2.981470e+01 -2.992736e+01 -2.993225e+01 -2.984145e+01
## HQ(n)  -2.905200e+01 -2.881370e+01 -2.879289e+01 -2.866431e+01 -2.844005e+01
## SC(n)  -2.778450e+01 -2.735120e+01 -2.713539e+01 -2.681181e+01 -2.639255e+01
## FPE(n)  1.030190e-13  1.153897e-13  1.042689e-13  1.052778e-13  1.174016e-13
```

```r
#Estimando o VAR Reduzido
VAR_CE_pe <- VAR(base_SVAR_final[107:261,c(1,4,15,16)], p = 4, season = NULL, exog = NULL, type = "cons
VAR_CE_pe
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_CE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_CE.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_CE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.719597796   0.256007493   0.077590008  -0.019483292  -0.470250326
##       g_CE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_CE.l3
##   0.035415302   0.223103425   0.028804850  -0.206246990   0.020472987
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_CE.l4       IPCA.l4
##  -0.666319902   0.001163805  -0.103439803   0.016223442  -1.353757576
## Selic.Over.l4         const
##  -0.016922483   0.010637308
##
##
## Estimated coefficients for equation g_CE:
## =========================================
## Call:
## g_CE = g_BR.l1 + g_CE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_CE.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_CE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   -0.34120303    0.29620516   -0.08672733   -0.03519712   -0.46195663
##       g_CE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_CE.l3
##   -0.18398856    2.15882193    0.08555076   -0.04854917   -0.15135367
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_CE.l4       IPCA.l4
##   -1.49264897   -0.01486056   -0.15384428   -0.04783431   -4.54768750
## Selic.Over.l4         const
##   -0.04418325    0.02298797
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_CE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_CE.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_CE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.030534920   0.015771465   0.553036193  -0.001035155   0.001975161
##       g_CE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_CE.l3
##  -0.001187734   0.100785745   0.007822999   0.030027497  -0.010961955
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_CE.l4       IPCA.l4
##  -0.028088310  -0.001467592   0.004038663   0.007176119  -0.121148125
## Selic.Over.l4         const
##  -0.005708079   0.002643533
##
##
## Estimated coefficients for equation Selic.Over:
```

```
## ================================================
## Call:
## Selic.Over = g_BR.l1 + g_CE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_CE.l2 + IPCA.l2 + Selic.Over.l
##
##        g_BR.l1        g_CE.l1        IPCA.l1 Selic.Over.l1        g_BR.l2
##     0.24167014    -0.05246778     2.46062127    0.33296602     0.19580686
##        g_CE.l2        IPCA.l2 Selic.Over.l2        g_BR.l3        g_CE.l3
##    -0.11136958     1.74307632     0.63781610   -0.13728628     0.06602679
##        IPCA.l3 Selic.Over.l3        g_BR.l4        g_CE.l4        IPCA.l4
##     3.67668125     0.30864235    -0.08714494   -0.01756385     3.28410916
## Selic.Over.l4          const
##    -0.31515088    -0.02700776
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_CE_pe, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_CE_pe
## Chi-squared = 102.29, df = 80, p-value = 0.04722
```

```r
arch.test(VAR_CE_pe, multivariate.only = FALSE)
```

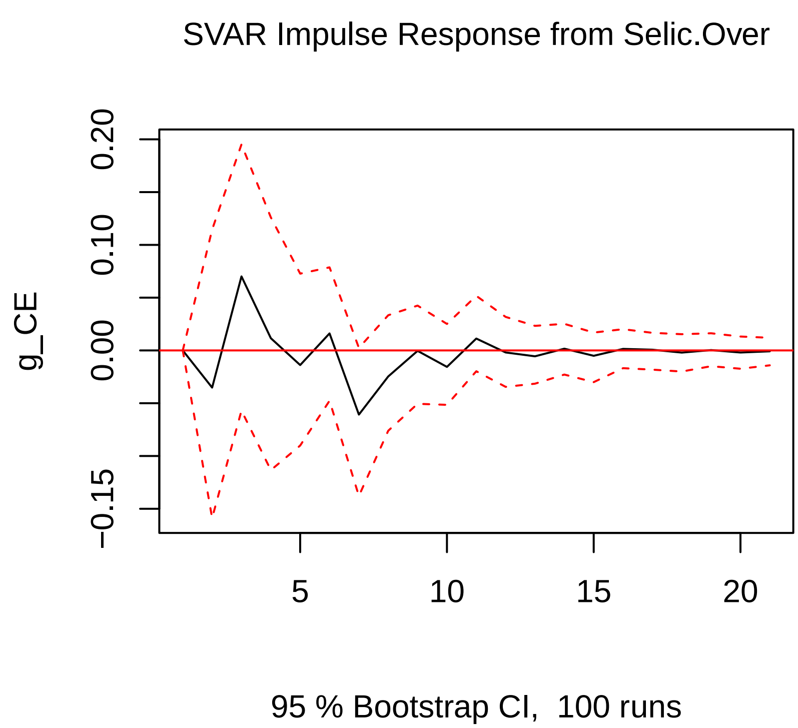
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 1.0575, df = 16, p-value = 1
##
##
## $g_CE
##
##  ARCH test (univariate)
##
## data:  Residual of g_CE equation
## Chi-squared = 10.631, df = 16, p-value = 0.8317
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 12.198, df = 16, p-value = 0.7303
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 32.7, df = 16, p-value = 0.008096
```

```
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_CE_pe
## Chi-squared = 596.7, df = 500, p-value = 0.001859
```

```r
#Estimando o VAR Estrutural
SVAR_CE_pe <- SVAR(VAR_CE_pe, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_CE_pe
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                 g_BR     g_CE    IPCA Selic.Over
## g_BR        1.00000 0.000000 0.00000          0
## g_CE       -0.02346 1.000000 0.00000          0
## IPCA        0.08314 0.055465 1.00000          0
## Selic.Over  0.07212 0.004911 0.09088          1
```

```r
#Função Impulso-Resposta
SVAR_CE_irf_pe <- irf(SVAR_CE_pe, impulse = "Selic.Over", response = "g_CE", n.ahead=20, ortho = TRUE)
plot(SVAR_CE_irf_pe)
```



```r
##############################################
##################ESPÍRITOSANTO##################
##############################################
#Selecionando o Lag
lagselect_ES <- VARselect(base_SVAR_final[,c(1,5,15,16)],lag.max=10, type="both")
lagselect_ES$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```r
lagselect_ES$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -2.964388e+01 -2.993813e+01 -2.992947e+01 -3.002109e+01 -3.000298e+01
## HQ(n)  -2.950822e+01 -2.971204e+01 -2.961294e+01 -2.961412e+01 -2.950558e+01
## SC(n)  -2.930678e+01 -2.937631e+01 -2.914291e+01 -2.900980e+01 -2.876697e+01
## FPE(n)  1.336117e-13  9.956512e-14  1.004613e-13  9.171392e-14  9.346616e-14
##                     6             7             8             9            10
## AIC(n) -2.996960e+01 -2.988215e+01 -2.983695e+01 -2.981210e+01 -2.975101e+01
## HQ(n)  -2.938176e+01 -2.920388e+01 -2.906823e+01 -2.895295e+01 -2.880142e+01
## SC(n)  -2.850885e+01 -2.819668e+01 -2.792674e+01 -2.767717e+01 -2.739135e+01
## FPE(n)  9.675319e-14  1.057646e-13  1.108890e-13  1.139837e-13  1.215678e-13
```

```r
#Estimando o VAR Reduzido
VAR_ES <- VAR(base_SVAR_final[,c(1,5,15,16)], p = 5, season = NULL, exog = NULL, type = "const")
VAR_ES
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_ES.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_ES.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_ES.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.172266566   0.085975045   0.276466426  -0.015028872  -0.228935821
##       g_ES.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_ES.l3
##   0.036525778  -0.236219109  -0.004978974  -0.174806650   0.023347751
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_ES.l4       IPCA.l4
##   0.218708046  -0.001566812  -0.083049247   0.053000201  -1.392278340
## Selic.Over.l4       g_BR.l5       g_ES.l5       IPCA.l5 Selic.Over.l5
##   0.012449227  -0.068091949   0.013733779   0.508885498   0.010610303
##         const
##   0.002223003
##
##
## Estimated coefficients for equation g_ES:
## =========================================
## Call:
## g_ES = g_BR.l1 + g_ES.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_ES.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_ES.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.583523517  -0.211325437  -0.119089983   0.008156671   0.231196879
```

```
##       g_ES.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_ES.l3
##  -0.044605259  -0.157691476  -0.064606580  -0.169578678  -0.069703775
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_ES.l4       IPCA.l4
##   2.470675103  -0.037718199   0.098175210   0.042149672  -2.042487650
## Selic.Over.l4       g_BR.l5       g_ES.l5       IPCA.l5 Selic.Over.l5
##   0.038611337  -0.152615593   0.101789341   0.341008116   0.057347067
##         const
##  -0.005223247
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_ES.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_ES.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_ES.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0097408489  0.0025622277  0.6554418486 -0.0004131773 -0.0084675670
##       g_ES.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_ES.l3
##  0.0060471932  0.0144614617  0.0041817437  0.0036123201 -0.0007196605
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_ES.l4       IPCA.l4
##  0.0063925942  0.0008268368  0.0026250496 -0.0019749559 -0.0015583609
## Selic.Over.l4       g_BR.l5       g_ES.l5       IPCA.l5 Selic.Over.l5
##  0.0029408172 -0.0105513916  0.0080942595 -0.1785296437 -0.0069735383
##         const
##  0.0020343674
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_ES.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_ES.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_ES.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.15074598   -0.04302102    2.24141890    0.32349682   -0.09569893
##       g_ES.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_ES.l3
##    0.15329368    2.25677927    0.57372010   -0.16601134    0.22123556
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_ES.l4       IPCA.l4
##    3.67679173    0.39022028   -0.16116807    0.17509320   -0.44737025
## Selic.Over.l4       g_BR.l5       g_ES.l5       IPCA.l5 Selic.Over.l5
##   -0.27176577    0.01354730   -0.07183605    3.25227982   -0.07282848
##         const
##   -0.00499409
```

```
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_ES, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_ES
## Chi-squared = 99.641, df = 80, p-value = 0.06772
```

```r
arch.test(VAR_ES, multivariate.only = FALSE)
```

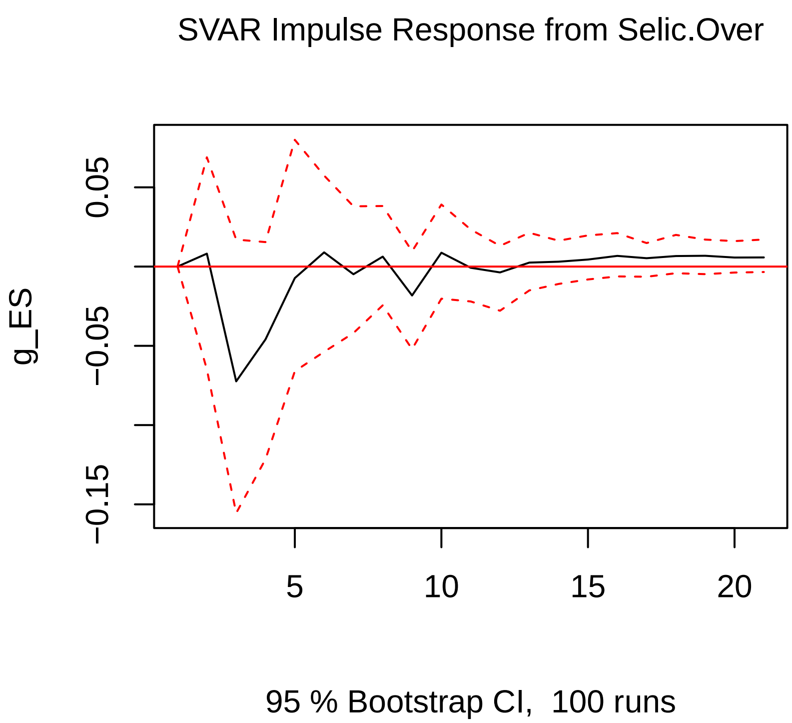
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 4.737, df = 16, p-value = 0.9969
##
##
## $g_ES
##
##  ARCH test (univariate)
##
## data:  Residual of g_ES equation
## Chi-squared = 12.246, df = 16, p-value = 0.7269
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 18.939, df = 16, p-value = 0.2718
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 49.844, df = 16, p-value = 2.427e-05
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_ES
## Chi-squared = 649.06, df = 500, p-value = 7.332e-06
```

```r
#Estimando o VAR Estrutural
SVAR_ES <- SVAR(VAR_ES, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_ES
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##               g_BR    g_ES    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_ES       0.05649 1.00000 0.00000          0
## IPCA       0.08834 0.07060 1.00000          0
```

```
## Selic.Over 0.07950 0.04294 0.09171          1
```

```
#Função Impulso-Resposta
SVAR_ES_irf <- irf(SVAR_ES, impulse = "Selic.Over", response = "g_ES", n.ahead=20, ortho = TRUE)
plot(SVAR_ES_irf)
```




```
###Comparando Diferentes Períodos###

#----------------Período dos Autores - 01-01-2002 até 01-11-2010----------------#

#Selecionando o Lag
lagselect_ES_pa <- VARselect(base_SVAR_final[1:106,c(1,5,15,16)],lag.max=10, type="both")
lagselect_ES_pa$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      2      1      1      2
```

```
lagselect_ES_pa$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -3.080396e+01 -3.089463e+01 -3.080690e+01 -3.077216e+01 -3.071952e+01
## HQ(n)  -3.054482e+01 -3.046274e+01 -3.020225e+01 -2.999475e+01 -2.976935e+01
## SC(n)  -3.016287e+01 -2.982616e+01 -2.931103e+01 -2.884890e+01 -2.836887e+01
## FPE(n)  4.190787e-14  3.836617e-14  4.210854e-14  4.401685e-14  4.710610e-14
##                     6             7             8             9            10
## AIC(n) -3.062123e+01 -3.054740e+01 -3.057821e+01 -3.053591e+01 -3.044422e+01
## HQ(n)  -2.949830e+01 -2.925171e+01 -2.910976e+01 -2.889470e+01 -2.863026e+01
## SC(n)  -2.784319e+01 -2.734197e+01 -2.694538e+01 -2.647569e+01 -2.595661e+01
```

```
## FPE(n)  5.314275e-14  5.902029e-14  5.967028e-14  6.574551e-14  7.729515e-14
```

```r
#Estimando o VAR Reduzido
VAR_ES_pa <- VAR(base_SVAR_final[1:106,c(1,5,15,16)], p = lagselect_ES_pa$selection[1], season = NULL, c
VAR_ES_pa
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_ES.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_ES.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_ES.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.091320517   0.112571993  -0.316657617  -0.010154038  -0.177340553
##       g_ES.l2       IPCA.l2 Selic.Over.l2         const
##   0.083667616   0.161753695   0.008338497   0.004750379
##
##
## Estimated coefficients for equation g_ES:
## =========================================
## Call:
## g_ES = g_BR.l1 + g_ES.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_ES.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_ES.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.83839974   -0.19030520   -1.73076742   -0.02961845   -0.25444075
##       g_ES.l2       IPCA.l2 Selic.Over.l2         const
##    0.05028198    1.47869140    0.01888685    0.01788928
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_ES.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_ES.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_ES.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0154110930  0.0027132668  0.7486442353  0.0016915296 -0.0275470650
##       g_ES.l2       IPCA.l2 Selic.Over.l2         const
##  0.0117772033 -0.0616259608 -0.0010489137  0.0009474373
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_ES.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_ES.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_ES.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.14494763   -0.17231266    4.17616243    0.45028404   -0.22097904
##       g_ES.l2       IPCA.l2 Selic.Over.l2         const
##   -0.02697219    6.04599635    0.46382644    0.04213364
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:
```

```r
serial.test(VAR_ES_pa, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_ES_pa
## Chi-squared = 100.93, df = 80, p-value = 0.05698
```

```r
arch.test(VAR_ES_pa, multivariate.only = FALSE)
```

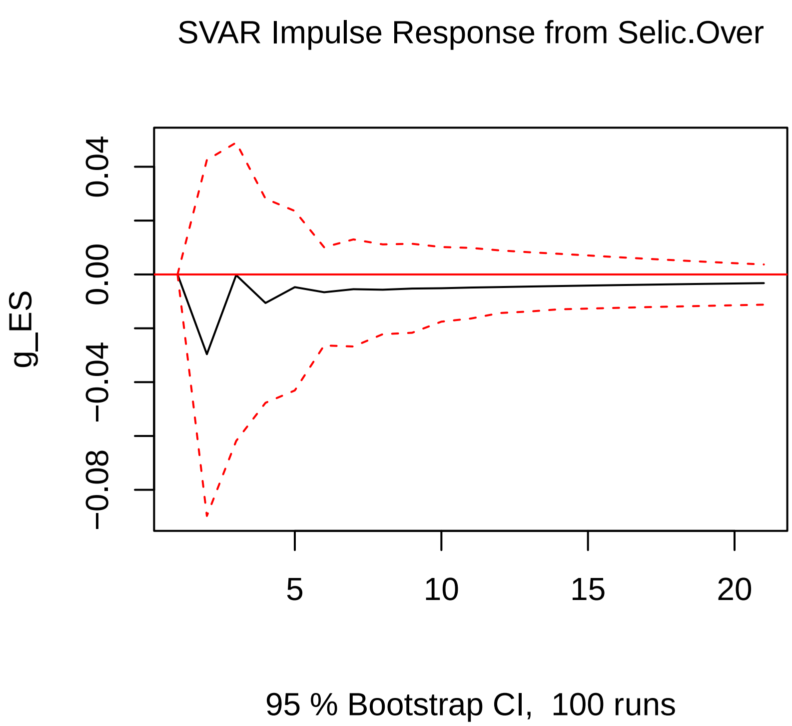
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 12.037, df = 16, p-value = 0.7414
##
##
## $g_ES
##
##  ARCH test (univariate)
##
## data:  Residual of g_ES equation
## Chi-squared = 19.348, df = 16, p-value = 0.251
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 15.414, df = 16, p-value = 0.4946
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 28.602, df = 16, p-value = 0.02676
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_ES_pa
## Chi-squared = 584.89, df = 500, p-value = 0.005133
```

```r
#Estimando o VAR Estrutural
SVAR_ES_pa <- SVAR(VAR_ES_pa, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_ES_pa
```

```
##
## SVAR Estimation Results:
## ========================
```

```
##
##
## Estimated A matrix:
##                g_BR    g_ES    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_ES       0.07049 1.00000 0.00000          0
## IPCA       0.09303 0.06939 1.00000          0
## Selic.Over 0.08526 0.03968 0.09022          1
```

```
#Função Impulso-Resposta
SVAR_ES_irf_pa <- irf(SVAR_ES_pa, impulse = "Selic.Over", response = "g_ES", n.ahead=20, ortho = TRUE)
plot(SVAR_ES_irf_pa)
```




```
#----------------Período Estendido - 01-12-2010 até 01-10-2023----------------#

lagselect_ES_pe <- VARselect(base_SVAR_final[107:261,c(1,5,15,16)],lag.max=10, type="both")
lagselect_ES_pe$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      1      4
```

```
lagselect_ES_pe$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -2.922854e+01 -2.953018e+01 -2.952175e+01 -2.959813e+01 -2.955103e+01
## HQ(n)  -2.902834e+01 -2.919651e+01 -2.905461e+01 -2.899753e+01 -2.881695e+01
## SC(n)  -2.873584e+01 -2.870901e+01 -2.837211e+01 -2.812003e+01 -2.774446e+01
## FPE(n)  2.024370e-13  1.498261e-13  1.513270e-13  1.405826e-13  1.479976e-13
```

```
##                    6             7             8             9            10
## AIC(n) -2.951878e+01 -2.940903e+01 -2.930894e+01 -2.926485e+01 -2.911262e+01
## HQ(n)  -2.865125e+01 -2.840803e+01 -2.817447e+01 -2.799691e+01 -2.771121e+01
## SC(n)  -2.738375e+01 -2.694553e+01 -2.651697e+01 -2.614442e+01 -2.566371e+01
## FPE(n)  1.538027e-13  1.731206e-13  1.935223e-13  2.052031e-13  2.433344e-13
```

```
#Estimando o VAR Reduzido
VAR_ES_pe <- VAR(base_SVAR_final[107:261,c(1,5,15,16)], p = lagselect_ES_pe$selection[1], season = NULL
VAR_ES_pe
```

```
##
## VAR Estimation Results:
## ========================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_ES.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_ES.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##        g_BR.l1        g_ES.l1        IPCA.l1 Selic.Over.l1        g_BR.l2
## -0.2550566048  0.0403499097  0.4523254039  0.0004745601 -0.2522903231
##        g_ES.l2        IPCA.l2 Selic.Over.l2        g_BR.l3        g_ES.l3
## -0.0104806690 -0.2482785878  0.0137263692 -0.1792070481 -0.0275968426
##        IPCA.l3 Selic.Over.l3        g_BR.l4        g_ES.l4        IPCA.l4
## -0.2735913396  0.0004547716 -0.0851998558  0.0186390775 -1.7912574289
## Selic.Over.l4          const
## -0.0201945596  0.0110975832
##
##
## Estimated coefficients for equation g_ES:
## =========================================
## Call:
## g_ES = g_BR.l1 + g_ES.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_ES.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##        g_BR.l1        g_ES.l1        IPCA.l1 Selic.Over.l1        g_BR.l2
##   0.501763863  -0.198883767   0.214717457   0.100049811   0.263425051
##        g_ES.l2        IPCA.l2 Selic.Over.l2        g_BR.l3        g_ES.l3
##  -0.082029442  -0.303292766  -0.048817257  -0.239767220  -0.082055456
##        IPCA.l3 Selic.Over.l3        g_BR.l4        g_ES.l4        IPCA.l4
##   2.895289054   0.005785548   0.195029446   0.022776863  -4.577981882
## Selic.Over.l4          const
##  -0.053414058   0.001681002
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_ES.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_ES.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##        g_BR.l1        g_ES.l1        IPCA.l1 Selic.Over.l1        g_BR.l2
## -0.0053386083  0.0009544841  0.5704119364  0.0011069752 -0.0037112209
##        g_ES.l2        IPCA.l2 Selic.Over.l2        g_BR.l3        g_ES.l3
##  0.0036353905  0.0382721947  0.0068891907  0.0039761051  0.0003554880
##        IPCA.l3 Selic.Over.l3        g_BR.l4        g_ES.l4        IPCA.l4
##  0.0237582673 -0.0039894979  0.0074967804 -0.0048726805 -0.1525311604
```

```
## Selic.Over.l4          const
## -0.0044814041  0.0028035329
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_ES.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_ES.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_ES.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.15514367   -0.07995051    1.83282785    0.31374930   -0.02772346
##       g_ES.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_ES.l3
##    0.14285476    1.92916256    0.63605252   -0.25444906    0.20361817
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_ES.l4       IPCA.l4
##    3.77390111    0.33174749   -0.29649651    0.18552969    3.19184341
## Selic.Over.l4         const
##   -0.31990822   -0.02224908
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_ES_pe, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_ES_pe
## Chi-squared = 87.923, df = 80, p-value = 0.2549
```

```r
arch.test(VAR_ES_pe, multivariate.only = FALSE)
```

```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 1.6783, df = 16, p-value = 1
##
##
## $g_ES
##
##  ARCH test (univariate)
##
## data:  Residual of g_ES equation
## Chi-squared = 14.109, df = 16, p-value = 0.5906
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 12.606, df = 16, p-value = 0.7013
##
##
## $Selic.Over
```

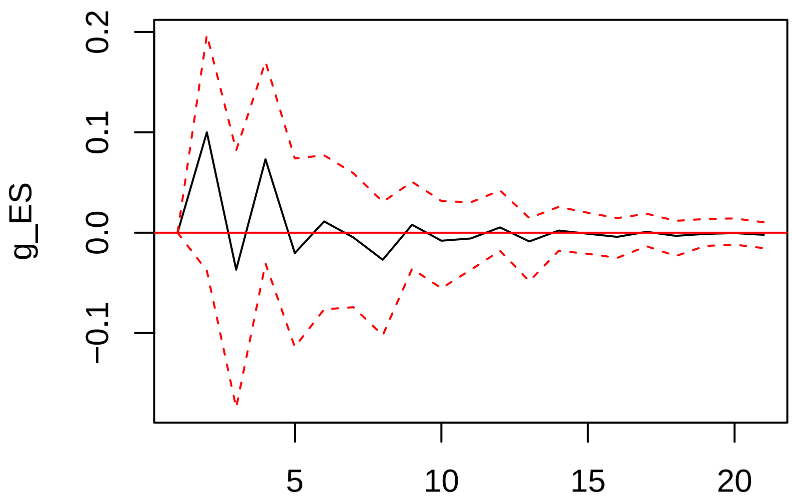
```
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 25.594, df = 16, p-value = 0.06001
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_ES_pe
## Chi-squared = 587.51, df = 500, p-value = 0.004128
```

```
#Estimando o VAR Estrutural
SVAR_ES_pe <- SVAR(VAR_ES_pe, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_ES
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_ES    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_ES       0.05649 1.00000 0.00000          0
## IPCA       0.08834 0.07060 1.00000          0
## Selic.Over 0.07950 0.04294 0.09171          1
```

```
#Função Impulso-Resposta
SVAR_ES_irf_pe <- irf(SVAR_ES_pe, impulse = "Selic.Over", response = "g_ES", n.ahead=20, ortho = TRUE)
plot(SVAR_ES_irf_pe)
```

SVAR Impulse Response from Selic.Over



95 % Bootstrap CI, 100 runs

```r
############################################
################GOIÁS################
############################################
#Selecionando o Lag
lagselect_GO <- VARselect(base_SVAR_final[,c(1,6,15,16)],lag.max=10, type="both")
lagselect_GO$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      5      4      2      5
```

```r
lagselect_GO$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -3.086122e+01 -3.137480e+01 -3.138677e+01 -3.159527e+01 -3.162361e+01
## HQ(n)  -3.072556e+01 -3.114871e+01 -3.107024e+01 -3.118830e+01 -3.112621e+01
## SC(n)  -3.052412e+01 -3.081298e+01 -3.060021e+01 -3.058398e+01 -3.038760e+01
## FPE(n)  3.955119e-14  2.366847e-14  2.339385e-14  1.900105e-14  1.848513e-14
##                     6             7             8             9            10
## AIC(n) -3.159714e+01 -3.150360e+01 -3.144382e+01 -3.144409e+01 -3.137666e+01
## HQ(n)  -3.100930e+01 -3.082533e+01 -3.067510e+01 -3.058494e+01 -3.042708e+01
## SC(n)  -3.013640e+01 -2.981813e+01 -2.953361e+01 -2.930915e+01 -2.901700e+01
## FPE(n)  1.900342e-14  2.090032e-14  2.223484e-14  2.228846e-14  2.392253e-14
```

```r
#Estimando o VAR Reduzido
VAR_GO <- VAR(base_SVAR_final[,c(1,6,15,16)], p = lagselect_GO$selection[1], season = NULL, exog = NULL
VAR_GO
```

```
##
```

```
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## ==========================================
## Call:
## g_BR = g_BR.l1 + g_GO.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_GO.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_GO.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.064868049  -0.159321349   0.386537285  -0.006132949  -0.154963343
##       g_GO.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_GO.l3
##  -0.052653497  -0.404281946  -0.005547944  -0.106678050   0.003181092
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_GO.l4       IPCA.l4
##   0.356941425  -0.013740556  -0.046505909   0.105116595  -1.122271073
## Selic.Over.l4       g_BR.l5       g_GO.l5       IPCA.l5 Selic.Over.l5
##   0.010609798  -0.038534665   0.110301880   0.224990322   0.017041809
##         const
##   0.001108717
##
##
## Estimated coefficients for equation g_GO:
## ==========================================
## Call:
## g_GO = g_BR.l1 + g_GO.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_GO.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_GO.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.019707833  -0.977483907  -0.032789203  -0.002959576   0.012571985
##       g_GO.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_GO.l3
##  -0.917215254   0.086910332  -0.008162934  -0.005035041  -0.624472082
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_GO.l4       IPCA.l4
##   0.428418067   0.020581978   0.068193878  -0.507966965  -0.440540293
## Selic.Over.l4       g_BR.l5       g_GO.l5       IPCA.l5 Selic.Over.l5
##   0.018861887  -0.074979406  -0.132272080  -0.276850950  -0.018271429
##         const
##   0.001335545
##
##
## Estimated coefficients for equation IPCA:
## ==========================================
## Call:
## IPCA = g_BR.l1 + g_GO.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_GO.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_GO.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0023816552 -0.0068438565  0.6535833821 -0.0002769579 -0.0031911377
##       g_GO.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_GO.l3
##  0.0040669345  0.0175824614  0.0044467526  0.0042363681  0.0110495917
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_GO.l4       IPCA.l4
##  0.0096291108  0.0007276907  0.0044892646  0.0056534807 -0.0006459874
## Selic.Over.l4       g_BR.l5       g_GO.l5       IPCA.l5 Selic.Over.l5
##  0.0023812566 -0.0076327646  0.0024791732 -0.1717849933 -0.0067397449
##         const
##  0.0019527143
##
##
```

```
## Estimated coefficients for equation Selic.Over:
## ==============================================
## Call:
## Selic.Over = g_BR.l1 + g_GO.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_GO.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_GO.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.12878939    0.09840873    2.36648241    0.33043559    0.06126779
##       g_GO.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_GO.l3
##   -0.04312393    2.78337017    0.56765693    0.11941230   -0.06523925
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_GO.l4       IPCA.l4
##    3.33340894    0.38498821    0.10776303   -0.04237072   -0.56286039
## Selic.Over.l4       g_BR.l5       g_GO.l5       IPCA.l5 Selic.Over.l5
##   -0.26919710    0.06506364    0.03636922    3.56607519   -0.07083189
##         const
##   -0.00788735
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_GO, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_GO
## Chi-squared = 75.045, df = 80, p-value = 0.6358
```

```r
arch.test(VAR_GO, multivariate.only = FALSE)
```

```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 5.3154, df = 16, p-value = 0.9939
##
##
## $g_GO
##
##  ARCH test (univariate)
##
## data:  Residual of g_GO equation
## Chi-squared = 1.6675, df = 16, p-value = 1
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 18.539, df = 16, p-value = 0.2933
##
##
## $Selic.Over
##
##  ARCH test (univariate)
```

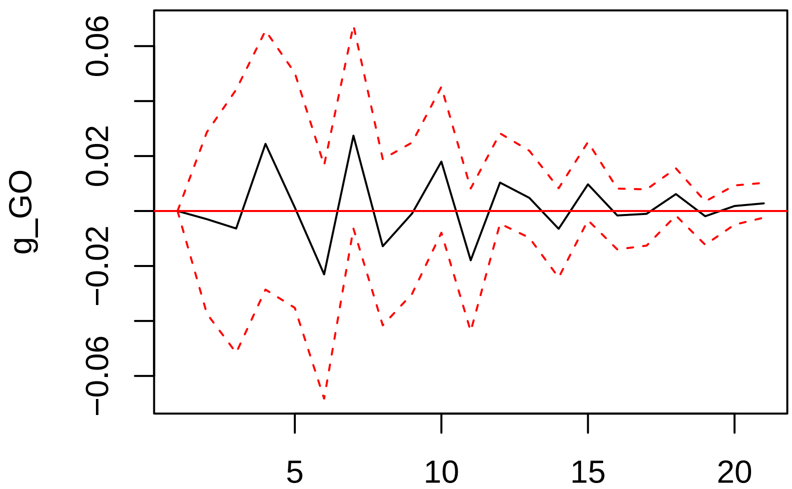
```
##
## data:  Residual of Selic.Over equation
## Chi-squared = 56.349, df = 16, p-value = 2.131e-06
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_GO
## Chi-squared = 740.35, df = 500, p-value = 1.365e-11
```

```r
#Estimando o VAR Estrutural
SVAR_GO <- SVAR(VAR_GO, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_GO
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_GO    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_GO       0.08269 1.00000 0.00000          0
## IPCA       0.09223 0.09324 1.00000          0
## Selic.Over 0.08159 0.07946 0.09482          1
```

```r
#Função Impulso-Resposta
SVAR_GO_irf <- irf(SVAR_GO, impulse = "Selic.Over", response = "g_GO", n.ahead=20, ortho = TRUE)
plot(SVAR_GO_irf)
```

SVAR Impulse Response from Selic.Over



95 % Bootstrap CI, 100 runs

```
###Comparando Diferentes Períodos###

#----------------Período dos Autores - 01-01-2002 até 01-11-2010----------------#

#Selecionando o Lag
lagselect_GO_pa <- VARselect(base_SVAR_final[1:106,c(1,6,15,16)],lag.max=10, type="both")
lagselect_GO_pa$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      6      2      2      5
```

```
lagselect_GO_pa$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.229147e+01 -3.276754e+01 -3.282487e+01 -3.295264e+01 -3.300132e+01
## HQ(n)  -3.203233e+01 -3.233564e+01 -3.222021e+01 -3.217522e+01 -3.205114e+01
## SC(n)  -3.165038e+01 -3.169906e+01 -3.132900e+01 -3.102937e+01 -3.065066e+01
## FPE(n)  9.468413e-15  5.896005e-15  5.597323e-15  4.973377e-15  4.809561e-15
##                    6             7             8             9            10
## AIC(n) -3.300201e+01 -3.295748e+01 -3.279237e+01 -3.278556e+01 -3.276919e+01
## HQ(n)  -3.187908e+01 -3.166179e+01 -3.132393e+01 -3.114436e+01 -3.095522e+01
## SC(n)  -3.022396e+01 -2.975205e+01 -2.915955e+01 -2.872534e+01 -2.828158e+01
## FPE(n)  4.914577e-15  5.300518e-15  6.518667e-15  6.931903e-15  7.558444e-15
```

```
#Estimando o VAR Reduzido
VAR_GO_pa <- VAR(base_SVAR_final[1:106,c(1,6,15,16)], p = 4, season = NULL, exog = NULL, type = "const"
VAR_GO_pa
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## ==========================================
## Call:
## g_BR = g_BR.l1 + g_GO.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_GO.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_GO.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.251729102  -0.018348867   0.303052471  -0.022540637  -0.048775777
##       g_GO.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_GO.l3
##   0.084192971  -0.269911293  -0.008402289  -0.012641141   0.143684617
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_GO.l4       IPCA.l4
##   0.488630599   0.002721962   0.023909033   0.063951716  -0.325185566
## Selic.Over.l4         const
##   0.026044234   0.002245584
##
##
## Estimated coefficients for equation g_GO:
## ==========================================
## Call:
## g_GO = g_BR.l1 + g_GO.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_GO.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_GO.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0334692745 -1.4087086912  0.8266469292 -0.0011589415  0.0872963632
##       g_GO.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_GO.l3
## -1.5105559365 -0.1295474598 -0.0203346507 -0.0502859920 -1.0121317926
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_GO.l4       IPCA.l4
##  0.3252224781  0.0006131424  0.1231302293 -0.4668096020 -0.4754423229
## Selic.Over.l4         const
##  0.0181894410  0.0193608172
##
##
## Estimated coefficients for equation IPCA:
## ==========================================
## Call:
## IPCA = g_BR.l1 + g_GO.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_GO.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_GO.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0096897240 -0.0119478083  0.7843092727  0.0013871681 -0.0168841885
##       g_GO.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_GO.l3
## -0.0279679242  0.0200198215 -0.0009372471  0.0217104436 -0.0038041146
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_GO.l4       IPCA.l4
## -0.1199803151 -0.0019779795  0.0057905612  0.0041339692  0.0255749232
## Selic.Over.l4         const
##  0.0022846680  0.0008035404
##
##
## Estimated coefficients for equation Selic.Over:
## ================================================
## Call:
## Selic.Over = g_BR.l1 + g_GO.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_GO.l2 + IPCA.l2 + Selic.Over.l
##
```

```
##       g_BR.l1       g_GO.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.10000188   -0.38680936    4.29283832    0.35820294   -0.25480069
##       g_GO.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_GO.l3
##   -0.83274714    3.23849731    0.49145871    0.40081450   -0.44479921
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_GO.l4       IPCA.l4
##    3.02589558    0.33645198    0.25058292   -0.51835246    1.79624845
## Selic.Over.l4         const
##   -0.28765192    0.05328355
```

```
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_GO_pa, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_GO_pa
## Chi-squared = 108.1, df = 80, p-value = 0.01991
```

```
arch.test(VAR_GO_pa, multivariate.only = FALSE)
```

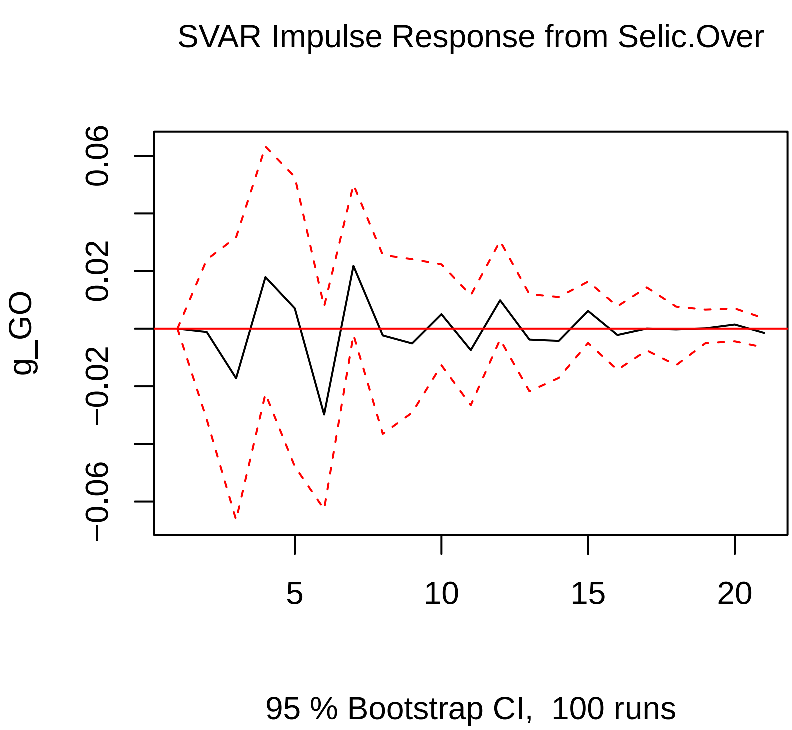
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 9.3846, df = 16, p-value = 0.8967
##
##
## $g_GO
##
##  ARCH test (univariate)
##
## data:  Residual of g_GO equation
## Chi-squared = 15.26, df = 16, p-value = 0.5057
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 5.6264, df = 16, p-value = 0.9917
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 20.76, df = 16, p-value = 0.1879
##
##
##
##  ARCH (multivariate)
```

```
##
## data:  Residuals of VAR object VAR_GO_pa
## Chi-squared = 573.66, df = 500, p-value = 0.01239
```

```r
#Estimando o VAR Estrutural
SVAR_GO_pa <- SVAR(VAR_GO_pa, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_GO_pa
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_GO    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_GO       0.09769 1.00000 0.00000          0
## IPCA       0.09722 0.09785 1.00000          0
## Selic.Over 0.08785 0.09111 0.09374          1
```

```r
#Função Impulso-Resposta
SVAR_GO_irf_pa <- irf(SVAR_GO_pa, impulse = "Selic.Over", response = "g_GO", n.ahead=20, ortho = TRUE)
plot(SVAR_GO_irf_pa)
```




```r
#----------------Período Estendido - 01-12-2010 até 01-10-2023----------------#

lagselect_GO_pe <- VARselect(base_SVAR_final[107:261,c(1,6,15,16)],lag.max=10, type="both")
lagselect_GO_pe$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```r
lagselect_GO_pe$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -3.032667e+01 -3.077317e+01 -3.077093e+01 -3.099065e+01 -3.097455e+01
## HQ(n)  -3.012647e+01 -3.043950e+01 -3.030379e+01 -3.039004e+01 -3.024048e+01
## SC(n)  -2.983397e+01 -2.995200e+01 -2.962130e+01 -2.951254e+01 -2.916798e+01
## FPE(n)  6.751128e-14  4.322769e-14  4.339135e-14  3.492764e-14  3.564722e-14
##                     6             7             8             9            10
## AIC(n) -3.092839e+01 -3.078860e+01 -3.071469e+01 -3.062853e+01 -3.047922e+01
## HQ(n)  -3.006085e+01 -2.978759e+01 -2.958021e+01 -2.936059e+01 -2.907781e+01
## SC(n)  -2.879335e+01 -2.832509e+01 -2.792272e+01 -2.750809e+01 -2.703032e+01
## FPE(n)  3.756471e-14  4.357231e-14  4.744877e-14  5.247428e-14  6.204334e-14
```

```r
#Estimando o VAR Reduzido
VAR_GO_pe <- VAR(base_SVAR_final[107:261,c(1,6,15,16)], p = lagselect_GO_pe$selection[1], season = NULL
VAR_GO_pe
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_GO.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_GO.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_GO.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.169078225  -0.198697246   0.523791440   0.003790553  -0.255137216
##       g_GO.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_GO.l3
##  -0.096960704  -0.571090602   0.015836327  -0.168760524  -0.117921264
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_GO.l4       IPCA.l4
##   0.063006643  -0.011442595  -0.107384870   0.001481406  -1.788384968
## Selic.Over.l4         const
##  -0.012817937   0.010509524
##
##
## Estimated coefficients for equation g_GO:
## =========================================
## Call:
## g_GO = g_BR.l1 + g_GO.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_GO.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_GO.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0286084678 -0.8299677405 -0.7366784283 -0.0135500929  0.0012572919
##       g_GO.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_GO.l3
## -0.7705441196  0.9662421306 -0.0155713265 -0.0211593128 -0.4468775428
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_GO.l4       IPCA.l4
##  0.1382469591  0.0412111612  0.0675041411 -0.4236782516 -0.4513823611
## Selic.Over.l4         const
## -0.0055881327  0.0001252806
##
##
## Estimated coefficients for equation IPCA:
```

```
## ========================================
## Call:
## IPCA = g_BR.l1 + g_GO.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_GO.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_GO.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.001866240  -0.010630088   0.573500008   0.001036627  -0.001539879
##       g_GO.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_GO.l3
##   0.007552397   0.030519991   0.005909844   0.004843031   0.011444618
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_GO.l4       IPCA.l4
##   0.048946316  -0.003801963   0.007274436   0.006721589  -0.158490191
## Selic.Over.l4         const
##  -0.003601968   0.002711487
##
##
## Estimated coefficients for equation Selic.Over:
## ==============================================
## Call:
## Selic.Over = g_BR.l1 + g_GO.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_GO.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_GO.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.032502706   0.058263754   2.020012465   0.328206074  -0.004291574
##       g_GO.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_GO.l3
##  -0.155087170   1.921665247   0.640933018  -0.020584866  -0.296786581
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_GO.l4       IPCA.l4
##   3.679089392   0.327691625  -0.066991841  -0.106547235   3.237891776
## Selic.Over.l4         const
##  -0.331983912  -0.025439666
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_GO_pe, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_GO_pe
## Chi-squared = 85.642, df = 80, p-value = 0.3126
```

```r
arch.test(VAR_GO_pe, multivariate.only = FALSE)
```

```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 1.7815, df = 16, p-value = 1
##
##
## $g_GO
##
##  ARCH test (univariate)
##
## data:  Residual of g_GO equation
## Chi-squared = 2.507, df = 16, p-value = 0.9999
##
```

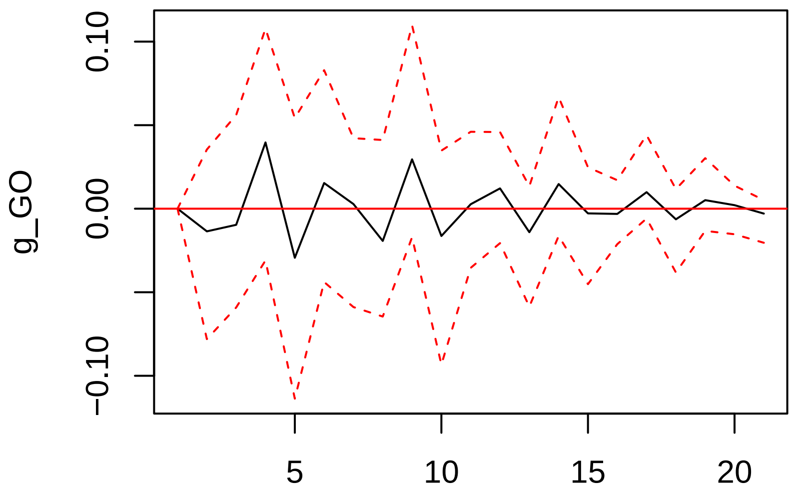
```
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 14.486, df = 16, p-value = 0.5626
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 33.726, df = 16, p-value = 0.005913
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_GO_pe
## Chi-squared = 616.26, df = 500, p-value = 0.0002849
```

```r
#Estimando o VAR Estrutural
SVAR_GO_pe <- SVAR(VAR_GO_pe, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_GO
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_GO    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_GO       0.08269 1.00000 0.00000          0
## IPCA       0.09223 0.09324 1.00000          0
## Selic.Over 0.08159 0.07946 0.09482          1
```

```r
#Função Impulso-Resposta
SVAR_GO_irf_pe <- irf(SVAR_GO_pe, impulse = "Selic.Over", response = "g_GO", n.ahead=20, ortho = TRUE)
plot(SVAR_GO_irf_pe)
```

SVAR Impulse Response from Selic.Over



95 % Bootstrap CI, 100 runs

```r
###########################################
################MINAS################
###########################################
#Selecionando o Lag
lagselect_MG <- VARselect(base_SVAR_final[,c(1,7,15,16)],lag.max=10, type="both")
lagselect_MG$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```r
lagselect_MG$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.101122e+01 -3.128703e+01 -3.129061e+01 -3.135451e+01 -3.133231e+01
## HQ(n)  -3.087556e+01 -3.106094e+01 -3.097408e+01 -3.094755e+01 -3.083490e+01
## SC(n)  -3.067412e+01 -3.072520e+01 -3.050405e+01 -3.034323e+01 -3.009629e+01
## FPE(n)  3.404209e-14  2.583983e-14  2.575505e-14  2.417336e-14  2.473637e-14
##                    6             7             8             9            10
## AIC(n) -3.132470e+01 -3.123231e+01 -3.119482e+01 -3.116514e+01 -3.114031e+01
## HQ(n)  -3.073686e+01 -3.055404e+01 -3.042611e+01 -3.030599e+01 -3.019072e+01
## SC(n)  -2.986395e+01 -2.954684e+01 -2.928461e+01 -2.903020e+01 -2.878064e+01
## FPE(n)  2.495468e-14  2.741401e-14  2.852151e-14  2.945962e-14  3.030087e-14
```

```r
#Estimando o VAR Reduzido
VAR_MG <- VAR(base_SVAR_final[,c(1,7,15,16)], p = 5, season = NULL, exog = NULL, type = "const")
VAR_MG
```

```
##
```

```
## VAR Estimation Results:
## ========================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_MG.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_MG.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_MG.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.2697763421  0.1557779200  0.4595298237 -0.0111691570 -0.2811121496
##       g_MG.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_MG.l3
##  0.1137105877 -0.3978557318 -0.0026044945 -0.2610984782  0.1382612520
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_MG.l4       IPCA.l4
##  0.2105418182 -0.0040102733 -0.1705948897  0.1182348843 -1.1919726734
## Selic.Over.l4       g_BR.l5       g_MG.l5       IPCA.l5 Selic.Over.l5
##  0.0101619369 -0.1386490421  0.1297207584  0.2784169667  0.0103802160
##         const
##  0.0009571995
##
##
## Estimated coefficients for equation g_MG:
## =========================================
## Call:
## g_MG = g_BR.l1 + g_MG.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_MG.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_MG.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  0.0661776343 -0.1401906220  0.4049535390 -0.0232409129  0.0453902766
##       g_MG.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_MG.l3
## -0.1253587006 -0.4377029105 -0.0181185050 -0.0866095173 -0.0221170935
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_MG.l4       IPCA.l4
##  0.6460575939  0.0068687052 -0.0627141330  0.0211912036 -0.8876958304
## Selic.Over.l4       g_BR.l5       g_MG.l5       IPCA.l5 Selic.Over.l5
##  0.0294928977 -0.0525479653  0.0557063962  0.1764378230  0.0054446675
##         const
##  0.0005577908
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_MG.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_MG.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_MG.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0138633298  0.0090626287  0.6482607515 -0.0001624476 -0.0130749775
##       g_MG.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_MG.l3
##  0.0106967864  0.0231684231  0.0047172239  0.0020648433  0.0045694527
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_MG.l4       IPCA.l4
##  0.0108498630  0.0010287194  0.0069281874 -0.0047414099 -0.0147663114
## Selic.Over.l4       g_BR.l5       g_MG.l5       IPCA.l5 Selic.Over.l5
##  0.0020090823 -0.0087089665  0.0014169445 -0.1708720285 -0.0069802786
##         const
##  0.0019790638
##
##
```

```
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_MG.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_MG.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_MG.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.141539142  -0.003577998   2.371533691   0.328267886  -0.054177017
##       g_MG.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_MG.l3
##   0.059092452   2.646352805   0.569096773  -0.179800987   0.314727401
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_MG.l4       IPCA.l4
##   3.485999859   0.385991518  -0.040696933   0.127138792  -0.564186231
## Selic.Over.l4       g_BR.l5       g_MG.l5       IPCA.l5 Selic.Over.l5
##  -0.264484600  -0.058840195   0.135763983   3.447761854  -0.075023369
##         const
##  -0.008236118
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_MG, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_MG
## Chi-squared = 101.78, df = 80, p-value = 0.05067
```

```r
arch.test(VAR_MG, multivariate.only = FALSE)
```

```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 2.8076, df = 16, p-value = 0.9999
##
##
## $g_MG
##
##  ARCH test (univariate)
##
## data:  Residual of g_MG equation
## Chi-squared = 28.952, df = 16, p-value = 0.02426
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 22.439, df = 16, p-value = 0.1296
##
##
## $Selic.Over
##
##  ARCH test (univariate)
```

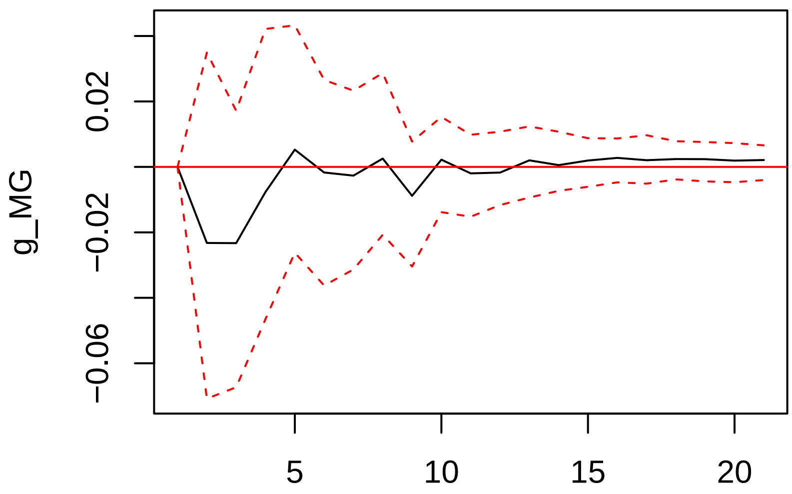
```
##
## data:  Residual of Selic.Over equation
## Chi-squared = 56.001, df = 16, p-value = 2.433e-06
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_MG
## Chi-squared = 653.03, df = 500, p-value = 4.519e-06
```

```r
#Estimando o VAR Estrutural
SVAR_MG <- SVAR(VAR_MG, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_MG
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##               g_BR    g_MG    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_MG       0.04538 1.00000 0.00000          0
## IPCA       0.08830 0.08432 1.00000          0
## Selic.Over 0.08221 0.08265 0.09532          1
```

```r
#Função Impulso-Resposta
SVAR_MG_irf <- irf(SVAR_MG, impulse = "Selic.Over", response = "g_MG", n.ahead=20, ortho = TRUE)
plot(SVAR_MG_irf)
```

SVAR Impulse Response from Selic.Over



95 % Bootstrap CI, 100 runs

```r
###Comparando Diferentes Períodos###

#----------------Período dos Autores - 01-01-2002 até 01-11-2010----------------#

#Selecionando o Lag
lagselect_MG_pa <- VARselect(base_SVAR_final[1:106,c(1,7,15,16)],lag.max=10, type="both")
lagselect_MG_pa$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##     10      1      1      2
```

```r
lagselect_MG_pa$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -3.278838e+01 -3.287835e+01 -3.283272e+01 -3.286312e+01 -3.283639e+01
## HQ(n)  -3.252924e+01 -3.244645e+01 -3.222807e+01 -3.208571e+01 -3.188621e+01
## SC(n)  -3.214729e+01 -3.180987e+01 -3.133685e+01 -3.093986e+01 -3.048573e+01
## FPE(n)  5.760638e-15  5.277540e-15  5.553523e-15  5.439088e-15  5.671956e-15
##                     6             7             8             9            10
## AIC(n) -3.288552e+01 -3.287745e+01 -3.285132e+01 -3.292473e+01 -3.297563e+01
## HQ(n)  -3.176259e+01 -3.158176e+01 -3.138287e+01 -3.128353e+01 -3.116166e+01
## SC(n)  -3.010747e+01 -2.967202e+01 -2.921849e+01 -2.886451e+01 -2.848802e+01
## FPE(n)  5.521757e-15  5.742143e-15  6.145535e-15  6.031313e-15  6.148628e-15
```

```r
#Estimando o VAR Reduzido
VAR_MG_pa <- VAR(base_SVAR_final[1:106,c(1,7,15,16)], p = 2, season = NULL, exog = NULL, type = "const")
VAR_MG_pa
```

```
##
## VAR Estimation Results:
## ========================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_MG.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_MG.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_MG.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.020791460   0.181204527  -0.140715312  -0.006115116  -0.289076578
##       g_MG.l2       IPCA.l2 Selic.Over.l2         const
##   0.141430478   0.022837842   0.002900789   0.006796464
##
##
## Estimated coefficients for equation g_MG:
## =========================================
## Call:
## g_MG = g_BR.l1 + g_MG.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_MG.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_MG.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.584991986  -0.029139782  -0.521859343  -0.001840282  -0.385315799
##       g_MG.l2       IPCA.l2 Selic.Over.l2         const
##   0.061890142   0.447229977  -0.001707570   0.006359073
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_MG.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_MG.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_MG.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.057209997   0.034882271   0.714400692   0.002144214  -0.048166923
##       g_MG.l2       IPCA.l2 Selic.Over.l2         const
##   0.019275732  -0.024858408  -0.001648398   0.001190188
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_MG.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_MG.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_MG.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.92956404   -0.67740518    3.78548915    0.43242143   -0.53966985
##       g_MG.l2       IPCA.l2 Selic.Over.l2         const
##    0.20422214    6.34723533    0.48439007    0.03862111
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_MG_pa, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_MG_pa
```

```
## Chi-squared = 106.22, df = 80, p-value = 0.02662
```

```r
arch.test(VAR_MG_pa, multivariate.only = FALSE)
```

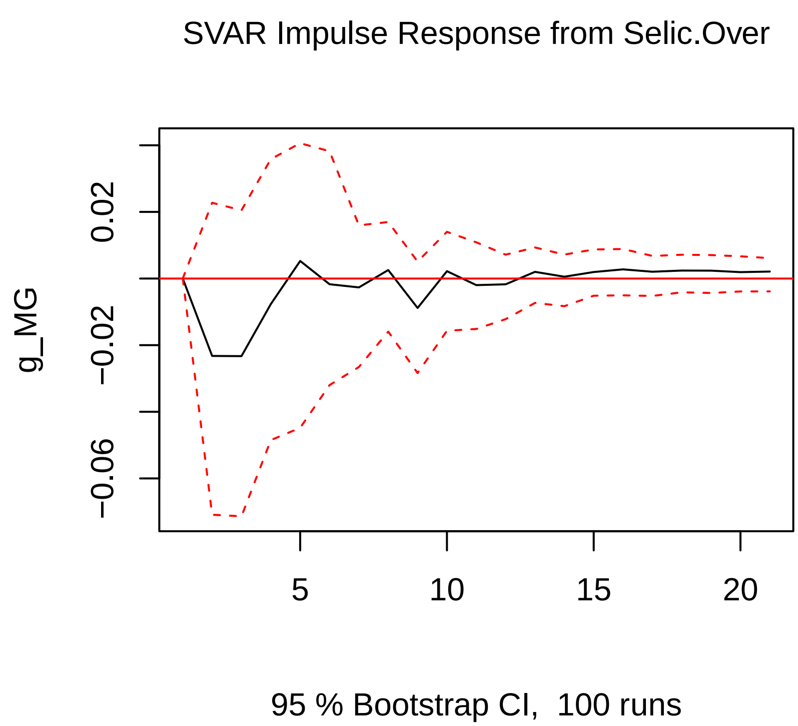
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 15.15, df = 16, p-value = 0.5137
##
##
## $g_MG
##
##  ARCH test (univariate)
##
## data:  Residual of g_MG equation
## Chi-squared = 43.392, df = 16, p-value = 0.0002438
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 18.851, df = 16, p-value = 0.2765
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 28.052, df = 16, p-value = 0.03117
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_MG_pa
## Chi-squared = 637.08, df = 500, p-value = 3.003e-05
```

```r
#Estimando o VAR Estrutural
SVAR_MG_pa <- SVAR(VAR_MG, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_MG_pa
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##               g_BR    g_MG    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_MG       0.04538 1.00000 0.00000          0
```

```
## IPCA       0.08830 0.08432 1.00000          0
## Selic.Over 0.08221 0.08265 0.09532          1
```

```r
#Função Impulso-Resposta
SVAR_MG_irf_pa <- irf(SVAR_MG_irf_pa, impulse = "Selic.Over", response = "g_MG", n.ahead=20, ortho = TRUE)
plot(SVAR_MG_irf_pa)
```




```r
#----------------Período Estendido - 01-12-2010 até 01-10-2023----------------#

lagselect_MG_pe <- VARselect(base_SVAR_final[107:261,c(1,7,15,16)],lag.max=10, type="both")
lagselect_MG_pe$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      1      4
```

```r
lagselect_MG_pe$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.050017e+01 -3.075930e+01 -3.077883e+01 -3.079478e+01 -3.069062e+01
## HQ(n)  -3.029997e+01 -3.042563e+01 -3.031169e+01 -3.019417e+01 -2.995655e+01
## SC(n)  -3.000747e+01 -2.993814e+01 -2.962919e+01 -2.931668e+01 -2.888405e+01
## FPE(n)  5.675802e-14  4.383140e-14  4.304998e-14  4.248485e-14  4.735176e-14
##                    6             7             8             9            10
## AIC(n) -3.068574e+01 -3.055348e+01 -3.047593e+01 -3.034331e+01 -3.026518e+01
## HQ(n)  -2.981820e+01 -2.955248e+01 -2.934145e+01 -2.907537e+01 -2.886377e+01
## SC(n)  -2.855070e+01 -2.808998e+01 -2.768395e+01 -2.722287e+01 -2.681627e+01
## FPE(n)  4.788088e-14  5.512122e-14  6.024448e-14  6.979394e-14  7.685151e-14
```

```r
#Estimando o VAR Reduzido
VAR_MG_pe <- VAR(base_SVAR_final[107:261,c(1,7,15,16)], p = lagselect_MG_pe$selection[1], season = NULL
VAR_MG_pe
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_MG.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_MG.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_MG.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.287149983   0.080667929   0.527965856  -0.002603362  -0.233669478
##       g_MG.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_MG.l3
##  -0.010127244  -0.307697212   0.022661657  -0.223689129   0.034798945
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_MG.l4       IPCA.l4
##  -0.246401672  -0.003940712  -0.128244415   0.035756131  -1.761851653
## Selic.Over.l4         const
##  -0.021457690   0.010547232
##
##
## Estimated coefficients for equation g_MG:
## =========================================
## Call:
## g_MG = g_BR.l1 + g_MG.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_MG.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_MG.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.032125138  -0.307825292   0.274214792  -0.042055380   0.122431132
##       g_MG.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_MG.l3
##  -0.296215092  -0.557636640   0.007068115  -0.009765088  -0.173789023
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_MG.l4       IPCA.l4
##  -0.240055004   0.026484745  -0.077065205  -0.011541343  -0.041412792
## Selic.Over.l4         const
##  -0.001276487   0.008012965
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_MG.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_MG.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_MG.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.006319149   0.003493220   0.570836946   0.001009775  -0.004437318
##       g_MG.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_MG.l3
##   0.006466788   0.043091787   0.006464847   0.006086877   0.001161908
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_MG.l4       IPCA.l4
##   0.023357644  -0.003253647   0.010745221  -0.006789763  -0.155014853
## Selic.Over.l4         const
##  -0.004648354   0.002767264
##
##
## Estimated coefficients for equation Selic.Over:
```

```
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_MG.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_MG.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_MG.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   -0.08406118    0.24186506    2.05726382    0.32562265   -0.08938701
##       g_MG.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_MG.l3
##    0.11325672    2.12179714    0.63678826   -0.33107215    0.32576550
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_MG.l4       IPCA.l4
##    4.06646482    0.32441335   -0.13684405    0.13942334    2.97673341
## Selic.Over.l4         const
##   -0.32064756   -0.02863560
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_MG_pe, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_MG_pe
## Chi-squared = 79.788, df = 80, p-value = 0.4857
```

```r
arch.test(VAR_MG_pe, multivariate.only = FALSE)
```

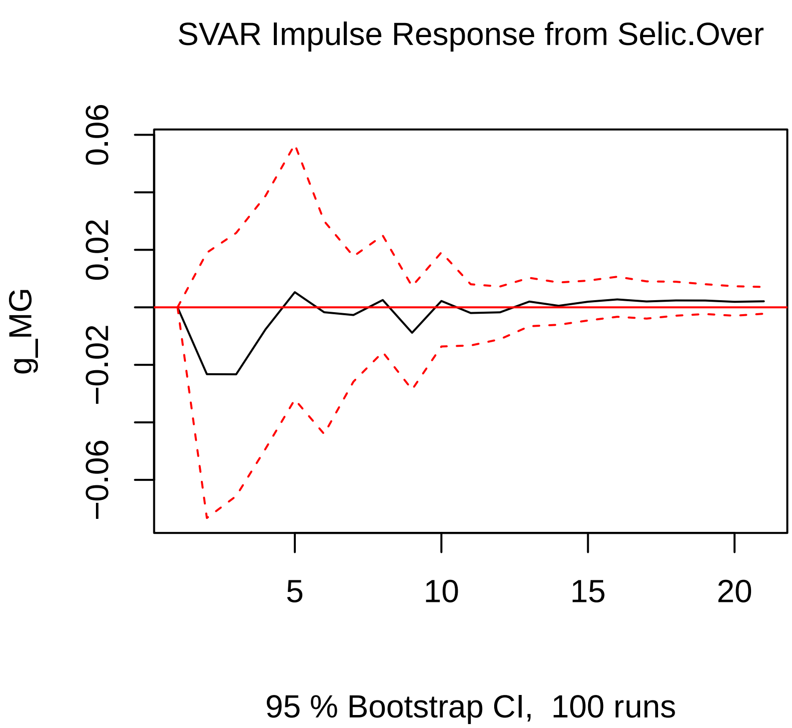
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 1.4746, df = 16, p-value = 1
##
##
## $g_MG
##
##  ARCH test (univariate)
##
## data:  Residual of g_MG equation
## Chi-squared = 12.789, df = 16, p-value = 0.6881
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 15.309, df = 16, p-value = 0.5022
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 33.255, df = 16, p-value = 0.006835
```

```
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_MG_pe
## Chi-squared = 573.04, df = 500, p-value = 0.01298
```

```r
#Estimando o VAR Estrutural
SVAR_MG_pe <- SVAR(VAR_MG, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_MG_pe
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                 g_BR    g_MG    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_MG       0.04538 1.00000 0.00000          0
## IPCA       0.08830 0.08432 1.00000          0
## Selic.Over 0.08221 0.08265 0.09532          1
```

```r
#Função Impulso-Resposta
SVAR_MG_irf_pe <- irf(SVAR_MG_pe, impulse = "Selic.Over", response = "g_MG", n.ahead=20, ortho = TRUE)
plot(SVAR_MG_irf_pe)
```



```r
############################################
################PARÁ#################
############################################
#Selecionando o Lag
lagselect_PA <- VARselect(base_SVAR_final[,c(1,8,15,16)],lag.max=10, type="both")
lagselect_PA$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```r
lagselect_PA$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -2.934605e+01 -2.962874e+01 -2.967198e+01 -2.974708e+01 -2.972076e+01
## HQ(n)  -2.921040e+01 -2.940265e+01 -2.935545e+01 -2.934011e+01 -2.922335e+01
## SC(n)  -2.900896e+01 -2.906691e+01 -2.888542e+01 -2.873580e+01 -2.848474e+01
## FPE(n)  1.799646e-13  1.356675e-13  1.299645e-13  1.206244e-13  1.239431e-13
##                     6             7             8             9            10
## AIC(n) -2.970480e+01 -2.963086e+01 -2.958638e+01 -2.957475e+01 -2.957826e+01
## HQ(n)  -2.911696e+01 -2.895259e+01 -2.881766e+01 -2.871560e+01 -2.862867e+01
## SC(n)  -2.824405e+01 -2.794539e+01 -2.767617e+01 -2.743982e+01 -2.721860e+01
## FPE(n)  1.260856e-13  1.359795e-13  1.424657e-13  1.445182e-13  1.444918e-13
```

```r
#Estimando o VAR Reduzido
VAR_PA <- VAR(base_SVAR_final[,c(1,8,15,16)], p = 5, season = NULL, exog = NULL, type = "const")
VAR_PA
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_PA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PA.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_PA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -7.089534e-02  5.396737e-02  2.624168e-01 -1.157779e-02 -1.764230e-01
##       g_PA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PA.l3
## -3.889560e-02 -1.270909e-01 -8.003035e-05 -8.150463e-02  3.567709e-02
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PA.l4       IPCA.l4
##  5.213703e-02 -1.088466e-02 -5.560210e-02 -2.498206e-02 -1.002077e+00
## Selic.Over.l4       g_BR.l5       g_PA.l5       IPCA.l5 Selic.Over.l5
##  9.695831e-03  7.419211e-03 -1.727783e-04  2.614368e-01  1.467607e-02
##         const
##  1.344332e-03
##
##
## Estimated coefficients for equation g_PA:
## =========================================
## Call:
## g_PA = g_BR.l1 + g_PA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PA.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_PA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  0.2072978317 -0.4812785571 -0.2091583638 -0.0359871891 -0.0083231214
```

```
##       g_PA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PA.l3
## -0.3372102122  0.0931379411  0.0015954355  0.2012123938 -0.3393622207
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PA.l4       IPCA.l4
## -0.9650298248  0.0464177156  0.0005224269 -0.2087379263  1.4407332936
## Selic.Over.l4       g_BR.l5       g_PA.l5       IPCA.l5 Selic.Over.l5
##  0.0289168202 -0.0552544720 -0.1122495322 -0.6046074104 -0.0245019692
##         const
## -0.0062634215
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_PA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PA.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_PA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0061088117 -0.0028368008  0.6551500583 -0.0003153420 -0.0014156640
##       g_PA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PA.l3
##  0.0001155601  0.0122856159  0.0043590514  0.0051455742 -0.0016890722
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PA.l4       IPCA.l4
##  0.0172855250  0.0010382257  0.0039659488  0.0021687949 -0.0129264041
## Selic.Over.l4       g_BR.l5       g_PA.l5       IPCA.l5 Selic.Over.l5
##  0.0021507979 -0.0086939355  0.0003876094 -0.1619842215 -0.0066514826
##         const
##  0.0019496621
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_PA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PA.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_PA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.120849362   0.028172805   2.549634828   0.331466980   0.033429468
##       g_PA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PA.l3
##   0.084276369   2.647851342   0.565391685   0.096923551   0.002512714
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PA.l4       IPCA.l4
##   3.408140353   0.384946680   0.095938764   0.027837992  -0.577738298
## Selic.Over.l4       g_BR.l5       g_PA.l5       IPCA.l5 Selic.Over.l5
##  -0.266579399   0.063723946   0.017960244   3.502202251  -0.073202725
##         const
##  -0.007643573
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_PA, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_PA
## Chi-squared = 95.935, df = 80, p-value = 0.1081
```

```r
arch.test(VAR_PA, multivariate.only = FALSE)
```

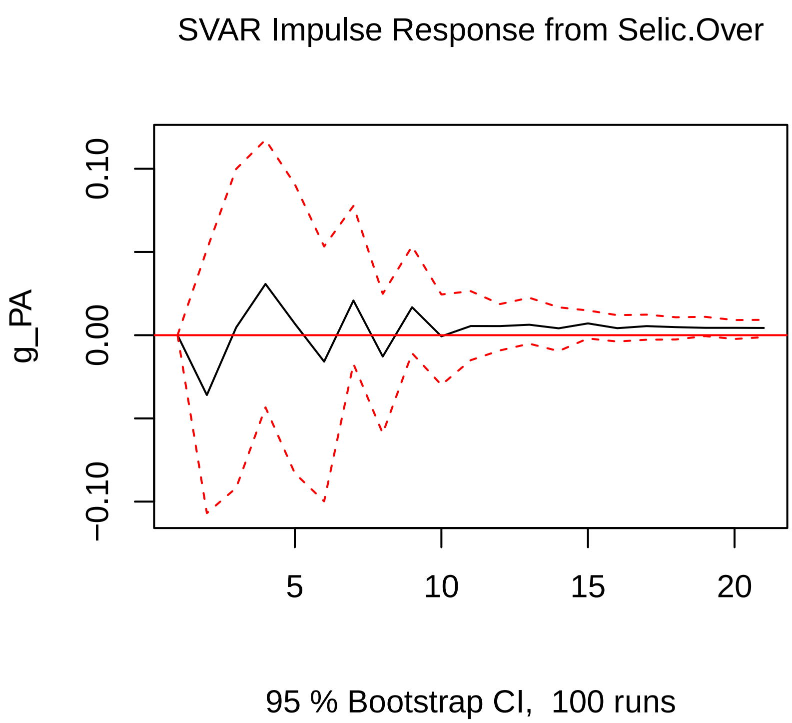
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 5.1579, df = 16, p-value = 0.9949
##
##
## $g_PA
##
##  ARCH test (univariate)
##
## data:  Residual of g_PA equation
## Chi-squared = 35.234, df = 16, p-value = 0.003692
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 18.509, df = 16, p-value = 0.295
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 56.449, df = 16, p-value = 2.051e-06
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_PA
## Chi-squared = 733.47, df = 500, p-value = 4.238e-11
```

```r
#Estimando o VAR Estrutural
SVAR_PA <- SVAR(VAR_PA, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_PA
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_PA    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_PA       0.07636 1.00000 0.00000          0
## IPCA       0.08969 0.07076 1.00000          0
```

```
## Selic.Over 0.07907 0.06113 0.09357          1
```

```r
#Função Impulso-Resposta
SVAR_PA_irf <- irf(SVAR_PA, impulse = "Selic.Over", response = "g_PA", n.ahead=20, ortho = TRUE)
plot(SVAR_PA_irf)
```




```r
###Comparando Diferentes Períodos###

#----------------Período dos Autores - 01-01-2002 até 01-11-2010----------------#

#Selecionando o Lag
lagselect_PA_pa <- VARselect(base_SVAR_final[1:106,c(1,8,15,16)],lag.max=10, type="both")
lagselect_PA_pa$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      5      1      1      5
```

```r
lagselect_PA_pa$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -3.148402e+01 -3.148906e+01 -3.143577e+01 -3.145904e+01 -3.154018e+01
## HQ(n)  -3.122489e+01 -3.105716e+01 -3.083112e+01 -3.068163e+01 -3.059000e+01
## SC(n)  -3.084294e+01 -3.042058e+01 -2.993990e+01 -2.953578e+01 -2.918952e+01
## FPE(n)  2.122979e-14  2.117357e-14  2.245207e-14  2.214675e-14  2.073337e-14
##                     6             7             8             9            10
## AIC(n) -3.144627e+01 -3.145068e+01 -3.132617e+01 -3.122753e+01 -3.126373e+01
## HQ(n)  -3.032334e+01 -3.015499e+01 -2.985772e+01 -2.958632e+01 -2.944977e+01
## SC(n)  -2.866823e+01 -2.824524e+01 -2.769334e+01 -2.716731e+01 -2.677612e+01
```

```
## FPE(n)  2.328801e-14  2.391738e-14  2.824378e-14  3.292287e-14  3.406002e-14
```

```r
#Estimando o VAR Reduzido
VAR_PA_pa <- VAR(base_SVAR_final[1:106,c(1,8,15,16)], p = 5, season = NULL, exog = NULL, type = "const")
VAR_PA_pa
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_PA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PA.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_PA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  0.2393770513  0.0486380187  0.0399869732 -0.0255721558 -0.0624886900
##       g_PA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PA.l3
## -0.0908283755 -0.0244877880 -0.0090514094  0.0463271238 -0.0677994607
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PA.l4       IPCA.l4
##  0.5266543852 -0.0004905052  0.0743393146 -0.0774858442 -0.1410536932
## Selic.Over.l4       g_BR.l5       g_PA.l5       IPCA.l5 Selic.Over.l5
##  0.0207753716 -0.0341941703 -0.0701340163  0.1396104647  0.0112644439
##         const
##  0.0033516995
##
##
## Estimated coefficients for equation g_PA:
## =========================================
## Call:
## g_PA = g_BR.l1 + g_PA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PA.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_PA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.366398002  -0.491849628   0.182355811  -0.043888771  -0.091232795
##       g_PA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PA.l3
##  -0.277454605   1.881583252  -0.021061325   0.008859302  -0.297923122
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PA.l4       IPCA.l4
##  -1.910993312   0.068475609   0.522920827  -0.145887480   1.968505757
## Selic.Over.l4       g_BR.l5       g_PA.l5       IPCA.l5 Selic.Over.l5
##   0.013369438   0.503513336  -0.067343372  -0.574878389  -0.008976589
##         const
##  -0.010251707
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_PA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PA.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_PA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  0.0114465580 -0.0021262237  0.8225949804 -0.0014083083 -0.0071232394
##       g_PA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PA.l3
## -0.0316741984  0.0168763688  0.0033663995  0.0284674523 -0.0065637041
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PA.l4       IPCA.l4
## -0.1621640582  0.0022547414 -0.0042347741 -0.0002989588  0.2321827123
```

```
## Selic.Over.l4       g_BR.l5       g_PA.l5       IPCA.l5 Selic.Over.l5
##  0.0052068377 -0.0002803578 -0.0024115391 -0.3228875435 -0.0079083880
##         const
##  0.0005973522
##
##
## Estimated coefficients for equation Selic.Over:
## ==============================================
## Call:
## Selic.Over = g_BR.l1 + g_PA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PA.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_PA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.31487374   -0.36523298    3.38061254    0.34715761   -0.10380490
##       g_PA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PA.l3
##    0.03360377    4.97128747    0.47348033    0.22532586   -0.11866024
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PA.l4       IPCA.l4
##    3.20186074    0.38409204    0.20835814    0.30127133   -4.70444136
## Selic.Over.l4       g_BR.l5       g_PA.l5       IPCA.l5 Selic.Over.l5
##   -0.26595928    0.53093809   -0.01634056    7.56209971   -0.05061457
##         const
##    0.04707996
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_PA_pa, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_PA_pa
## Chi-squared = 102.79, df = 80, p-value = 0.04399
```

```r
arch.test(VAR_PA_pa, multivariate.only = FALSE)
```

```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 12.042, df = 16, p-value = 0.7411
##
##
## $g_PA
##
##  ARCH test (univariate)
##
## data:  Residual of g_PA equation
## Chi-squared = 19.89, df = 16, p-value = 0.2252
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
```

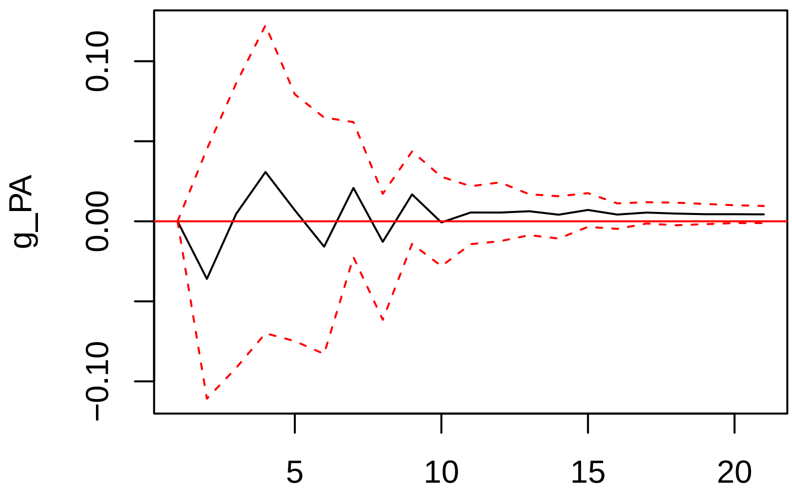
```
## Chi-squared = 11.829, df = 16, p-value = 0.7556
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 20.644, df = 16, p-value = 0.1926
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_PA_pa
## Chi-squared = 565.67, df = 500, p-value = 0.02205
```

```r
#Estimando o VAR Estrutural
SVAR_PA_pa <- SVAR(VAR_PA, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_PA_pa
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_PA    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_PA       0.07636 1.00000 0.00000          0
## IPCA       0.08969 0.07076 1.00000          0
## Selic.Over 0.07907 0.06113 0.09357          1
```

```r
#Função Impulso-Resposta
SVAR_PA_irf_pa <- irf(SVAR_PA_pa, impulse = "Selic.Over", response = "g_PA", n.ahead=20, ortho = TRUE)
plot(SVAR_PA_irf_pa)
```

SVAR Impulse Response from Selic.Over



95 % Bootstrap CI, 100 runs

```
#----------------Período Estendido - 01-12-2010 até 01-10-2023----------------#

lagselect_PA_pe <- VARselect(base_SVAR_final[107:261,c(1,8,15,16)],lag.max=10, type="both")
lagselect_PA_pe$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      1      4
```

```
lagselect_PA_pe$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -2.859921e+01 -2.885297e+01 -2.890058e+01 -2.893791e+01 -2.884384e+01
## HQ(n)  -2.839901e+01 -2.851930e+01 -2.843345e+01 -2.833731e+01 -2.810977e+01
## SC(n)  -2.810651e+01 -2.803180e+01 -2.775095e+01 -2.745981e+01 -2.703727e+01
## FPE(n)  3.798434e-13  2.949146e-13  2.816332e-13  2.720584e-13  3.001806e-13
##                    6             7             8             9            10
## AIC(n) -2.881700e+01 -2.872291e+01 -2.860125e+01 -2.854960e+01 -2.850612e+01
## HQ(n)  -2.794947e+01 -2.772191e+01 -2.746677e+01 -2.728166e+01 -2.710472e+01
## SC(n)  -2.668197e+01 -2.625941e+01 -2.580927e+01 -2.542916e+01 -2.505722e+01
## FPE(n)  3.102723e-13  3.438155e-13  3.927178e-13  4.195814e-13  4.462732e-13
```

```
#Estimando o VAR Reduzido
VAR_PA_pe <- VAR(base_SVAR_final[107:261,c(1,8,15,16)], p = lagselect_PA_pe$selection[1], season = NULL
VAR_PA_pe
```

```
##
## VAR Estimation Results:
## ========================
```

```
##
## Estimated coefficients for equation g_BR:
## ==========================================
## Call:
## g_BR = g_BR.l1 + g_PA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PA.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_PA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.199378982   0.058091214   0.282444184   0.000331353  -0.273633027
##       g_PA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PA.l3
##  -0.027828922   0.048426894   0.018921616  -0.173161032   0.043233710
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PA.l4       IPCA.l4
##  -0.431312232  -0.004851350  -0.121294856  -0.019595052  -1.716840661
## Selic.Over.l4         const
##  -0.020685174   0.011225429
##
##
## Estimated coefficients for equation g_PA:
## ==========================================
## Call:
## g_PA = g_BR.l1 + g_PA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PA.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_PA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.234671951  -0.481793157  -0.784450708  -0.048011419  -0.016395421
##       g_PA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PA.l3
##  -0.335719077  -0.738462795   0.001705441   0.237383797  -0.315717789
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PA.l4       IPCA.l4
##  -0.606165035   0.016019952  -0.152007220  -0.161542319   1.607946550
## Selic.Over.l4         const
##   0.052428572  -0.008706611
##
##
## Estimated coefficients for equation IPCA:
## ==========================================
## Call:
## IPCA = g_BR.l1 + g_PA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PA.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_PA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0059914836 -0.0031537589  0.5810208754  0.0005436530  0.0016042036
##       g_PA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PA.l3
##  0.0029637707  0.0208859065  0.0065861048  0.0044609536 -0.0007227287
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PA.l4       IPCA.l4
##  0.0398457242 -0.0031598982  0.0069232821  0.0026802199 -0.1499600213
## Selic.Over.l4         const
## -0.0044386624  0.0027466405
##
##
## Estimated coefficients for equation Selic.Over:
## ================================================
## Call:
## Selic.Over = g_BR.l1 + g_PA.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PA.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_PA.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.03533968    0.06002390    2.25693249    0.32976136   -0.04939389
##       g_PA.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PA.l3
```

```
##    0.08107839    2.19321625    0.63507412   -0.08638775    0.01852346
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PA.l4       IPCA.l4
##    3.59618570    0.32423880   -0.05321357   -0.01128235    3.06340821
## Selic.Over.l4         const
##   -0.32633269   -0.02609435
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_PA_pe, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_PA_pe
## Chi-squared = 91.142, df = 80, p-value = 0.1854
```

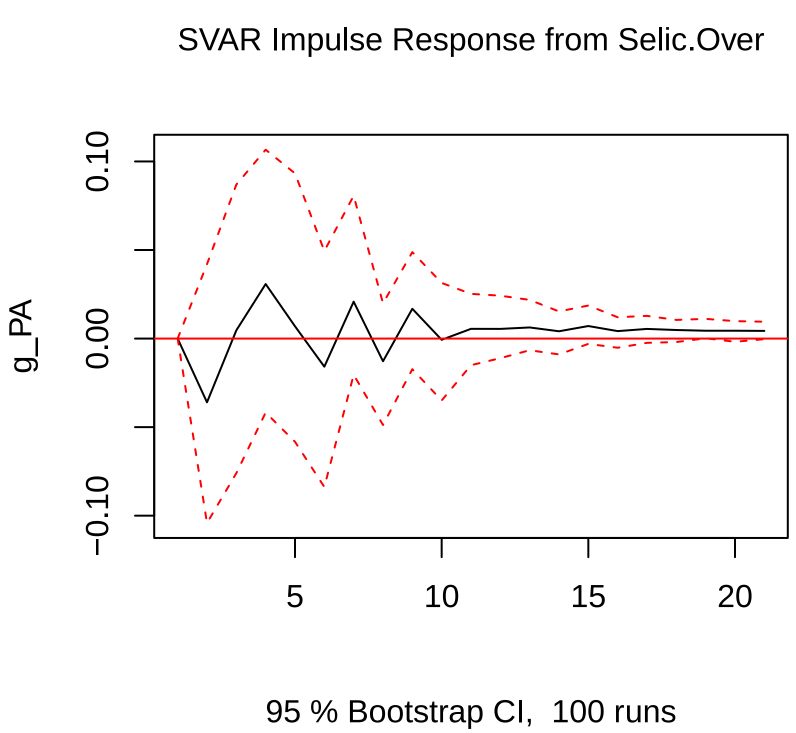
```r
arch.test(VAR_PA_pe, multivariate.only = FALSE)
```

```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 1.4872, df = 16, p-value = 1
##
##
## $g_PA
##
##  ARCH test (univariate)
##
## data:  Residual of g_PA equation
## Chi-squared = 24.108, df = 16, p-value = 0.08718
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 13.558, df = 16, p-value = 0.6316
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 34.256, df = 16, p-value = 0.005017
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_PA_pe
## Chi-squared = 623.37, df = 500, p-value = 0.0001359
```

```r
#Estimando o VAR Estrutural
SVAR_PA_pe <- SVAR(VAR_PA, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_PA
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                 g_BR    g_PA    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_PA       0.07636 1.00000 0.00000          0
## IPCA       0.08969 0.07076 1.00000          0
## Selic.Over 0.07907 0.06113 0.09357          1
```

```r
#Função Impulso-Resposta
SVAR_PA_irf_pe <- irf(SVAR_PA, impulse = "Selic.Over", response = "g_PA", n.ahead=20, ortho = TRUE)
plot(SVAR_PA_irf_pe)
```




```r
############################################
################PERNAMBUCO#################
############################################
#Selecionando o Lag
lagselect_PE <- VARselect(base_SVAR_final[,c(1,9,15,16)],lag.max=10, type="both")
lagselect_PE$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```r
lagselect_PE$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.018659e+01 -3.045924e+01 -3.046920e+01 -3.055885e+01 -3.055653e+01
## HQ(n)  -3.005093e+01 -3.023315e+01 -3.015267e+01 -3.015188e+01 -3.005912e+01
## SC(n)  -2.984949e+01 -2.989742e+01 -2.968264e+01 -2.954756e+01 -2.932051e+01
## FPE(n)  7.765126e-14  5.912787e-14  5.855944e-14  5.356600e-14  5.373440e-14
##                    6             7             8             9            10
## AIC(n) -3.053017e+01 -3.046770e+01 -3.041906e+01 -3.040510e+01 -3.035254e+01
## HQ(n)  -2.994233e+01 -2.978942e+01 -2.965034e+01 -2.954595e+01 -2.940295e+01
## SC(n)  -2.906942e+01 -2.878222e+01 -2.850885e+01 -2.827017e+01 -2.799288e+01
## FPE(n)  5.523472e-14  5.888998e-14  6.195583e-14  6.299497e-14  6.661581e-14
```

```r
#Estimando o VAR Reduzido
VAR_PE <- VAR(base_SVAR_final[,c(1,9,15,16)], p = 5, season = NULL, exog = NULL, type = "const")
VAR_PE
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_PE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PE.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_PE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.1284131056  0.0334205059  0.4299914229 -0.0097303919 -0.1845177257
##       g_PE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PE.l3
##  0.0527283107 -0.3856028669 -0.0060278857 -0.0815784215 -0.0301516818
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PE.l4       IPCA.l4
##  0.2703650784 -0.0057965489 -0.0832182280  0.0456910786 -1.3396436314
## Selic.Over.l4       g_BR.l5       g_PE.l5       IPCA.l5 Selic.Over.l5
##  0.0063724683 -0.0167175440  0.0131323545  0.5509092948  0.0171135102
##         const
##  0.0009013208
##
##
## Estimated coefficients for equation g_PE:
## =========================================
## Call:
## g_PE = g_BR.l1 + g_PE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PE.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_PE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.116034289  -0.152501690  -0.362670884  -0.031618602   0.030709296
##       g_PE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PE.l3
##  -0.151628612   1.947688788   0.021630843   0.048010276  -0.203759177
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PE.l4       IPCA.l4
##  -0.518056017   0.015795040   0.010142202  -0.115919110  -2.741457011
## Selic.Over.l4       g_BR.l5       g_PE.l5       IPCA.l5 Selic.Over.l5
##  -0.016944413  -0.079587697   0.013716535   0.923391665   0.012446728
##         const
```

```
##   0.003778441
##
##
## Estimated coefficients for equation IPCA:
## ==========================================
## Call:
## IPCA = g_BR.l1 + g_PE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PE.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_PE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0014212831 -0.0042831614  0.6504590907 -0.0006207946 -0.0031120882
##       g_PE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PE.l3
## -0.0003228020  0.0129069280  0.0042832874  0.0131044229 -0.0067717044
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PE.l4       IPCA.l4
##  0.0341046066  0.0014270014  0.0098841627 -0.0081667156 -0.0119338214
## Selic.Over.l4       g_BR.l5       g_PE.l5       IPCA.l5 Selic.Over.l5
##  0.0023995004 -0.0024416595 -0.0074876093 -0.1681946327 -0.0069444002
##         const
##  0.0019600817
##
##
## Estimated coefficients for equation Selic.Over:
## ================================================
## Call:
## Selic.Over = g_BR.l1 + g_PE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PE.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_PE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.262363877  -0.066712991   2.488702231   0.327765044   0.076270937
##       g_PE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PE.l3
##  -0.039760966   2.465957531   0.558518612   0.345010574  -0.265396873
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PE.l4       IPCA.l4
##   4.126120255   0.394707908   0.146330342  -0.064366327  -1.032018603
## Selic.Over.l4       g_BR.l5       g_PE.l5       IPCA.l5 Selic.Over.l5
##  -0.271178840   0.288698274  -0.249028829   3.838635452  -0.067554514
##         const
##  -0.008653178
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_PE, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_PE
## Chi-squared = 101.69, df = 80, p-value = 0.05136
```

```r
arch.test(VAR_PE, multivariate.only = FALSE)
```

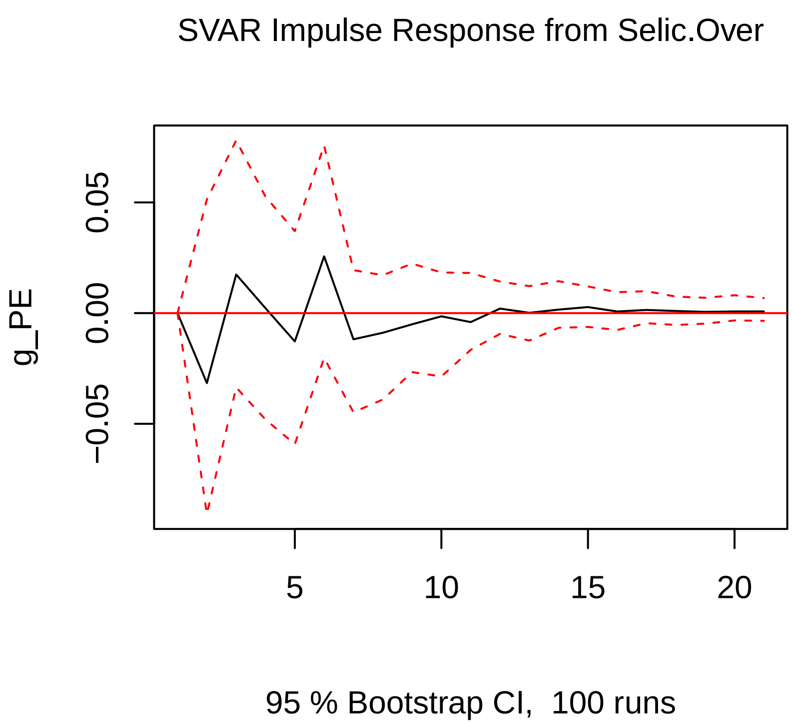
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 4.4084, df = 16, p-value = 0.998
##
```

```
##
## $g_PE
##
##  ARCH test (univariate)
##
## data:  Residual of g_PE equation
## Chi-squared = 18.425, df = 16, p-value = 0.2996
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 22.714, df = 16, p-value = 0.1216
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 58.422, df = 16, p-value = 9.631e-07
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_PE
## Chi-squared = 621.57, df = 500, p-value = 0.0001645
```

```r
#Estimando o VAR Estrutural
SVAR_PE <- SVAR(VAR_PE, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_PE
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##               g_BR    g_PE    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_PE       0.05066 1.00000 0.00000          0
## IPCA       0.08814 0.07816 1.00000          0
## Selic.Over 0.07911 0.04977 0.09272          1
```

```r
#Função Impulso-Resposta
SVAR_PE_irf <- irf(SVAR_PE, impulse = "Selic.Over", response = "g_PE", n.ahead=20, ortho = TRUE)
plot(SVAR_PE_irf)
```




```r
###Comparando Diferentes Períodos###

#----------------Período dos Autores - 01-01-2002 até 01-11-2010----------------#

#Selecionando o Lag
lagselect_PE_pa <- VARselect(base_SVAR_final[1:106,c(1,9,15,16)],lag.max=10, type="both")
lagselect_PE_pa$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      9      1      1      5
```

```r
lagselect_PE_pa$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -3.159450e+01 -3.174551e+01 -3.170849e+01 -3.174826e+01 -3.182212e+01
## HQ(n)  -3.133536e+01 -3.131361e+01 -3.110384e+01 -3.097085e+01 -3.087195e+01
## SC(n)  -3.095341e+01 -3.067703e+01 -3.021262e+01 -2.982500e+01 -2.947147e+01
## FPE(n)  1.900935e-14  1.638395e-14  1.709289e-14  1.658455e-14  1.563956e-14
##                     6             7             8             9            10
## AIC(n) -3.182748e+01 -3.179637e+01 -3.176336e+01 -3.189849e+01 -3.185799e+01
## HQ(n)  -3.070455e+01 -3.050068e+01 -3.029491e+01 -3.025728e+01 -3.004403e+01
## SC(n)  -2.904944e+01 -2.859093e+01 -2.813053e+01 -2.783827e+01 -2.737038e+01
## FPE(n)  1.590654e-14  1.692712e-14  1.824123e-14  1.683080e-14  1.880014e-14
```

```r
#Estimando o VAR Reduzido
VAR_PE_pa <- VAR(base_SVAR_final[1:106,c(1,9,15,16)], p = 3, season = NULL, exog = NULL, type = "const")
VAR_PE_pa
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_PE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PE.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##        g_BR.l1       g_PE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.251721886   0.033233885   0.170761219  -0.022620519  -0.027826867
##        g_PE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PE.l3
##   -0.013677120  -0.232730498   0.002772174  -0.015667082  -0.044270653
##        IPCA.l3 Selic.Over.l3         const
##    0.249219519   0.016118540   0.005358368
##
##
## Estimated coefficients for equation g_PE:
## =========================================
## Call:
## g_PE = g_BR.l1 + g_PE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PE.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##        g_BR.l1       g_PE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   -0.232207223  -0.195653952  -0.068804387  -0.025705662   0.617437004
##        g_PE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PE.l3
##   -0.270868965   1.455937839   0.009343999   0.014332835  -0.052602565
##        IPCA.l3 Selic.Over.l3         const
##   -2.025069034   0.018601008   0.003054977
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_PE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PE.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##        g_BR.l1       g_PE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.0049776908 -0.0131282926  0.7614830769  0.0022039261 -0.0307961823
##        g_PE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PE.l3
##   0.0018699060 -0.0081621664 -0.0009878786  0.0268661186  0.0058998520
##        IPCA.l3 Selic.Over.l3         const
## -0.0732344039 -0.0005177777  0.0008620950
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_PE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PE.l2 + IPCA.l2 + Selic.Over.l
##
##        g_BR.l1       g_PE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    -0.09757821    0.04907219    3.80727938    0.30906862   -0.17528118
##        g_PE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PE.l3
##    -0.47521754    4.53875371    0.39823725    0.44044065   -0.02839344
##        IPCA.l3 Selic.Over.l3         const
##     5.19124399    0.19714347    0.03267045
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_PE_pa, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_PE_pa
## Chi-squared = 115.06, df = 80, p-value = 0.006253
```

```r
arch.test(VAR_PE_pa, multivariate.only = FALSE)
```

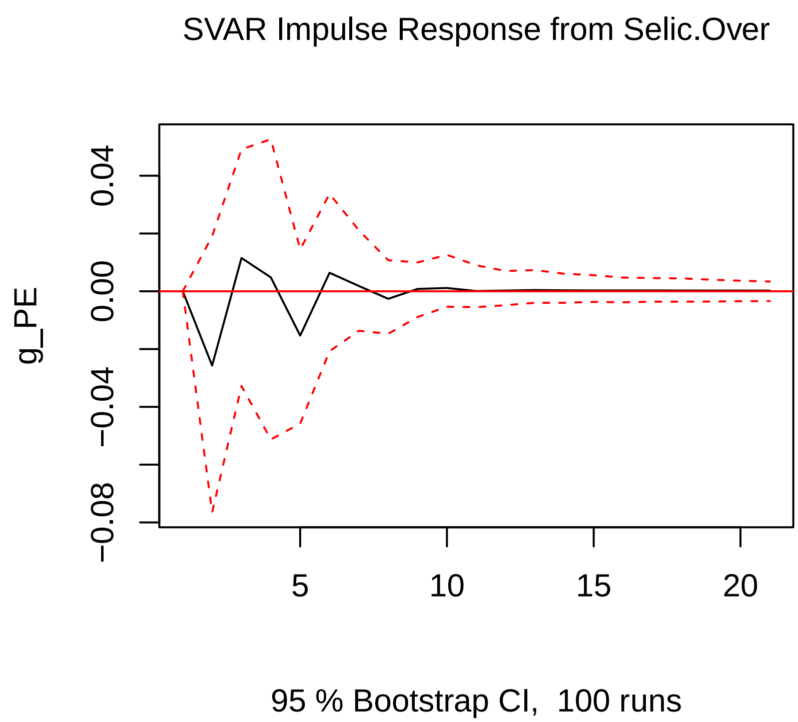
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 11.923, df = 16, p-value = 0.7493
##
##
## $g_PE
##
##  ARCH test (univariate)
##
## data:  Residual of g_PE equation
## Chi-squared = 18.756, df = 16, p-value = 0.2815
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 14.405, df = 16, p-value = 0.5686
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 23.464, df = 16, p-value = 0.1019
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_PE_pa
## Chi-squared = 545.09, df = 500, p-value = 0.07985
```

```r
#Estimando o VAR Estrutural
SVAR_PE_pa <- SVAR(VAR_PE_pa, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_PE_pa
```

```
##
```

```
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                 g_BR    g_PE    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_PE       0.08597 1.00000 0.00000          0
## IPCA       0.09520 0.09004 1.00000          0
## Selic.Over 0.09530 0.04662 0.09136          1
```

```
#Função Impulso-Resposta
SVAR_PE_irf_pa <- irf(SVAR_PE_pa, impulse = "Selic.Over", response = "g_PE", n.ahead=20, ortho = TRUE)
plot(SVAR_PE_irf_pa)
```




```
#---------------Período Estendido - 01-12-2010 até 01-10-2023---------------#

lagselect_PE_pe <- VARselect(base_SVAR_final[107:261,c(1,9,15,16)],lag.max=10, type="both")
lagselect_PE_pe$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      1      4
```

```
lagselect_PE_pe$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -2.966712e+01 -2.988362e+01 -2.993014e+01 -3.000555e+01 -2.992359e+01
## HQ(n)  -2.946692e+01 -2.954996e+01 -2.946300e+01 -2.940495e+01 -2.918952e+01
```

```
## SC(n)  -2.917442e+01 -2.906246e+01 -2.878050e+01 -2.852745e+01 -2.811702e+01
## FPE(n)  1.305618e-13  1.052175e-13  1.005901e-13  9.353853e-14  1.019656e-13
##                    6             7             8             9            10
## AIC(n) -2.993758e+01 -2.989319e+01 -2.984894e+01 -2.975866e+01 -2.968033e+01
## HQ(n)  -2.907005e+01 -2.889219e+01 -2.871447e+01 -2.849072e+01 -2.827892e+01
## SC(n)  -2.780255e+01 -2.742969e+01 -2.705697e+01 -2.663823e+01 -2.623142e+01
## FPE(n)  1.011768e-13  1.066792e-13  1.127752e-13  1.252347e-13  1.379271e-13
```

```
#Estimando o VAR Reduzido
VAR_PE_pe <- VAR(base_SVAR_final[107:261,c(1,9,15,16)], p = lagselect_PE_pe$selection[1], season = NULL
VAR_PE_pe
```

```
##
## VAR Estimation Results:
## ========================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_PE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PE.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_PE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.303807485   0.075709840   0.446751206   0.006135358  -0.324342904
##       g_PE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PE.l3
##   0.088027462  -0.365984215   0.012207724  -0.186682588  -0.010399024
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PE.l4       IPCA.l4
##  -0.258725266   0.002957653  -0.187508422   0.092879252  -1.978411832
## Selic.Over.l4         const
##  -0.026480430   0.011932607
##
##
## Estimated coefficients for equation g_PE:
## =========================================
## Call:
## g_PE = g_BR.l1 + g_PE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PE.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_PE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.238471200  -0.103326838  -0.646914284  -0.010583233  -0.220370068
##       g_PE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PE.l3
##  -0.050518852   2.262827346   0.010070768  -0.017990069  -0.235365143
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PE.l4       IPCA.l4
##   0.086944494   0.003401182  -0.126589608  -0.047730551  -3.626541707
## Selic.Over.l4         const
##  -0.009763885   0.013324243
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_PE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PE.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_PE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.004577187   0.001994150   0.564886128   0.001603556  -0.002923916
##       g_PE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PE.l3
##   0.005820527   0.031972289   0.005719808   0.016960262  -0.010844246
```

```
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PE.l4       IPCA.l4
##   0.056359539  -0.003005818   0.007860075  -0.002139233  -0.174075261
## Selic.Over.l4         const
##  -0.004722259   0.002774125
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_PE.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PE.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_PE.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.22292688   -0.18296588    2.41435666    0.35740147   -0.11498468
##       g_PE.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PE.l3
##    0.11415618    1.44856427    0.60621204    0.04604560   -0.14661668
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PE.l4       IPCA.l4
##    4.70433165    0.32236610   -0.04083411   -0.02734451    2.36604055
## Selic.Over.l4         const
##   -0.32178095   -0.02590087
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_PE_pe, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_PE_pe
## Chi-squared = 101.2, df = 80, p-value = 0.05487
```

```r
arch.test(VAR_PE_pe, multivariate.only = FALSE)
```

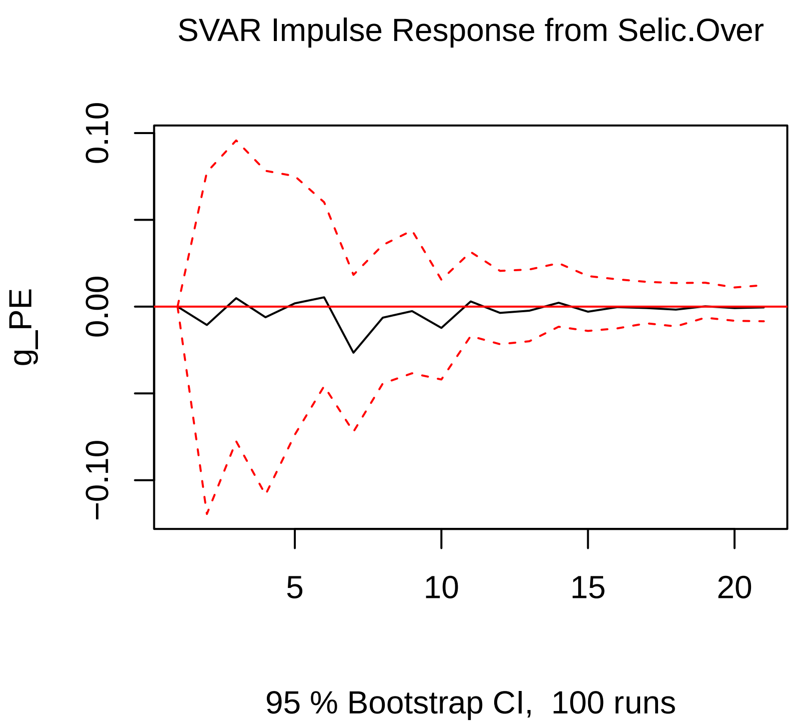
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 1.1251, df = 16, p-value = 1
##
##
## $g_PE
##
##  ARCH test (univariate)
##
## data:  Residual of g_PE equation
## Chi-squared = 8.1258, df = 16, p-value = 0.945
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 13.971, df = 16, p-value = 0.6009
##
```

```
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 31.864, df = 16, p-value = 0.01041
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_PE_pe
## Chi-squared = 586.68, df = 500, p-value = 0.004425
```

```
#Estimando o VAR Estrutural
SVAR_PE_pe <- SVAR(VAR_PE_pe, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_PE_pe
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_PE    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_PE       0.03319 1.00000 0.00000          0
## IPCA       0.08536 0.07220 1.00000          0
## Selic.Over 0.07600 0.03782 0.09375          1
```

```
#Função Impulso-Resposta
SVAR_PE_irf_pe <- irf(SVAR_PE_pe, impulse = "Selic.Over", response = "g_PE", n.ahead=20, ortho = TRUE)
plot(SVAR_PE_irf_pe)
```




```r
###########################################
################PARANÁ################
###########################################
#Selecionando o Lag
lagselect_PR <- VARselect(base_SVAR_final[,c(1,10,15,16)],lag.max=10, type="both")
lagselect_PR$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```r
lagselect_PR$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -2.993834e+01 -3.025245e+01 -3.028591e+01 -3.035540e+01 -3.034793e+01
## HQ(n)  -2.980268e+01 -3.002636e+01 -2.996938e+01 -2.994843e+01 -2.985053e+01
## SC(n)  -2.960124e+01 -2.969062e+01 -2.949936e+01 -2.934411e+01 -2.911192e+01
## FPE(n)  9.953151e-14  7.271120e-14  7.033899e-14  6.565185e-14  6.619769e-14
##                     6             7             8             9            10
## AIC(n) -3.030269e+01 -3.023454e+01 -3.018146e+01 -3.016588e+01 -3.014876e+01
## HQ(n)  -2.971485e+01 -2.955626e+01 -2.941275e+01 -2.930673e+01 -2.919918e+01
## SC(n)  -2.884195e+01 -2.854906e+01 -2.827126e+01 -2.803095e+01 -2.778910e+01
## FPE(n)  6.934308e-14  7.435360e-14  7.857218e-14  8.001981e-14  8.167277e-14
```

```r
#Estimando o VAR Reduzido
VAR_PR <- VAR(base_SVAR_final[,c(1,10,15,16)], p = 5, season = NULL, exog = NULL, type = "const")
VAR_PR
```

```
##
```

```
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_PR.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PR.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_PR.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.071886310  -0.028902364   0.386307991  -0.007379030  -0.082075768
##       g_PR.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PR.l3
##  -0.047616917  -0.392023931  -0.004074030  -0.132100207   0.007043595
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PR.l4       IPCA.l4
##   0.287241254  -0.012250825  -0.105813389   0.049468032  -0.979937676
## Selic.Over.l4       g_BR.l5       g_PR.l5       IPCA.l5 Selic.Over.l5
##   0.006824974  -0.043344669   0.037500425   0.109817181   0.019216131
##         const
##   0.001179077
##
##
## Estimated coefficients for equation g_PR:
## =========================================
## Call:
## g_PR = g_BR.l1 + g_PR.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PR.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_PR.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.022186066  -0.400376679   0.209597804  -0.001762904   0.051168279
##       g_PR.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PR.l3
##  -0.278284432   2.774930070  -0.050350549   0.242197922  -0.200571728
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PR.l4       IPCA.l4
##  -0.572624463   0.026223741   0.027599625  -0.093884638  -3.756331775
## Selic.Over.l4       g_BR.l5       g_PR.l5       IPCA.l5 Selic.Over.l5
##   0.031236602   0.067802587  -0.020801236   1.541294882  -0.008513584
##         const
##   0.005498779
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_PR.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PR.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_PR.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0066608569  0.0009384339  0.6522096218 -0.0005623772 -0.0106820538
##       g_PR.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PR.l3
##  0.0051335453  0.0269593124  0.0044224580  0.0086093987  0.0006159340
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PR.l4       IPCA.l4
##  0.0010837506  0.0011142527  0.0027274793  0.0006882098 -0.0206994336
## Selic.Over.l4       g_BR.l5       g_PR.l5       IPCA.l5 Selic.Over.l5
##  0.0025485507 -0.0149262223  0.0042607020 -0.1506092737 -0.0069464725
##         const
##  0.0019352108
##
##
```

```
## Estimated coefficients for equation Selic.Over:
## ==============================================
## Call:
## Selic.Over = g_BR.l1 + g_PR.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PR.l2 + IPCA.l2 + Selic.Over.l
##
##        g_BR.l1       g_PR.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.012749394   0.093861551   2.606354747   0.326977355   0.038208689
##        g_PR.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PR.l3
##    0.033471185   2.775746664   0.563955889   0.175673150  -0.024165234
##        IPCA.l3 Selic.Over.l3       g_BR.l4       g_PR.l4       IPCA.l4
##    2.886266583   0.388714482   0.064094426   0.005539290  -0.444125471
## Selic.Over.l4       g_BR.l5       g_PR.l5       IPCA.l5 Selic.Over.l5
##   -0.264478304  -0.038343169   0.078898249   3.847654794  -0.072508572
##          const
##   -0.008817606
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_PR, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_PR
## Chi-squared = 105.96, df = 80, p-value = 0.02765
```

```r
arch.test(VAR_PR, multivariate.only = FALSE)
```

```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 4.8741, df = 16, p-value = 0.9963
##
##
## $g_PR
##
##  ARCH test (univariate)
##
## data:  Residual of g_PR equation
## Chi-squared = 6.6008, df = 16, p-value = 0.9802
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 19.184, df = 16, p-value = 0.2592
##
##
## $Selic.Over
##
##  ARCH test (univariate)
```

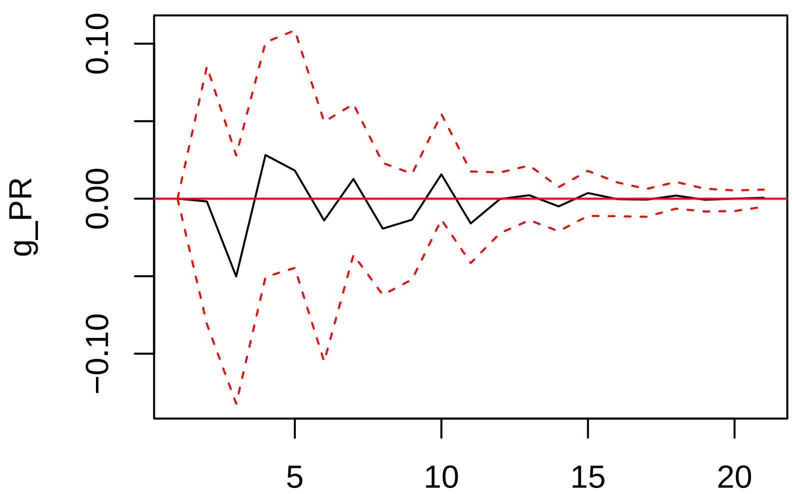
```
##
## data:  Residual of Selic.Over equation
## Chi-squared = 60.547, df = 16, p-value = 4.232e-07
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_PR
## Chi-squared = 664.91, df = 500, p-value = 1.006e-06
```

```r
#Estimando o VAR Estrutural
SVAR_PR <- SVAR(VAR_PR, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_PR
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_PR    IPCA Selic.Over
## g_BR       1.000000 0.00000 0.00000          0
## g_PR       0.009055 1.00000 0.00000          0
## IPCA       0.084790 0.06688 1.00000          0
## Selic.Over 0.075781 0.03214 0.09107          1
```

```r
#Função Impulso-Resposta
SVAR_PR_irf <- irf(SVAR_PR, impulse = "Selic.Over", response = "g_PR", n.ahead=20, ortho = TRUE)
plot(SVAR_PR_irf)
```

SVAR Impulse Response from Selic.Over



95 % Bootstrap CI, 100 runs

```
###Comparando Diferentes Períodos###

#----------------Período dos Autores - 01-01-2002 até 01-11-2010----------------#

#Selecionando o Lag
lagselect_PR_pa <- VARselect(base_SVAR_final[1:106,c(1,10,15,16)],lag.max=10, type="both")
lagselect_PR_pa$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##     10      1      1      2
```

```
lagselect_PR_pa$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -3.089257e+01 -3.095871e+01 -3.082245e+01 -3.077642e+01 -3.082884e+01
## HQ(n)  -3.063344e+01 -3.052682e+01 -3.021779e+01 -2.999901e+01 -2.987867e+01
## SC(n)  -3.025149e+01 -2.989023e+01 -2.932658e+01 -2.885316e+01 -2.847819e+01
## FPE(n)  3.835385e-14  3.598482e-14  4.145908e-14  4.382986e-14  4.222778e-14
##                     6             7             8             9            10
## AIC(n) -3.076554e+01 -3.071027e+01 -3.073840e+01 -3.086437e+01 -3.096780e+01
## HQ(n)  -2.964261e+01 -2.941458e+01 -2.926995e+01 -2.922316e+01 -2.915383e+01
## SC(n)  -2.798750e+01 -2.750484e+01 -2.710557e+01 -2.680415e+01 -2.648019e+01
## FPE(n)  4.600150e-14  5.014974e-14  5.083820e-14  4.733887e-14  4.578970e-14
```

```
#Estimando o VAR Reduzido
VAR_PR_pa <- VAR(base_SVAR_final[1:106,c(1,10,15,16)], p = 2, season = NULL, exog = NULL, type = "const
VAR_PR_pa
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_PR.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PR.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_PR.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.432496845  -0.104198948   0.156523800  -0.014298104   0.029906798
##       g_PR.l2       IPCA.l2 Selic.Over.l2         const
##  -0.071930386   0.052165657   0.009629236   0.006314384
##
##
## Estimated coefficients for equation g_PR:
## =========================================
## Call:
## g_PR = g_BR.l1 + g_PR.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PR.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_PR.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   1.093159069  -0.630023086   1.275340876  -0.002973937   0.209265517
##       g_PR.l2       IPCA.l2 Selic.Over.l2         const
##  -0.267796456   1.036330329  -0.019167464   0.018175710
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_PR.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PR.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_PR.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0060114503  0.0032862511  0.7536798487  0.0011973083 -0.0222889446
##       g_PR.l2       IPCA.l2 Selic.Over.l2         const
##  0.0033036414 -0.0535624885 -0.0006835395  0.0010311369
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_PR.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PR.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_PR.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.22934553   -0.19794320    3.61120376    0.44253518   -0.03784828
##       g_PR.l2       IPCA.l2 Selic.Over.l2         const
##   -0.17695638    6.97525271    0.47027099    0.04163249
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_PR_pa, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_PR_pa
```

```
## Chi-squared = 104.63, df = 80, p-value = 0.03372
```

```r
arch.test(VAR_PR_pa, multivariate.only = FALSE)
```

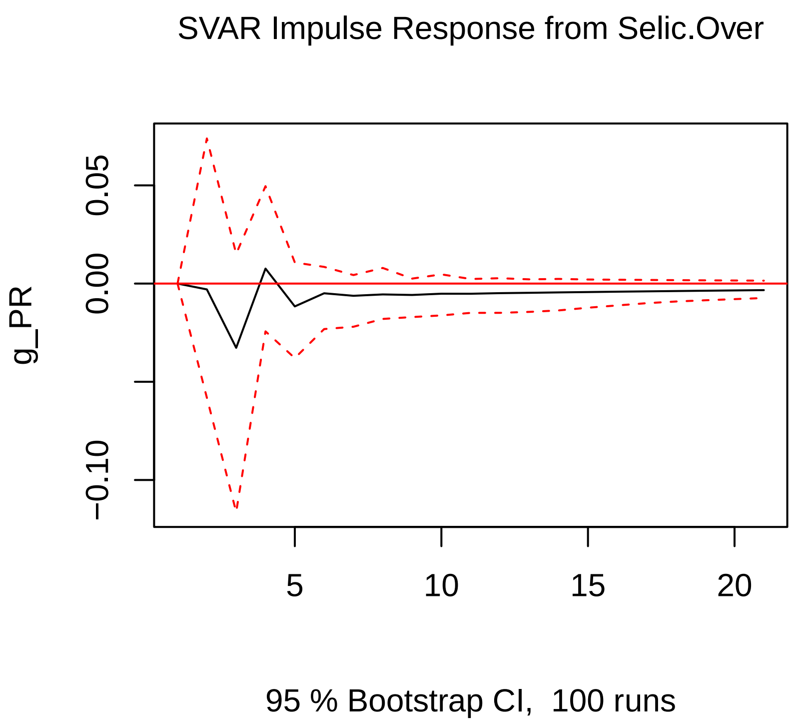
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 15.051, df = 16, p-value = 0.5209
##
##
## $g_PR
##
##  ARCH test (univariate)
##
## data:  Residual of g_PR equation
## Chi-squared = 17.256, df = 16, p-value = 0.3692
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 15.908, df = 16, p-value = 0.4594
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 26.828, df = 16, p-value = 0.04343
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_PR_pa
## Chi-squared = 594.95, df = 500, p-value = 0.002174
```

```r
#Estimando o VAR Estrutural
SVAR_PR_pa <- SVAR(VAR_PR_pa, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_PR_pa
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##               g_BR    g_PR    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_PR       0.06295 1.00000 0.00000          0
```

```
## IPCA       0.09235 0.07282 1.00000          0
## Selic.Over 0.09833 0.09924 0.09591          1
```

```r
#Função Impulso-Resposta
SVAR_PR_irf_pa <- irf(SVAR_PR_pa, impulse = "Selic.Over", response = "g_PR", n.ahead=20, ortho = TRUE)
plot(SVAR_PR_irf_pa)
```




```r
#----------------Período Estendido - 01-12-2010 até 01-10-2023----------------#

lagselect_PR_pe <- VARselect(base_SVAR_final[107:261,c(1,10,15,16)],lag.max=10, type="both")
lagselect_PR_pe$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```r
lagselect_PR_pe$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -2.964696e+01 -2.997794e+01 -3.003389e+01 -3.008811e+01 -3.006045e+01
## HQ(n)  -2.944676e+01 -2.964427e+01 -2.956676e+01 -2.948751e+01 -2.932637e+01
## SC(n)  -2.915426e+01 -2.915677e+01 -2.888426e+01 -2.861001e+01 -2.825388e+01
## FPE(n)  1.332202e-13  9.574750e-14  9.067656e-14  8.612610e-14  8.892346e-14
##                    6             7             8             9            10
## AIC(n) -3.002672e+01 -2.993224e+01 -2.981272e+01 -2.973877e+01 -2.967898e+01
## HQ(n)  -2.915919e+01 -2.893124e+01 -2.867825e+01 -2.847083e+01 -2.827757e+01
## SC(n)  -2.789169e+01 -2.746874e+01 -2.702075e+01 -2.661834e+01 -2.623007e+01
## FPE(n)  9.254814e-14  1.025939e-13  1.169343e-13  1.277506e-13  1.381134e-13
```

```r
#Estimando o VAR Reduzido
VAR_PR_pe <- VAR(base_SVAR_final[107:261,c(1,10,15,16)], p = lagselect_PR_pe$selection[1], season = NULL
VAR_PR_pe
```

```
##
## VAR Estimation Results:
## ========================
##
## Estimated coefficients for equation g_BR:
## ==========================================
## Call:
## g_BR = g_BR.l1 + g_PR.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PR.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_PR.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.267809007   0.022152252   0.600368358  -0.002771924  -0.180008899
##       g_PR.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PR.l3
##  -0.032448718  -0.377342252   0.020991873  -0.177184814  -0.024700715
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PR.l4       IPCA.l4
##  -0.450300646  -0.001190937  -0.201832124   0.051660324  -1.499664124
## Selic.Over.l4         const
##  -0.023188639   0.010747681
##
##
## Estimated coefficients for equation g_PR:
## ==========================================
## Call:
## g_PR = g_BR.l1 + g_PR.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PR.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_PR.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   -0.51981488   -0.21014812   -0.84887384   -0.01494466   -0.05277651
##       g_PR.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PR.l3
##   -0.26058419    3.53103319   -0.01312118    0.06270835   -0.16504621
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PR.l4       IPCA.l4
##   -1.12827647    0.06991644   -0.15503154   -0.04613851   -3.79370462
## Selic.Over.l4         const
##   -0.05185294    0.01819748
##
##
## Estimated coefficients for equation IPCA:
## ==========================================
## Call:
## IPCA = g_BR.l1 + g_PR.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PR.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_PR.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0040666839 -0.0003980389  0.5700942031  0.0010567747 -0.0061020347
##       g_PR.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_PR.l3
##  0.0041693047  0.0436607182  0.0064031704  0.0152010031 -0.0045564469
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_PR.l4       IPCA.l4
##  0.0196212802 -0.0031480508  0.0059076346 -0.0012126268 -0.1574348589
## Selic.Over.l4         const
## -0.0047509308  0.0028059698
##
##
## Estimated coefficients for equation Selic.Over:
```

```
## ================================================
## Call:
## Selic.Over = g_BR.l1 + g_PR.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_PR.l2 + IPCA.l2 + Selic.Over.l
##
##        g_BR.l1        g_PR.l1        IPCA.l1 Selic.Over.l1        g_BR.l2
##   -0.219679132    0.187199400    2.308387067    0.321321952   -0.001815965
##        g_PR.l2        IPCA.l2 Selic.Over.l2        g_BR.l3        g_PR.l3
##    0.041346026    2.455401188    0.650485880    0.005950243   -0.051997876
##        IPCA.l3 Selic.Over.l3        g_BR.l4        g_PR.l4        IPCA.l4
##    2.684986829    0.339261717    0.043147518   -0.112578212    3.320746663
## Selic.Over.l4          const
##   -0.346648946   -0.025587639
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_PR_pe, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_PR_pe
## Chi-squared = 90.727, df = 80, p-value = 0.1935
```

```r
arch.test(VAR_PR_pe, multivariate.only = FALSE)
```

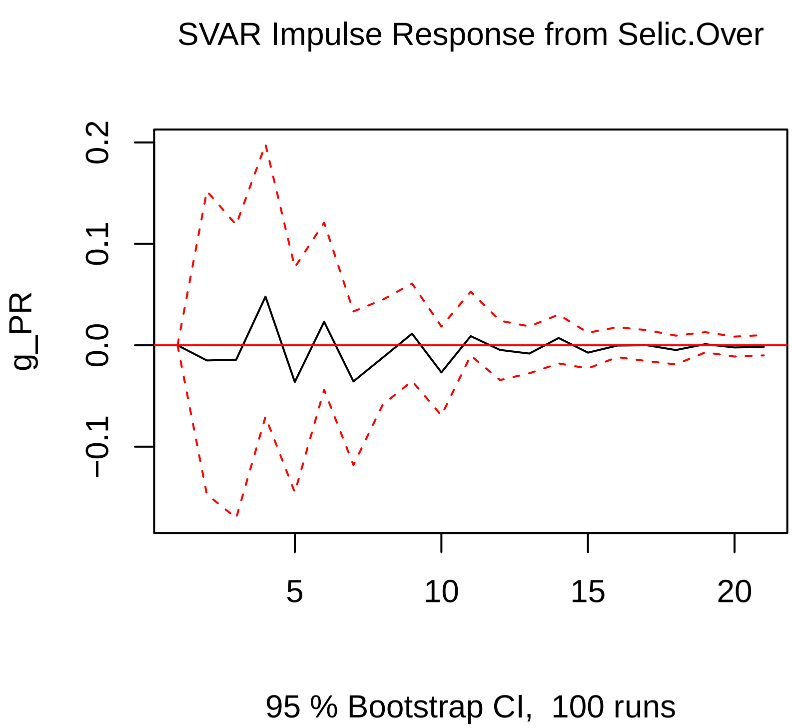
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 1.5059, df = 16, p-value = 1
##
##
## $g_PR
##
##  ARCH test (univariate)
##
## data:  Residual of g_PR equation
## Chi-squared = 3.8446, df = 16, p-value = 0.9991
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 14.428, df = 16, p-value = 0.5669
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 31.6, df = 16, p-value = 0.01127
```

```
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_PR_pe
## Chi-squared = 637.34, df = 500, p-value = 2.914e-05
```

```r
#Estimando o VAR Estrutural
SVAR_PR_pe <- SVAR(VAR_PR_pe, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_PR_pe
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                  g_BR    g_PR    IPCA Selic.Over
## g_BR        1.00000 0.00000 0.00000          0
## g_PR       -0.01500 1.00000 0.00000          0
## IPCA        0.08165 0.06432 1.00000          0
## Selic.Over  0.07345 0.01138 0.09157          1
```

```r
#Função Impulso-Resposta
SVAR_PR_irf_pe <- irf(SVAR_PR_pe, impulse = "Selic.Over", response = "g_PR", n.ahead=20, ortho = TRUE)
plot(SVAR_PR_irf_pe)
```



```r
###########################################
################RIO DE JANEIRO################
###########################################
#Selecionando o Lag
lagselect_RJ <- VARselect(base_SVAR_final[,c(1,11,15,16)],lag.max=10, type="both")
lagselect_RJ$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```r
lagselect_RJ$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -3.065990e+01 -3.100127e+01 -3.101475e+01 -3.109707e+01 -3.109650e+01
## HQ(n)  -3.052424e+01 -3.077518e+01 -3.069822e+01 -3.069010e+01 -3.059910e+01
## SC(n)  -3.032280e+01 -3.043944e+01 -3.022819e+01 -3.008578e+01 -2.986049e+01
## FPE(n)  4.837177e-14  3.438694e-14  3.393647e-14  3.127119e-14  3.131436e-14
##                     6             7             8             9            10
## AIC(n) -3.105920e+01 -3.095309e+01 -3.092725e+01 -3.092652e+01 -3.089069e+01
## HQ(n)  -3.047136e+01 -3.027481e+01 -3.015853e+01 -3.006737e+01 -2.994111e+01
## SC(n)  -2.959846e+01 -2.926762e+01 -2.901704e+01 -2.879159e+01 -2.853103e+01
## FPE(n)  3.254276e-14  3.624413e-14  3.727164e-14  3.739870e-14  3.889209e-14
```

```r
#Estimando o VAR Reduzido
VAR_RJ <- VAR(base_SVAR_final[,c(1,11,15,16)], p = lagselect_RJ$selection[1], season = NULL, exog = NUL
VAR_RJ
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_RJ.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RJ.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_RJ.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.048795365  -0.080643964   0.371992632  -0.013517071  -0.160997528
##       g_RJ.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RJ.l3
##   0.008681440  -0.263997407   0.001209008  -0.079513252  -0.020191278
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RJ.l4       IPCA.l4
##   0.105297308   0.001091089  -0.072737867   0.035916650  -0.963546832
## Selic.Over.l4         const
##   0.013658220   0.002003502
##
##
## Estimated coefficients for equation g_RJ:
## =========================================
## Call:
## g_RJ = g_BR.l1 + g_RJ.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RJ.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_RJ.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.221302265  -0.494147119   1.104251897  -0.015957611   0.203674671
##       g_RJ.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RJ.l3
##  -0.362094795  -1.372975660   0.014065984   0.080895829  -0.267568817
```

```
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RJ.l4       IPCA.l4
##   0.058184258   0.008320017  -0.069987736  -0.090264994  -0.074496256
## Selic.Over.l4         const
##  -0.008067513   0.004871617
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_RJ.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RJ.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_RJ.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0022005770 -0.0019897769  0.6523669672  0.0013254952 -0.0031867952
##       g_RJ.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RJ.l3
##  0.0007173778  0.0311573751  0.0018065230  0.0122661272 -0.0078485355
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RJ.l4       IPCA.l4
## -0.0069188688 -0.0024552154  0.0128135228 -0.0103180696 -0.0659767145
## Selic.Over.l4         const
## -0.0002879923  0.0016095139
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_RJ.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RJ.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_RJ.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.035963524   0.101916104   2.548214898   0.364318850  -0.087064025
##       g_RJ.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RJ.l3
##   0.125016710   2.472151812   0.548835889  -0.019752681   0.077396815
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RJ.l4       IPCA.l4
##   3.319400366   0.337903657  -0.021367518   0.091692019   1.962946320
## Selic.Over.l4         const
##  -0.302863423  -0.007280986
```

```
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_RJ, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_RJ
## Chi-squared = 99.694, df = 80, p-value = 0.06724
```

```
arch.test(VAR_RJ, multivariate.only = FALSE)
```

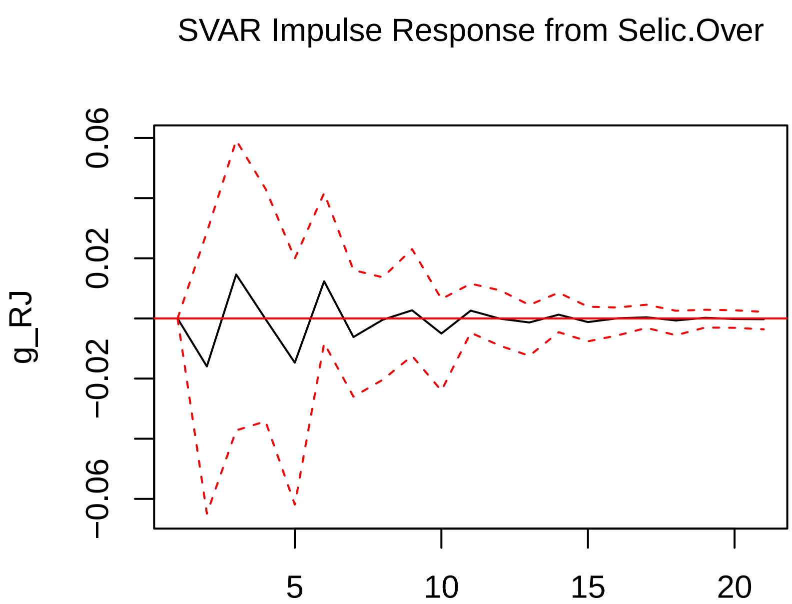
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 5.0267, df = 16, p-value = 0.9956
##
##
```

```
## $g_RJ
##
##  ARCH test (univariate)
##
## data:  Residual of g_RJ equation
## Chi-squared = 6.6659, df = 16, p-value = 0.9792
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 23.861, df = 16, p-value = 0.09259
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 58.229, df = 16, p-value = 1.038e-06
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_RJ
## Chi-squared = 658.78, df = 500, p-value = 2.206e-06
```

```
#Estimando o VAR Estrutural
SVAR_RJ <- SVAR(VAR_RJ, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_RJ
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##               g_BR    g_RJ    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_RJ       0.05764 1.00000 0.00000          0
## IPCA       0.08933 0.08589 1.00000          0
## Selic.Over 0.08105 0.07711 0.09488          1
```

```
#Função Impulso-Resposta
SVAR_RJ_irf <- irf(SVAR_RJ, impulse = "Selic.Over", response = "g_RJ", n.ahead=20, ortho = TRUE)
plot(SVAR_RJ_irf)
```



95 % Bootstrap CI, 100 runs

```r
###Comparando Diferentes Períodos###

#----------------Período dos Autores - 01-01-2002 até 01-11-2010----------------#

#Selecionando o Lag
lagselect_RJ_pa <- VARselect(base_SVAR_final[1:106,c(1,11,15,16)],lag.max=10, type="both")
lagselect_RJ_pa$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      2      1      1      2
```

```r
lagselect_RJ_pa$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.227876e+01 -3.237662e+01 -3.234297e+01 -3.228254e+01 -3.227934e+01
## HQ(n)  -3.201963e+01 -3.194472e+01 -3.173832e+01 -3.150512e+01 -3.132917e+01
## SC(n)  -3.163768e+01 -3.130814e+01 -3.084710e+01 -3.035927e+01 -2.992869e+01
## FPE(n)  9.589466e-15  8.716301e-15  9.062822e-15  9.720133e-15  9.900423e-15
##                    6             7             8             9            10
## AIC(n) -3.222423e+01 -3.206132e+01 -3.206205e+01 -3.208454e+01 -3.198482e+01
## HQ(n)  -3.110130e+01 -3.076563e+01 -3.059360e+01 -3.044334e+01 -3.017085e+01
## SC(n)  -2.944619e+01 -2.885589e+01 -2.842922e+01 -2.802433e+01 -2.749721e+01
## FPE(n)  1.069720e-14  1.298716e-14  1.353113e-14  1.397338e-14  1.656077e-14
```

```r
#Estimando o VAR Reduzido
VAR_RJ_pa <- VAR(base_SVAR_final[1:106,c(1,11,15,16)], p = lagselect_RJ_pa$selection[1], season = NULL,
VAR_RJ_pa
```

```
##
## VAR Estimation Results:
## ========================
##
## Estimated coefficients for equation g_BR:
## ==========================================
## Call:
## g_BR = g_BR.l1 + g_RJ.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RJ.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_RJ.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.341150061  -0.075440883   0.102514019  -0.009329155  -0.093374561
##       g_RJ.l2       IPCA.l2 Selic.Over.l2         const
##   0.023375819  -0.066943916   0.005507342   0.006242760
##
##
## Estimated coefficients for equation g_RJ:
## ==========================================
## Call:
## g_RJ = g_BR.l1 + g_RJ.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RJ.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_RJ.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.422036628  -0.475338147   2.178709361  -0.022500951   0.332358529
##       g_RJ.l2       IPCA.l2 Selic.Over.l2         const
##  -0.172201905  -1.703261068   0.014818691   0.008449818
##
##
## Estimated coefficients for equation IPCA:
## ==========================================
## Call:
## IPCA = g_BR.l1 + g_RJ.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RJ.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_RJ.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  0.0088011222 -0.0187592906  0.7404114085  0.0013290889  0.0007457115
##       g_RJ.l2       IPCA.l2 Selic.Over.l2         const
## -0.0222933106 -0.0165775892 -0.0010157771  0.0011644575
##
##
## Estimated coefficients for equation Selic.Over:
## ================================================
## Call:
## Selic.Over = g_BR.l1 + g_RJ.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RJ.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_RJ.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.08041482   -0.25311944    3.22869098    0.44861079    0.02348132
##       g_RJ.l2       IPCA.l2 Selic.Over.l2         const
##   -0.40634014    7.17489058    0.46430357    0.04275935
```

```
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_RJ_pa, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_RJ_pa
```

```
## Chi-squared = 92.157, df = 80, p-value = 0.1664
```

```r
arch.test(VAR_RJ_pa, multivariate.only = FALSE)
```

```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 16.113, df = 16, p-value = 0.4451
##
##
## $g_RJ
##
##  ARCH test (univariate)
##
## data:  Residual of g_RJ equation
## Chi-squared = 9.4483, df = 16, p-value = 0.8938
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 16.259, df = 16, p-value = 0.435
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 26.704, df = 16, p-value = 0.04489
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_RJ_pa
## Chi-squared = 577.82, df = 500, p-value = 0.00903
```

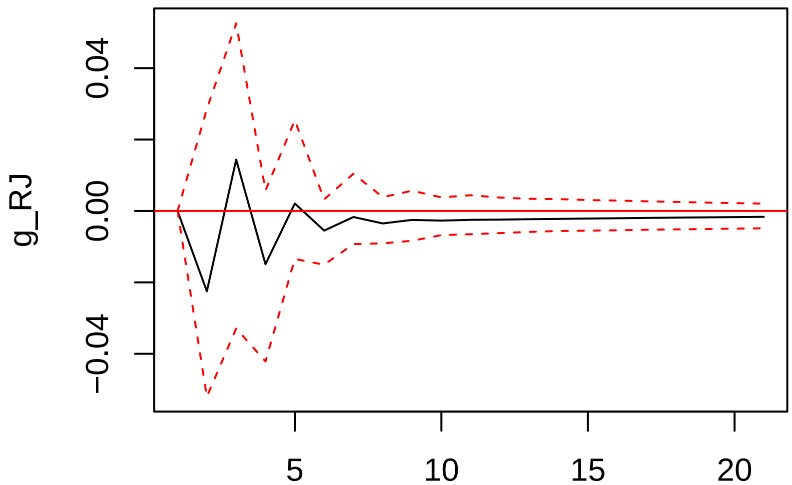
```r
#Estimando o VAR Estrutural
SVAR_RJ_pa <- SVAR(VAR_RJ_pa, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_RJ_pa
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_RJ    IPCA Selic.Over
## g_BR        1.00000 0.00000 0.00000          0
## g_RJ        0.08011 1.00000 0.00000          0
```

```
## IPCA       0.09512 0.09259 1.00000          0
## Selic.Over 0.09080 0.05349 0.09208          1
```

```r
#Função Impulso-Resposta
SVAR_RJ_irf_pa <- irf(SVAR_RJ_pa, impulse = "Selic.Over", response = "g_RJ", n.ahead=20, ortho = TRUE)
plot(SVAR_RJ_irf_pa)
```

SVAR Impulse Response from Selic.Over



95 % Bootstrap CI, 100 runs

```r
#----------------Período Estendido - 01-12-2010 até 01-10-2023----------------#

lagselect_RJ_pe <- VARselect(base_SVAR_final[107:261,c(1,11,15,16)],lag.max=10, type="both")
lagselect_RJ_pe$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      1      4
```

```r
lagselect_RJ_pe$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.007134e+01 -3.037582e+01 -3.038693e+01 -3.042702e+01 -3.038072e+01
## HQ(n)  -2.987114e+01 -3.004215e+01 -2.991979e+01 -2.982642e+01 -2.964665e+01
## SC(n)  -2.957864e+01 -2.955465e+01 -2.923729e+01 -2.894892e+01 -2.857415e+01
## FPE(n)  8.714958e-14  6.431747e-14  6.370505e-14  6.136903e-14  6.455404e-14
##                    6             7             8             9            10
## AIC(n) -3.034318e+01 -3.020009e+01 -3.011981e+01 -3.007875e+01 -2.994259e+01
## HQ(n)  -2.947565e+01 -2.919908e+01 -2.898534e+01 -2.881081e+01 -2.854118e+01
## SC(n)  -2.820815e+01 -2.773658e+01 -2.732784e+01 -2.695831e+01 -2.649368e+01
## FPE(n)  6.744209e-14  7.848688e-14  8.601519e-14  9.093134e-14  1.061089e-13
```

```r
#Estimando o VAR Reduzido
VAR_RJ_pe <- VAR(base_SVAR_final[107:261,c(1,11,15,16)], p = lagselect_RJ_pe$selection[1], season = NUL
VAR_RJ_pe
```

```
##
## VAR Estimation Results:
## ========================
##
## Estimated coefficients for equation g_BR:
## ==========================================
## Call:
## g_BR = g_BR.l1 + g_RJ.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RJ.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_RJ.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.166120562  -0.096332347   0.568629587  -0.001742462  -0.252041137
##       g_RJ.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RJ.l3
##  -0.001667966  -0.303343451   0.020840341  -0.140548170  -0.065860843
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RJ.l4       IPCA.l4
##  -0.390712712  -0.005461564  -0.120780838   0.017050595  -1.704406186
## Selic.Over.l4         const
##  -0.019178825   0.011018467
##
##
## Estimated coefficients for equation g_RJ:
## ==========================================
## Call:
## g_RJ = g_BR.l1 + g_RJ.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RJ.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_RJ.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.11635176   -0.47229875    0.61893385    0.00356481    0.11050611
##       g_RJ.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RJ.l3
##   -0.38416729   -0.57026083    0.01305670    0.03081446   -0.27181133
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RJ.l4       IPCA.l4
##   -0.96070742    0.00886043   -0.09255216   -0.12203364   -0.47309606
## Selic.Over.l4         const
##   -0.03009796    0.01067200
##
##
## Estimated coefficients for equation IPCA:
## ==========================================
## Call:
## IPCA = g_BR.l1 + g_RJ.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RJ.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_RJ.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0032200532  0.0014909703  0.5684189663  0.0006678351 -0.0069478192
##       g_RJ.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RJ.l3
##  0.0100474324  0.0649508869  0.0070883488  0.0104060260 -0.0082277863
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RJ.l4       IPCA.l4
##  0.0086151287 -0.0033249990  0.0138494881 -0.0122546237 -0.1511089227
## Selic.Over.l4         const
## -0.0048986588  0.0027552933
##
##
## Estimated coefficients for equation Selic.Over:
```

```
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_RJ.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RJ.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_RJ.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.05163991    0.06520218    1.97956746    0.32865731   -0.08668100
##       g_RJ.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RJ.l3
##    0.12361276    2.14079773    0.63130206   -0.10862526    0.04562561
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RJ.l4       IPCA.l4
##    3.75958583    0.32518533   -0.08048161    0.04440764    3.21118557
## Selic.Over.l4         const
##   -0.32106447   -0.02687604
```

```
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_RJ_pe, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_RJ_pe
## Chi-squared = 90.821, df = 80, p-value = 0.1916
```

```
arch.test(VAR_RJ_pe, multivariate.only = FALSE)
```

```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 1.4871, df = 16, p-value = 1
##
##
## $g_RJ
##
##  ARCH test (univariate)
##
## data:  Residual of g_RJ equation
## Chi-squared = 4.9124, df = 16, p-value = 0.9962
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 18.079, df = 16, p-value = 0.3193
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 34.773, df = 16, p-value = 0.004268
```

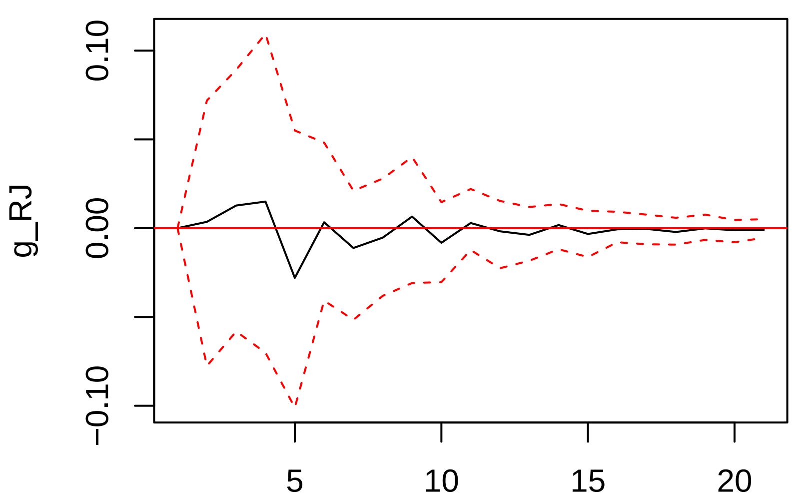
```
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_RJ_pe
## Chi-squared = 544.37, df = 500, p-value = 0.0831
```

```
#Estimando o VAR Estrutural
SVAR_RJ_pe <- SVAR(VAR_RJ_pe, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_RJ_pe
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_RJ    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_RJ       0.04878 1.00000 0.00000          0
## IPCA       0.08674 0.08207 1.00000          0
## Selic.Over 0.07872 0.08455 0.09749          1
```

```
#Função Impulso-Resposta
SVAR_RJ_irf_pe <- irf(SVAR_RJ_pe, impulse = "Selic.Over", response = "g_RJ", n.ahead=20, ortho = TRUE)
plot(SVAR_RJ_irf_pe)
```

SVAR Impulse Response from Selic.Over



95 % Bootstrap CI, 100 runs

```r
############################################
#################RIO GRANDE DO SUL#################
############################################
#Selecionando o Lag
lagselect_RS <- VARselect(base_SVAR_final[,c(1,12,15,16)],lag.max=10, type="both")
lagselect_RS$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      5      2      2      5
```

```r
lagselect_RS$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.056292e+01 -3.088148e+01 -3.091514e+01 -3.096974e+01 -3.097587e+01
## HQ(n)  -3.042726e+01 -3.065539e+01 -3.059861e+01 -3.056277e+01 -3.047846e+01
## SC(n)  -3.022582e+01 -3.031965e+01 -3.012858e+01 -2.995845e+01 -2.973985e+01
## FPE(n)  5.329771e-14  3.876304e-14  3.749110e-14  3.551744e-14  3.532937e-14
##                    6             7             8             9            10
## AIC(n) -3.095673e+01 -3.087240e+01 -3.084142e+01 -3.082122e+01 -3.080797e+01
## HQ(n)  -3.036889e+01 -3.019412e+01 -3.007271e+01 -2.996207e+01 -2.985838e+01
## SC(n)  -2.949599e+01 -2.918692e+01 -2.893121e+01 -2.868629e+01 -2.844830e+01
## FPE(n)  3.605426e-14  3.929003e-14  4.061179e-14  4.155154e-14  4.224634e-14
```

```r
#Estimando o VAR Reduzido
VAR_RS <- VAR(base_SVAR_final[,c(1,12,15,16)], p = lagselect_RS$selection[1], season = NULL, exog = NULL
VAR_RS
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_RS.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RS.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_RS.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.284475880   0.168966337   0.427954356  -0.017679471  -0.136970184
##       g_RS.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RS.l3
##   0.009768174  -0.386074199   0.007997155  -0.127400691   0.019690108
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RS.l4       IPCA.l4
##  -0.103289092  -0.003325950  -0.034353049   0.009867779  -0.775486884
## Selic.Over.l4       g_BR.l5       g_RS.l5       IPCA.l5 Selic.Over.l5
##   0.007902115   0.056708891  -0.048960942   0.223134312   0.007810717
##         const
##   0.001024255
##
##
## Estimated coefficients for equation g_RS:
## =========================================
## Call:
## g_RS = g_BR.l1 + g_RS.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RS.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_RS.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.043033560  -0.134612904   0.498992473  -0.079863547   0.138058522
```

```
##       g_RS.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RS.l3
##  -0.317949333   1.787358734   0.011199642  -0.033453473  -0.089357391
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RS.l4       IPCA.l4
##  -1.653889389   0.028295213  -0.039404237  -0.087534233  -0.238392236
## Selic.Over.l4       g_BR.l5       g_RS.l5       IPCA.l5 Selic.Over.l5
##   0.069789432   0.041775908  -0.100913928  -0.128804087  -0.037469581
##         const
##   0.005786048
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_RS.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RS.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_RS.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0089876677  0.0022690477  0.6542409948 -0.0001007373 -0.0044769228
##       g_RS.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RS.l3
##  0.0027682014  0.0277132211  0.0039851504  0.0099010619 -0.0027643740
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RS.l4       IPCA.l4
## -0.0085827700  0.0011983147 -0.0040662941  0.0034428470 -0.0011480382
## Selic.Over.l4       g_BR.l5       g_RS.l5       IPCA.l5 Selic.Over.l5
##  0.0023656279 -0.0195910634  0.0114414942 -0.1646207167 -0.0068044248
##         const
##  0.0019032655
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_RS.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RS.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_RS.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.195162753  -0.045008613   2.111621207   0.344952299  -0.136368752
##       g_RS.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RS.l3
##   0.092950067   3.206780070   0.558339431   0.013697027   0.164627355
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RS.l4       IPCA.l4
##   3.217839948   0.370693076   0.278372843  -0.183817743  -0.929949062
## Selic.Over.l4       g_BR.l5       g_RS.l5       IPCA.l5 Selic.Over.l5
##  -0.255203827  -0.093920326   0.132824450   3.667962330  -0.074278543
##         const
##  -0.008090261
```

```
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_RS, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_RS
## Chi-squared = 100.52, df = 80, p-value = 0.06019
```

```r
arch.test(VAR_RS, multivariate.only = FALSE)
```

```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 6.087, df = 16, p-value = 0.9871
##
##
## $g_RS
##
##  ARCH test (univariate)
##
## data:  Residual of g_RS equation
## Chi-squared = 34.021, df = 16, p-value = 0.005398
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 16.01, df = 16, p-value = 0.4522
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 48.732, df = 16, p-value = 3.643e-05
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_RS
## Chi-squared = 637.48, df = 500, p-value = 2.867e-05
```

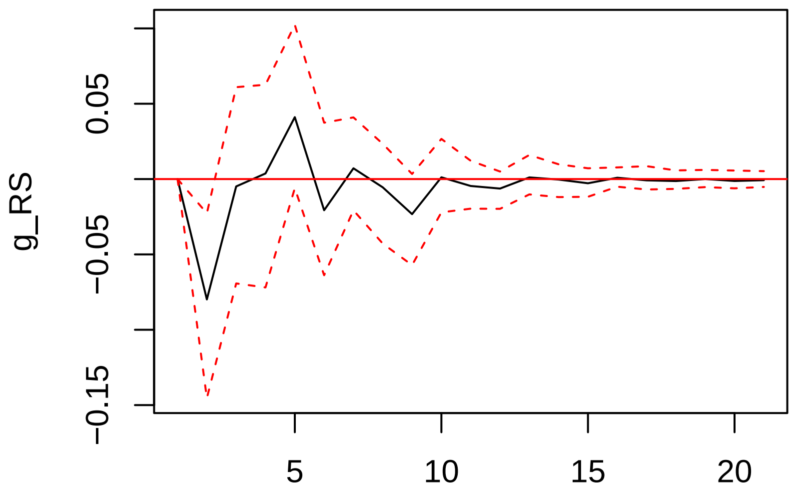
```r
#Estimando o VAR Estrutural
SVAR_RS <- SVAR(VAR_RS, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_RS
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##               g_BR    g_RS    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_RS       0.03212 1.00000 0.00000          0
## IPCA       0.08687 0.07796 1.00000          0
```

```
## Selic.Over 0.07492 0.04775 0.09187          1
```

```r
#Função Impulso-Resposta
SVAR_RS_irf <- irf(SVAR_RS, impulse = "Selic.Over", response = "g_RS", n.ahead=20, ortho = TRUE)
plot(SVAR_RS_irf)
```

SVAR Impulse Response from Selic.Over



95 % Bootstrap CI, 100 runs

```r
###Comparando Diferentes Períodos###

#----------------Período dos Autores - 01-01-2002 até 01-11-2010----------------#

#Selecionando o Lag
lagselect_RS_pa <- VARselect(base_SVAR_final[1:106,c(1,12,15,16)],lag.max=10, type="both")
lagselect_RS_pa$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      2      1      1      2
```

```r
lagselect_RS_pa$criteria
```

```
##                      1             2             3             4             5
## AIC(n) -3.152054e+01 -3.160842e+01 -3.154491e+01 -3.153730e+01 -3.157317e+01
## HQ(n)  -3.126140e+01 -3.117652e+01 -3.094026e+01 -3.075989e+01 -3.062300e+01
## SC(n)  -3.087945e+01 -3.053994e+01 -3.004904e+01 -2.961404e+01 -2.922252e+01
## FPE(n)  2.046850e-14  1.879130e-14  2.013065e-14  2.047968e-14  2.006044e-14
##                      6             7             8             9            10
## AIC(n) -3.153055e+01 -3.151127e+01 -3.143147e+01 -3.153137e+01 -3.153960e+01
## HQ(n)  -3.040762e+01 -3.021558e+01 -2.996303e+01 -2.989016e+01 -2.972564e+01
## SC(n)  -2.875251e+01 -2.830584e+01 -2.779865e+01 -2.747115e+01 -2.705199e+01
```

```
## FPE(n)  2.140576e-14  2.251122e-14  2.542084e-14  2.429648e-14  2.584854e-14
```

```r
#Estimando o VAR Reduzido
VAR_RS_pa <- VAR(base_SVAR_final[1:106,c(1,12,15,16)], p = lagselect_RS_pa$selection[1], season = NULL,
VAR_RS_pa
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_RS.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RS.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##        g_BR.l1       g_RS.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.213370611   0.050109064   0.085637241  -0.011251502  -0.063473188
##        g_RS.l2       IPCA.l2 Selic.Over.l2         const
##    0.013396858  -0.105049870   0.007905146   0.006080328
##
##
## Estimated coefficients for equation g_RS:
## =========================================
## Call:
## g_RS = g_BR.l1 + g_RS.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RS.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##        g_BR.l1       g_RS.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##     0.17389764   -0.15626045   -0.39534532   -0.03588422    0.22333805
##        g_RS.l2       IPCA.l2 Selic.Over.l2         const
##    -0.25800879    1.32457075    0.02400079    0.00935722
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_RS.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RS.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##        g_BR.l1       g_RS.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.0026498081 -0.0053610145  0.7637135210  0.0011016254 -0.0271396235
##        g_RS.l2       IPCA.l2 Selic.Over.l2         const
##   0.0081314871 -0.0569399942 -0.0006273406  0.0010565173
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_RS.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RS.l2 + IPCA.l2 + Selic.Over.l
##
##        g_BR.l1       g_RS.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##     0.16822497   -0.15834120    3.53809104    0.44522470   -0.25060419
##        g_RS.l2       IPCA.l2 Selic.Over.l2         const
##    -0.11205825    6.71102320    0.46947310    0.04050309
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:
```

```r
serial.test(VAR_RS_pa, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_RS_pa
## Chi-squared = 100.59, df = 80, p-value = 0.05966
```

```r
arch.test(VAR_RS_pa, multivariate.only = FALSE)
```

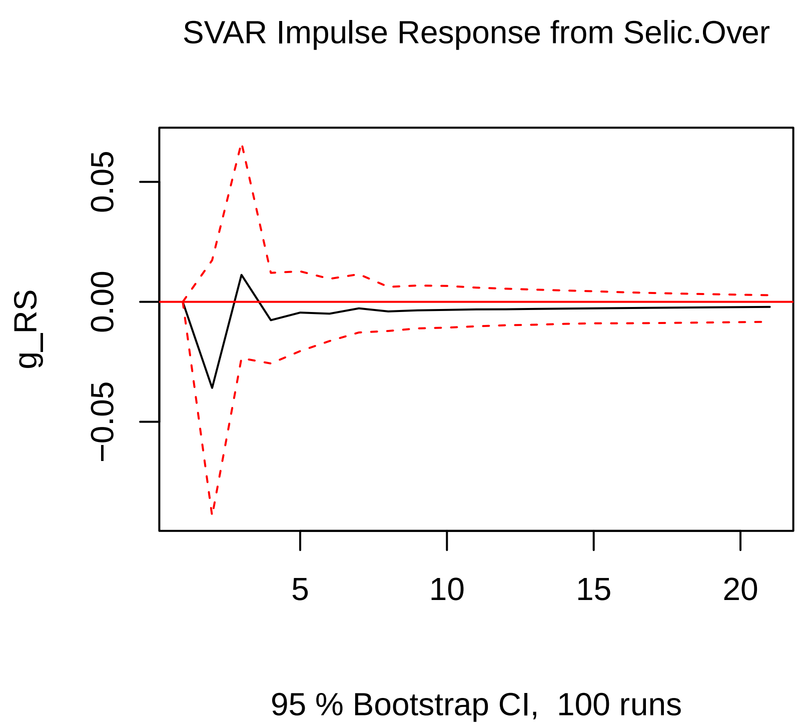
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 13.571, df = 16, p-value = 0.6307
##
##
## $g_RS
##
##  ARCH test (univariate)
##
## data:  Residual of g_RS equation
## Chi-squared = 16.006, df = 16, p-value = 0.4526
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 19.711, df = 16, p-value = 0.2335
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 28.234, df = 16, p-value = 0.02964
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_RS_pa
## Chi-squared = 579.59, df = 500, p-value = 0.00786
```

```r
#Estimando o VAR Estrutural
SVAR_RS_pa <- SVAR(VAR_RS_pa, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_RS_pa
```

```
##
## SVAR Estimation Results:
## ========================
```

```
##
##
## Estimated A matrix:
##               g_BR    g_RS    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_RS       0.06920 1.00000 0.00000          0
## IPCA       0.09343 0.08373 1.00000          0
## Selic.Over 0.09480 0.12323 0.09772          1
```

```
#Função Impulso-Resposta
SVAR_RS_irf_pa <- irf(SVAR_RS_pa, impulse = "Selic.Over", response = "g_RS", n.ahead=20, ortho = TRUE)
plot(SVAR_RS_irf_pa)
```




```
#----------------Período Estendido - 01-12-2010 até 01-10-2023----------------#

lagselect_RS_pe <- VARselect(base_SVAR_final[107:261,c(1,12,15,16)],lag.max=10, type="both")
lagselect_RS_pe$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      1      3
```

```
lagselect_RS_pe$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.026722e+01 -3.054349e+01 -3.059804e+01 -3.059927e+01 -3.050594e+01
## HQ(n)  -3.006702e+01 -3.020983e+01 -3.013091e+01 -2.999867e+01 -2.977187e+01
## SC(n)  -2.977452e+01 -2.972233e+01 -2.944841e+01 -2.912117e+01 -2.869937e+01
## FPE(n)  7.164676e-14  5.438884e-14  5.158064e-14  5.165848e-14  5.695591e-14
```

```
##                    6             7             8             9            10
## AIC(n) -3.046730e+01 -3.036414e+01 -3.026329e+01 -3.016689e+01 -3.006454e+01
## HQ(n)  -2.959976e+01 -2.936313e+01 -2.912882e+01 -2.889895e+01 -2.866313e+01
## SC(n)  -2.833227e+01 -2.790064e+01 -2.747132e+01 -2.704646e+01 -2.661563e+01
## FPE(n)  5.957000e-14  6.661171e-14  7.451841e-14  8.325935e-14  9.392706e-14
```

```
#Estimando o VAR Reduzido
VAR_RS_pe <- VAR(base_SVAR_final[107:261,c(1,12,15,16)], p = lagselect_RS_pe$selection[1], season = NUL
VAR_RS_pe
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_RS.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RS.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_RS.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.563918643   0.296753295   0.810966792  -0.039196051  -0.293535272
##       g_RS.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RS.l3
##   0.063407113  -0.371270296   0.040462636  -0.303510383   0.075776317
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RS.l4       IPCA.l4
##  -0.815279258   0.018047655  -0.232168400   0.104409437  -1.087544269
## Selic.Over.l4         const
##  -0.022495302   0.006982952
##
##
## Estimated coefficients for equation g_RS:
## =========================================
## Call:
## g_RS = g_BR.l1 + g_RS.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RS.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_RS.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   -0.24711576   -0.04204130    0.97297693   -0.07255862   -0.06247468
##       g_RS.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RS.l3
##   -0.23166175    1.22158071    0.03583901   -0.27517362    0.04800560
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RS.l4       IPCA.l4
##   -2.10251463    0.01054517   -0.23318539    0.03619521   -0.65475074
## Selic.Over.l4         const
##    0.01082583    0.01255742
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_RS.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RS.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_RS.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0012855072 -0.0006826639  0.5597613381  0.0009790117  0.0142365637
##       g_RS.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RS.l3
## -0.0069755104  0.0391331255  0.0063720729  0.0263406170 -0.0163307808
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RS.l4       IPCA.l4
##  0.0176250324 -0.0025888955  0.0102426083 -0.0038726259 -0.1233713961
```

```
## Selic.Over.l4         const
## -0.0053773219  0.0028766133
##
##
## Estimated coefficients for equation Selic.Over:
## ================================================
## Call:
## Selic.Over = g_BR.l1 + g_RS.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_RS.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_RS.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.17008321   -0.10268460    2.14991060    0.33279228   -0.25228155
##       g_RS.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_RS.l3
##    0.10033765    2.08774451    0.63058318   -0.47374285    0.31315197
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_RS.l4       IPCA.l4
##    4.12004795    0.30756838   -0.14642000    0.10096486    2.45368720
## Selic.Over.l4         const
##   -0.30445256   -0.02746139
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_RS_pe, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_RS_pe
## Chi-squared = 86.86, df = 80, p-value = 0.281
```

```r
arch.test(VAR_RS_pe, multivariate.only = FALSE)
```

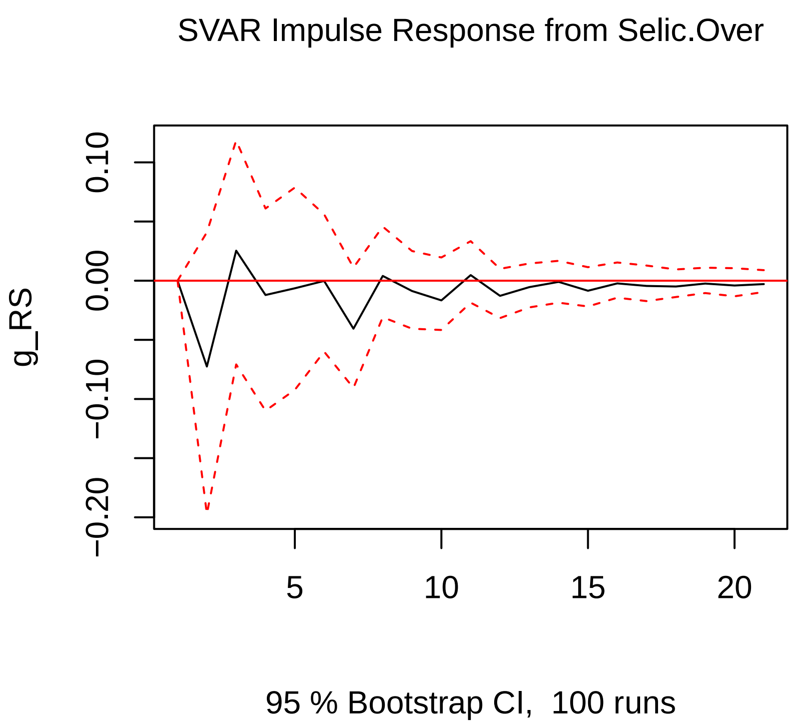
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 2.4726, df = 16, p-value = 1
##
##
## $g_RS
##
##  ARCH test (univariate)
##
## data:  Residual of g_RS equation
## Chi-squared = 19.138, df = 16, p-value = 0.2616
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 11.824, df = 16, p-value = 0.756
##
##
## $Selic.Over
```

```
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 33.834, df = 16, p-value = 0.00572
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_RS_pe
## Chi-squared = 543.88, df = 500, p-value = 0.08535
```

```
#Estimando o VAR Estrutural
SVAR_RS_pe <- SVAR(VAR_RS_pe, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_RS_pe
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##              g_BR    g_RS    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_RS       0.01315 1.00000 0.00000          0
## IPCA       0.08441 0.07338 1.00000          0
## Selic.Over 0.07130 0.01482 0.09069          1
```

```
#Função Impulso-Resposta
SVAR_RS_irf_pe <- irf(SVAR_RS_pe, impulse = "Selic.Over", response = "g_RS", n.ahead=20, ortho = TRUE)
plot(SVAR_RS_irf_pe)
```




```
###########################################
################SANTA CATARINA################
###########################################
#Selecionando o Lag
lagselect_SC <- VARselect(base_SVAR_final[,c(1,13,15,16)],lag.max=10, type="both")
lagselect_SC$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```
lagselect_SC$criteria
```

```
##                     1             2             3             4             5
## AIC(n) -3.104193e+01 -3.135177e+01 -3.141203e+01 -3.148175e+01 -3.146194e+01
## HQ(n)  -3.090628e+01 -3.112568e+01 -3.109550e+01 -3.107478e+01 -3.096454e+01
## SC(n)  -3.070484e+01 -3.078995e+01 -3.062548e+01 -3.047046e+01 -3.022592e+01
## FPE(n)  3.301231e-14  2.421989e-14  2.281022e-14  2.128529e-14  2.172884e-14
##                     6             7             8             9            10
## AIC(n) -3.141820e+01 -3.132352e+01 -3.125103e+01 -3.122266e+01 -3.117679e+01
## HQ(n)  -3.083036e+01 -3.064524e+01 -3.048231e+01 -3.036351e+01 -3.022720e+01
## SC(n)  -2.995745e+01 -2.963804e+01 -2.934082e+01 -2.908773e+01 -2.881712e+01
## FPE(n)  2.272717e-14  2.502438e-14  2.696259e-14  2.781283e-14  2.921544e-14
```

```
#Estimando o VAR Reduzido
VAR_SC <- VAR(base_SVAR_final[,c(1,13,15,16)], p = 5, season = NULL, exog = NULL, type = "const")
VAR_SC
```

```
##
```

```
## VAR Estimation Results:
## ========================
##
## Estimated coefficients for equation g_BR:
## ==========================================
## Call:
## g_BR = g_BR.l1 + g_SC.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SC.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_SC.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.3479949044  0.2462474455  0.4717865679 -0.0139739747 -0.2245854221
##       g_SC.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SC.l3
##  0.0872762367 -0.5103067543 -0.0010289027 -0.1400569037  0.0020124668
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SC.l4       IPCA.l4
##  0.0176678708  0.0001398154 -0.0492930774 -0.0093325104 -0.6770980104
## Selic.Over.l4       g_BR.l5       g_SC.l5       IPCA.l5 Selic.Over.l5
##  0.0091940317 -0.0152735797  0.0019661974  0.3057460001  0.0080165750
##         const
##  0.0002448392
##
##
## Estimated coefficients for equation g_SC:
## ==========================================
## Call:
## g_SC = g_BR.l1 + g_SC.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SC.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_SC.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0276067702 -0.1183750153  1.3152961214 -0.0299564281  0.0200569550
##       g_SC.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SC.l3
## -0.0047115836  0.3484153029 -0.0284320738  0.0910263781 -0.1448535732
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SC.l4       IPCA.l4
## -1.8109129507  0.0133327289  0.1296313599 -0.1858955170 -0.2529177009
## Selic.Over.l4       g_BR.l5       g_SC.l5       IPCA.l5 Selic.Over.l5
##  0.0427018740 -0.0093730190 -0.1057312491  0.0687176699 -0.0005051599
##         const
##  0.0041509970
##
##
## Estimated coefficients for equation IPCA:
## ==========================================
## Call:
## IPCA = g_BR.l1 + g_SC.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SC.l2 + IPCA.l2 + Selic.Over.l2 + g
##
##       g_BR.l1       g_SC.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0161208545  0.0068349752  0.6628589318 -0.0007649006 -0.0205420840
##       g_SC.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SC.l3
##  0.0201214323  0.0108689299  0.0046005272  0.0073510145 -0.0021646562
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SC.l4       IPCA.l4
## -0.0170520014  0.0016818498 -0.0011800376  0.0007588086  0.0083566810
## Selic.Over.l4       g_BR.l5       g_SC.l5       IPCA.l5 Selic.Over.l5
##  0.0025244694 -0.0117360265  0.0048090105 -0.1446713906 -0.0074307413
##         const
##  0.0018711548
##
##
```

```
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_SC.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SC.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_SC.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.286427378  -0.046619101   2.338494874   0.327213670   0.386125488
##       g_SC.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SC.l3
##  -0.333176514   2.973107165   0.562527322   0.342529708  -0.160970879
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SC.l4       IPCA.l4
##   3.995440707   0.372668056   0.513768531  -0.287132744  -0.748296295
## Selic.Over.l4       g_BR.l5       g_SC.l5       IPCA.l5 Selic.Over.l5
##  -0.264016444   0.435332190  -0.354033706   3.382968221  -0.060432479
##         const
##  -0.006025034
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_SC, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_SC
## Chi-squared = 83.856, df = 80, p-value = 0.3622
```

```r
arch.test(VAR_SC, multivariate.only = FALSE)
```

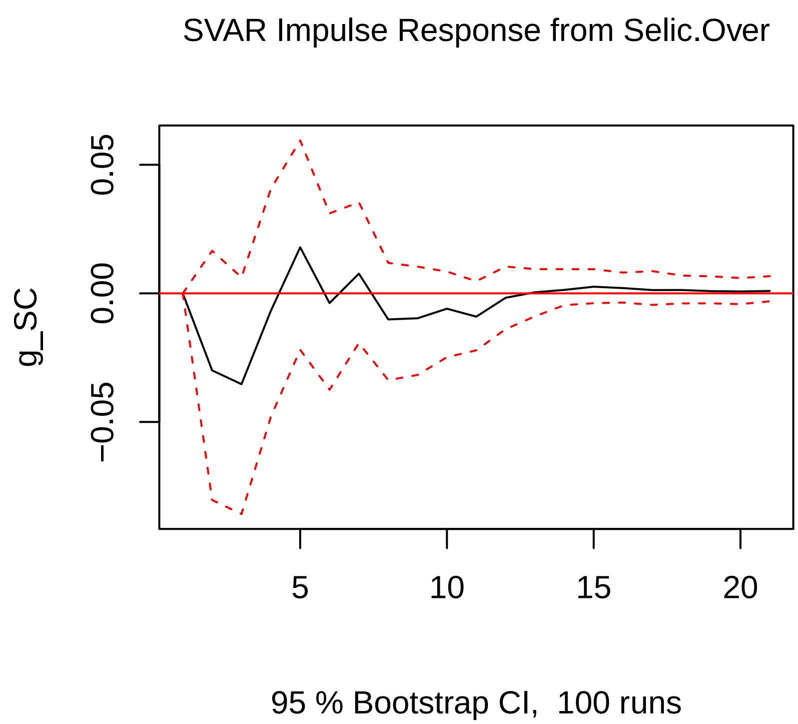
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 7.6777, df = 16, p-value = 0.9579
##
##
## $g_SC
##
##  ARCH test (univariate)
##
## data:  Residual of g_SC equation
## Chi-squared = 56.96, df = 16, p-value = 1.688e-06
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 13.207, df = 16, p-value = 0.6576
##
##
## $Selic.Over
##
##  ARCH test (univariate)
```

```
##
## data:  Residual of Selic.Over equation
## Chi-squared = 52.94, df = 16, p-value = 7.715e-06
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_SC
## Chi-squared = 849.43, df = 500, p-value < 2.2e-16
```

```
#Estimando o VAR Estrutural
SVAR_SC <- SVAR(VAR_SC, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_SC
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##               g_BR    g_SC    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_SC       0.04179 1.00000 0.00000          0
## IPCA       0.08804 0.08374 1.00000          0
## Selic.Over 0.07922 0.06795 0.09345          1
```

```
#Função Impulso-Resposta
SVAR_SC_irf <- irf(SVAR_SC, impulse = "Selic.Over", response = "g_SC", n.ahead=20, ortho = TRUE)
plot(SVAR_SC_irf)
```




```r
###Comparando Diferentes Períodos###

#----------------Período dos Autores - 01-01-2002 até 01-11-2010----------------#

#Selecionando o Lag
lagselect_SC_pa <- VARselect(base_SVAR_final[1:106,c(1,13,15,16)],lag.max=10, type="both")
lagselect_SC_pa$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      2      1      1      2
```

```r
lagselect_SC_pa$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.228388e+01 -3.243170e+01 -3.235858e+01 -3.239537e+01 -3.237809e+01
## HQ(n)  -3.202474e+01 -3.199980e+01 -3.175393e+01 -3.161795e+01 -3.142792e+01
## SC(n)  -3.164280e+01 -3.136322e+01 -3.086271e+01 -3.047211e+01 -3.002743e+01
## FPE(n)  9.540508e-15  8.249176e-15  8.922463e-15  8.683009e-15  8.969534e-15
##                    6             7             8             9            10
## AIC(n) -3.226877e+01 -3.227481e+01 -3.226710e+01 -3.241417e+01 -3.228720e+01
## HQ(n)  -3.114584e+01 -3.097912e+01 -3.079865e+01 -3.077296e+01 -3.047324e+01
## SC(n)  -2.949073e+01 -2.906938e+01 -2.863427e+01 -2.835395e+01 -2.779959e+01
## FPE(n)  1.023121e-14  1.049051e-14  1.102258e-14  1.004958e-14  1.223929e-14
```

```r
#Estimando o VAR Reduzido
VAR_SC_pa <- VAR(base_SVAR_final[1:106,c(1,13,15,16)], p = 2 , season = NULL, exog = NULL, type = "cons
VAR_SC_pa
```

```
##
## VAR Estimation Results:
## ========================
##
## Estimated coefficients for equation g_BR:
## ==========================================
## Call:
## g_BR = g_BR.l1 + g_SC.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SC.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_SC.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.286274971  -0.009380465   0.059768391  -0.010998600  -0.174306615
##       g_SC.l2       IPCA.l2 Selic.Over.l2         const
##   0.118391828  -0.088036817   0.007873487   0.005900407
##
##
## Estimated coefficients for equation g_SC:
## ==========================================
## Call:
## g_SC = g_BR.l1 + g_SC.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SC.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_SC.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.015937342  -0.052707407   0.608840882  -0.024235384   0.309593704
##       g_SC.l2       IPCA.l2 Selic.Over.l2         const
##   0.055876875  -1.223797389   0.023622149   0.003745998
##
##
## Estimated coefficients for equation IPCA:
## ==========================================
## Call:
## IPCA = g_BR.l1 + g_SC.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SC.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_SC.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0089597006  0.0077640114  0.7526264897  0.0010810511 -0.0138433991
##       g_SC.l2       IPCA.l2 Selic.Over.l2         const
## -0.0020847860 -0.0436362904 -0.0005965415  0.0010239729
##
##
## Estimated coefficients for equation Selic.Over:
## ================================================
## Call:
## Selic.Over = g_BR.l1 + g_SC.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SC.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_SC.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##    0.05071203   -0.12189749    3.93409092    0.44260203    0.35232705
##       g_SC.l2       IPCA.l2 Selic.Over.l2         const
##   -0.76835818    6.40385289    0.46981051    0.04208205
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_SC_pa, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_SC_pa
```

```
## Chi-squared = 97.081, df = 80, p-value = 0.09399
```

```r
arch.test(VAR_SC_pa, multivariate.only = FALSE)
```

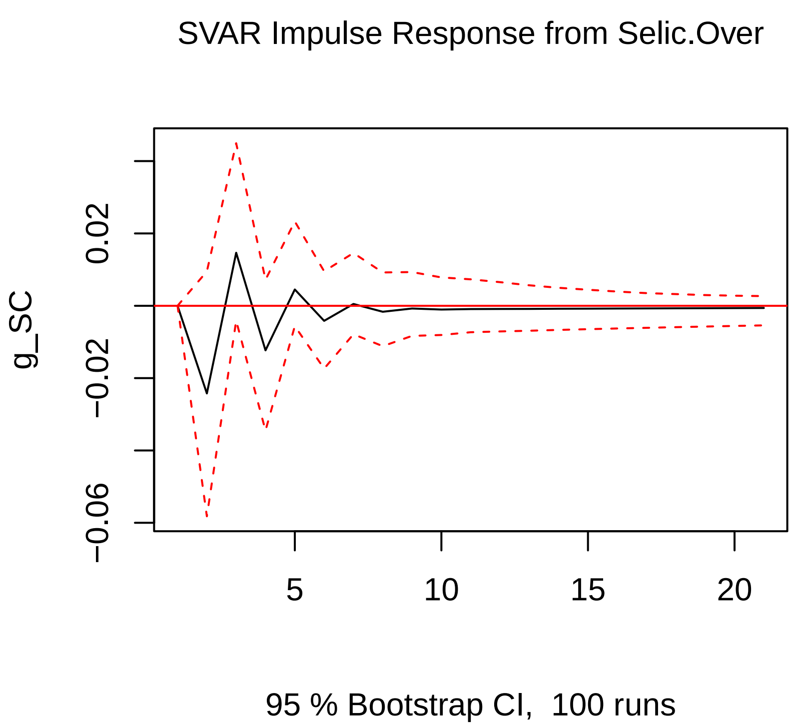
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 14.012, df = 16, p-value = 0.5978
##
##
## $g_SC
##
##  ARCH test (univariate)
##
## data:  Residual of g_SC equation
## Chi-squared = 21.884, df = 16, p-value = 0.147
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 18.704, df = 16, p-value = 0.2843
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 27.136, df = 16, p-value = 0.04
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_SC_pa
## Chi-squared = 576.6, df = 500, p-value = 0.009922
```

```r
#Estimando o VAR Estrutural
SVAR_SC_pa <- SVAR(VAR_SC_pa, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_SC_pa
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##               g_BR    g_SC    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_SC       0.07601 1.00000 0.00000          0
```

```
## IPCA       0.09457 0.09067 1.00000          0
## Selic.Over 0.08925 0.08726 0.09432          1
```

```
#Função Impulso-Resposta
SVAR_SC_irf_pa <- irf(SVAR_SC_pa, impulse = "Selic.Over", response = "g_SC", n.ahead=20, ortho = TRUE)
plot(SVAR_SC_irf_pa)
```




```
#----------------Período Estendido - 01-12-2010 até 01-10-2023----------------#

lagselect_SC_pe <- VARselect(base_SVAR_final[107:261,c(1,13,15,16)],lag.max=10, type="both")
lagselect_SC_pe$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```
lagselect_SC_pe$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.069346e+01 -3.102274e+01 -3.115411e+01 -3.124688e+01 -3.112947e+01
## HQ(n)  -3.049325e+01 -3.068908e+01 -3.068697e+01 -3.064628e+01 -3.039540e+01
## SC(n)  -3.020075e+01 -3.020158e+01 -3.000447e+01 -2.976878e+01 -2.932290e+01
## FPE(n)  4.678253e-14  3.368015e-14  2.957959e-14  2.703262e-14  3.053131e-14
##                    6             7             8             9            10
## AIC(n) -3.106735e+01 -3.093888e+01 -3.082316e+01 -3.070447e+01 -3.064266e+01
## HQ(n)  -3.019981e+01 -2.993788e+01 -2.968869e+01 -2.943654e+01 -2.924126e+01
## SC(n)  -2.893231e+01 -2.847538e+01 -2.803119e+01 -2.758404e+01 -2.719376e+01
## FPE(n)  3.269121e-14  3.749236e-14  4.257121e-14  4.863673e-14  5.268818e-14
```

```r
#Estimando o VAR Reduzido
VAR_SC_pe <- VAR(base_SVAR_final[107:261,c(1,13,15,16)], p = lagselect_SC_pe$selection[1], season = NULL
VAR_SC_pe
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_SC.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SC.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_SC.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.705248083   0.421393537   0.680817284  -0.006056272  -0.487338206
##       g_SC.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SC.l3
##   0.216398358  -0.570474822   0.014406602  -0.313761395   0.059466874
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SC.l4       IPCA.l4
##  -0.946375426   0.014840215  -0.166243672   0.003445850  -0.831007890
## Selic.Over.l4         const
##  -0.027973621   0.008863371
##
##
## Estimated coefficients for equation g_SC:
## =========================================
## Call:
## g_SC = g_BR.l1 + g_SC.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SC.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_SC.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.223941637  -0.008272447   1.369260521  -0.010948807  -0.222579964
##       g_SC.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SC.l3
##   0.122277352   1.029441538  -0.034985170  -0.059899327  -0.041709048
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SC.l4       IPCA.l4
##  -3.777133982   0.043998964  -0.001679000  -0.126192556   0.466351655
## Selic.Over.l4         const
##  -0.006616140   0.009586812
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_SC.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SC.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_SC.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -1.622994e-02  2.235993e-03  6.069065e-01  1.457236e-05 -2.068837e-02
##       g_SC.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SC.l3
##  2.528126e-02  4.727959e-02  6.420931e-03  2.085523e-02 -1.361750e-02
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SC.l4       IPCA.l4
## -3.139402e-02 -3.639288e-03  1.515997e-02 -1.328254e-02 -1.095648e-01
## Selic.Over.l4         const
## -3.288497e-03  2.653838e-03
##
##
## Estimated coefficients for equation Selic.Over:
```

```
## ================================================
## Call:
## Selic.Over = g_BR.l1 + g_SC.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SC.l2 + IPCA.l2 + Selic.Over.l
##
##        g_BR.l1        g_SC.l1        IPCA.l1 Selic.Over.l1        g_BR.l2
##     0.11450064     0.12242987     2.57476947     0.31195005     0.55619266
##        g_SC.l2        IPCA.l2 Selic.Over.l2        g_BR.l3        g_SC.l3
##    -0.41680404     1.28787305     0.63545976     0.37896152    -0.43210378
##        IPCA.l3 Selic.Over.l3        g_BR.l4        g_SC.l4        IPCA.l4
##     3.93026829     0.34175408     0.08786925    -0.04529452     4.10152211
## Selic.Over.l4          const
##    -0.32762904    -0.02792780
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_SC_pe, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_SC_pe
## Chi-squared = 86.235, df = 80, p-value = 0.297
```

```r
arch.test(VAR_SC_pe, multivariate.only = FALSE)
```

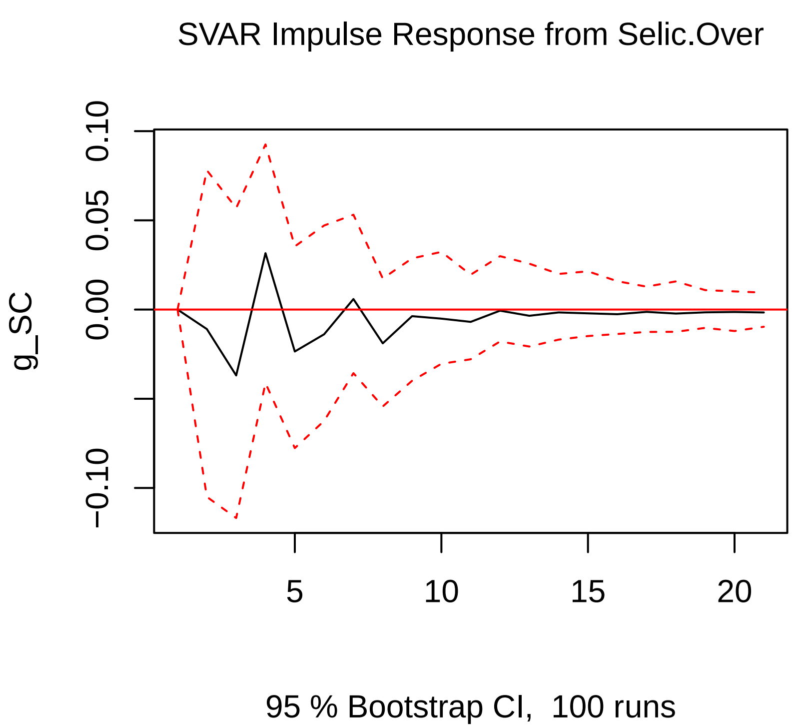
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 4.4746, df = 16, p-value = 0.9978
##
##
## $g_SC
##
##  ARCH test (univariate)
##
## data:  Residual of g_SC equation
## Chi-squared = 29.563, df = 16, p-value = 0.02041
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 7.6948, df = 16, p-value = 0.9574
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 35.07, df = 16, p-value = 0.003887
```

```
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_SC_pe
## Chi-squared = 670.8, df = 500, p-value = 4.643e-07
```

```r
#Estimando o VAR Estrutural
SVAR_SC_pe <- SVAR(VAR_SC_pe, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_SC_pe
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##                g_BR    g_SC    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_SC       0.02139 1.00000 0.00000          0
## IPCA       0.08527 0.07898 1.00000          0
## Selic.Over 0.07915 0.06655 0.09555          1
```

```r
#Função Impulso-Resposta
SVAR_SC_irf_pe <- irf(SVAR_SC_pe, impulse = "Selic.Over", response = "g_SC", n.ahead=20, ortho = TRUE)
plot(SVAR_SC_irf_pe)
```



```r
###########################################
################SÃO PAULO################
###########################################
#Selecionando o Lag
lagselect_SP <- VARselect(base_SVAR_final[,c(1,14,15,16)],lag.max=10, type="both")
lagselect_SP$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      2      4
```

```r
lagselect_SP$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.265692e+01 -3.298857e+01 -3.300615e+01 -3.307523e+01 -3.305144e+01
## HQ(n)  -3.252126e+01 -3.276248e+01 -3.268962e+01 -3.266827e+01 -3.255404e+01
## SC(n)  -3.231982e+01 -3.242674e+01 -3.221959e+01 -3.206395e+01 -3.181543e+01
## FPE(n)  6.565946e-15  4.713248e-15  4.632472e-15  4.325515e-15  4.433267e-15
##                    6             7             8             9            10
## AIC(n) -3.302295e+01 -3.296458e+01 -3.291869e+01 -3.289324e+01 -3.284460e+01
## HQ(n)  -3.243511e+01 -3.228630e+01 -3.214997e+01 -3.203409e+01 -3.189501e+01
## SC(n)  -3.156221e+01 -3.127910e+01 -3.100848e+01 -3.075830e+01 -3.048493e+01
## FPE(n)  4.566781e-15  4.849087e-15  5.087515e-15  5.232673e-15  5.511778e-15
```

```r
#Estimando o VAR Reduzido
VAR_SP <- VAR(base_SVAR_final[,c(1,14,15,16)], p = 5, season = NULL, exog = NULL, type = "const")
VAR_SP
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_SP.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SP.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_SP.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  0.1641917417 -0.2693404347  0.4309912934 -0.0101227184  0.3931597618
##       g_SP.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SP.l3
## -0.5010791495 -0.3175112173 -0.0052268505 -0.0328929741 -0.0627480758
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SP.l4       IPCA.l4
##  0.1114813271 -0.0134668734 -0.1551012280  0.0991004039 -1.1421677920
## Selic.Over.l4       g_BR.l5       g_SP.l5       IPCA.l5 Selic.Over.l5
##  0.0076783685 -0.1118474825  0.1309231442  0.4476129632  0.0234606066
##         const
##  0.0005297324
##
##
## Estimated coefficients for equation g_SP:
## =========================================
## Call:
## g_SP = g_BR.l1 + g_SP.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SP.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_SP.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  8.042698e-01 -8.550969e-01  3.177976e-01 -1.641193e-02  6.231901e-01
```

```
##       g_SP.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SP.l3
## -7.749229e-01 -4.014894e-01 -1.973775e-02  2.188098e-01 -2.526399e-01
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SP.l4       IPCA.l4
##  2.668389e-01  4.708160e-03 -5.357747e-03  1.517544e-02 -1.132165e+00
## Selic.Over.l4       g_BR.l5       g_SP.l5       IPCA.l5 Selic.Over.l5
##  2.211410e-02 -7.385674e-02  1.095574e-01  3.645930e-01  1.267903e-02
##         const
## -1.659096e-05
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_SP.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SP.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_SP.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0082758973  0.0028857976  0.6501383181 -0.0004412149 -0.0033106878
##       g_SP.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SP.l3
##  0.0001177041  0.0200584269  0.0045217211  0.0094338686 -0.0031809984
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SP.l4       IPCA.l4
##  0.0089282942  0.0011782639  0.0041371707 -0.0005433259 -0.0052711645
## Selic.Over.l4       g_BR.l5       g_SP.l5       IPCA.l5 Selic.Over.l5
##  0.0020770078  0.0001228855 -0.0076451751 -0.1675938317 -0.0067655059
##         const
##  0.0019709367
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_SP.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SP.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_SP.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.322505710  -0.156288112   2.416825705   0.329459263   0.078437240
##       g_SP.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SP.l3
##  -0.054167187   2.723602263   0.563924448   0.469804557  -0.383359019
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SP.l4       IPCA.l4
##   3.384170711   0.380720244   0.613234353  -0.471147091  -0.522013269
## Selic.Over.l4       g_BR.l5       g_SP.l5       IPCA.l5 Selic.Over.l5
##  -0.261645580   0.496797910  -0.402359023   3.454677720  -0.069035276
##         const
##  -0.008225199
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_SP, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_SP
## Chi-squared = 91.117, df = 80, p-value = 0.1858
```

```r
arch.test(VAR_SP, multivariate.only = FALSE)
```

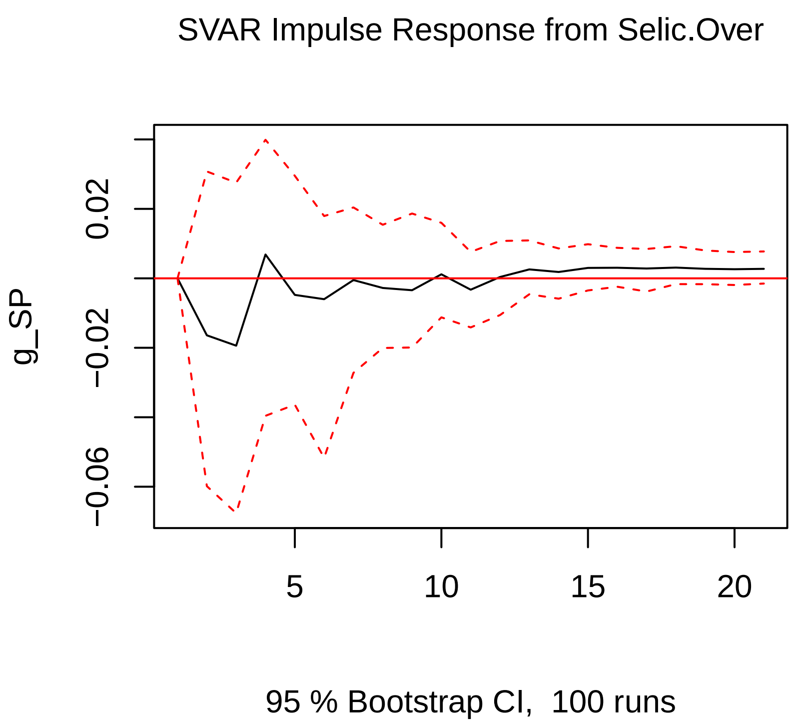
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 3.865, df = 16, p-value = 0.9991
##
##
## $g_SP
##
##  ARCH test (univariate)
##
## data:  Residual of g_SP equation
## Chi-squared = 4.43, df = 16, p-value = 0.9979
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 18.128, df = 16, p-value = 0.3165
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 53.497, df = 16, p-value = 6.263e-06
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_SP
## Chi-squared = 716.28, df = 500, p-value = 6.556e-10
```

```r
#Estimando o VAR Estrutural
SVAR_SP <- SVAR(VAR_SP, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_SP
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##               g_BR    g_SP    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_SP       0.03679 1.00000 0.00000          0
## IPCA       0.08752 0.08612 1.00000          0
```

```
## Selic.Over 0.07778 0.07830 0.09451          1
```

```r
#Função Impulso-Resposta
SVAR_SP_irf <- irf(SVAR_SP, impulse = "Selic.Over", response = "g_SP", n.ahead=20, ortho = TRUE)
plot(SVAR_SP_irf)
```




```r
###Comparando Diferentes Períodos###

#----------------Período dos Autores - 01-01-2002 até 01-11-2010----------------#

#Selecionando o Lag
lagselect_SP_pa <- VARselect(base_SVAR_final[1:106,c(1,14,15,16)],lag.max=10, type="both")
lagselect_SP_pa$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      2      1      1      2
```

```r
lagselect_SP_pa$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.430362e+01 -3.446953e+01 -3.441367e+01 -3.438187e+01 -3.439724e+01
## HQ(n)  -3.404449e+01 -3.403763e+01 -3.380901e+01 -3.360445e+01 -3.344707e+01
## SC(n)  -3.366254e+01 -3.340105e+01 -3.291780e+01 -3.245860e+01 -3.204659e+01
## FPE(n)  1.265927e-15  1.074957e-15  1.142808e-15  1.191091e-15  1.190862e-15
##                    6             7             8             9            10
## AIC(n) -3.430976e+01 -3.426668e+01 -3.423992e+01 -3.425207e+01 -3.418295e+01
## HQ(n)  -3.318683e+01 -3.297099e+01 -3.277147e+01 -3.261087e+01 -3.236899e+01
## SC(n)  -3.153172e+01 -3.106124e+01 -3.060709e+01 -3.019186e+01 -2.969534e+01
```

```
## FPE(n)  1.329032e-15  1.431334e-15  1.532844e-15  1.599392e-15  1.838410e-15
```

```r
#Estimando o VAR Reduzido
VAR_SP_pa <- VAR(base_SVAR_final[1:106,c(1,14,15,16)], p = 2, season = NULL, exog = NULL, type = "const
VAR_SP_pa
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_SP.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SP.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_SP.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   1.003732462  -0.798307356   0.199993512  -0.013113753   0.321023468
##       g_SP.l2       IPCA.l2 Selic.Over.l2         const
##  -0.365810047  -0.404298933   0.011099187   0.005763138
##
##
## Estimated coefficients for equation g_SP:
## =========================================
## Call:
## g_SP = g_BR.l1 + g_SP.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SP.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_SP.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   1.400091944  -1.273660500   0.124964003  -0.005209773   0.652821055
##       g_SP.l2       IPCA.l2 Selic.Over.l2         const
##  -0.581880384  -0.699340322   0.005638509   0.005256551
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_SP.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SP.l2 + IPCA.l2 + Selic.Over.l2 + co
##
##       g_BR.l1       g_SP.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
## -0.0516303315  0.0415347324  0.7796514122  0.0009374246  0.0119720855
##       g_SP.l2       IPCA.l2 Selic.Over.l2         const
## -0.0258376845 -0.0612463252 -0.0005648315  0.0011137397
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_SP.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SP.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_SP.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##     1.2598425    -1.6022588     4.0524225     0.4412432     1.1491980
##       g_SP.l2       IPCA.l2 Selic.Over.l2         const
##    -1.3504564     5.6864158     0.4767510     0.0412250
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:
```

```r
serial.test(VAR_SP_pa, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_SP_pa
## Chi-squared = 103.28, df = 80, p-value = 0.04104
```

```r
arch.test(VAR_SP_pa, multivariate.only = FALSE)
```

```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 34.114, df = 16, p-value = 0.005245
##
##
## $g_SP
##
##  ARCH test (univariate)
##
## data:  Residual of g_SP equation
## Chi-squared = 5.3501, df = 16, p-value = 0.9937
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 12.1, df = 16, p-value = 0.7371
##
##
## $Selic.Over
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 24.219, df = 16, p-value = 0.08482
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_SP_pa
## Chi-squared = 657.4, df = 500, p-value = 2.624e-06
```

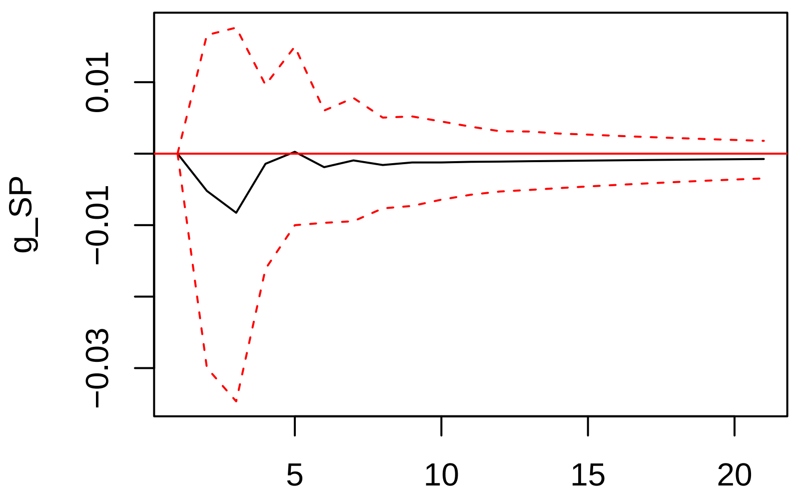
```r
#Estimando o VAR Estrutural
SVAR_SP_pa <- SVAR(VAR_SP_pa, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_SP_pa
```

```
##
## SVAR Estimation Results:
## ========================
```

```
##
##
## Estimated A matrix:
##                g_BR    g_SP    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_SP       0.08142 1.00000 0.00000          0
## IPCA       0.09558 0.09524 1.00000          0
## Selic.Over 0.10572 0.10306 0.09676          1
```

```
#Função Impulso-Resposta
SVAR_SP_irf_pa <- irf(SVAR_SP_pa, impulse = "Selic.Over", response = "g_SP", n.ahead=20, ortho = TRUE)
plot(SVAR_SP_irf_pa)
```

SVAR Impulse Response from Selic.Over



95 % Bootstrap CI, 100 runs

```
#----------------Período Estendido - 01-12-2010 até 01-10-2023----------------#

lagselect_SP_pe <- VARselect(base_SVAR_final[107:261,c(1,14,15,16)],lag.max=10, type="both")
lagselect_SP_pe$selection
```

```
## AIC(n)  HQ(n)  SC(n) FPE(n)
##      4      2      1      4
```

```
lagselect_SP_pe$criteria
```

```
##                    1             2             3             4             5
## AIC(n) -3.214089e+01 -3.245577e+01 -3.246674e+01 -3.253224e+01 -3.243688e+01
## HQ(n)  -3.194069e+01 -3.212211e+01 -3.199961e+01 -3.193164e+01 -3.170281e+01
## SC(n)  -3.164819e+01 -3.163461e+01 -3.131711e+01 -3.105414e+01 -3.063031e+01
## FPE(n)  1.100201e-14  8.035577e-15  7.960151e-15  7.475884e-15  8.259329e-15
```

```
##                   6             7             8             9            10
## AIC(n) -3.241605e+01 -3.238769e+01 -3.229559e+01 -3.223639e+01 -3.209839e+01
## HQ(n)  -3.154851e+01 -3.138669e+01 -3.116112e+01 -3.096846e+01 -3.069698e+01
## SC(n)  -3.028101e+01 -2.992419e+01 -2.950362e+01 -2.911596e+01 -2.864948e+01
## FPE(n)  8.485873e-15  8.805065e-15  9.764426e-15  1.051139e-14  1.228854e-14
```

```
#Estimando o VAR Reduzido
VAR_SP_pe <- VAR(base_SVAR_final[107:261,c(1,14,15,16)], p = lagselect_SP_pe$selection[1], season = NULL
VAR_SP_pe
```

```
##
## VAR Estimation Results:
## =======================
##
## Estimated coefficients for equation g_BR:
## =========================================
## Call:
## g_BR = g_BR.l1 + g_SP.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SP.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_SP.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  -0.219206090  -0.004810144   0.373982993  -0.005712785   0.146423166
##       g_SP.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SP.l3
##  -0.364140126  -0.082551376   0.021213794  -0.138122056  -0.040239744
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SP.l4       IPCA.l4
##  -0.394465179   0.003151522  -0.175745658   0.030446776  -1.693332522
## Selic.Over.l4         const
##  -0.024827873   0.011064278
##
##
## Estimated coefficients for equation g_SP:
## =========================================
## Call:
## g_SP = g_BR.l1 + g_SP.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SP.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_SP.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   0.450544278  -0.600018291   0.265531869  -0.014144862   0.367873304
##       g_SP.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SP.l3
##  -0.645553962  -0.093545130  -0.002219787   0.055782886  -0.180664788
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SP.l4       IPCA.l4
##  -0.251699568   0.021631578  -0.032747654  -0.051101843  -1.545435153
## Selic.Over.l4         const
##  -0.012063806   0.010287539
##
##
## Estimated coefficients for equation IPCA:
## =========================================
## Call:
## IPCA = g_BR.l1 + g_SP.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SP.l2 + IPCA.l2 + Selic.Over.l2 + g_
##
##       g_BR.l1       g_SP.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##  0.0129722638 -0.0151915026  0.5678243117  0.0006559568  0.0177498332
##       g_SP.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SP.l3
## -0.0150107305  0.0363456534  0.0063300194  0.0088823861 -0.0030698312
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SP.l4       IPCA.l4
##  0.0301811718 -0.0033168994 -0.0024187804  0.0083152446 -0.1443844992
```

```
## Selic.Over.l4         const
## -0.0041256360  0.0027494038
##
##
## Estimated coefficients for equation Selic.Over:
## ===============================================
## Call:
## Selic.Over = g_BR.l1 + g_SP.l1 + IPCA.l1 + Selic.Over.l1 + g_BR.l2 + g_SP.l2 + IPCA.l2 + Selic.Over.l
##
##       g_BR.l1       g_SP.l1       IPCA.l1 Selic.Over.l1       g_BR.l2
##   -0.21812269    0.25186910    2.07836491    0.33903919   -0.64861276
##       g_SP.l2       IPCA.l2 Selic.Over.l2       g_BR.l3       g_SP.l3
##    0.55720413    1.88842349    0.63854867    0.22890637   -0.26938133
##       IPCA.l3 Selic.Over.l3       g_BR.l4       g_SP.l4       IPCA.l4
##    3.74717839    0.30914551    0.62665027   -0.58911411    3.05246977
## Selic.Over.l4         const
##   -0.32274273   -0.02516197
```

```r
#Testando para presença de autocorrelação e heterocedasticidade nos resíduos:

serial.test(VAR_SP, type="BG")
```

```
##
##  Breusch-Godfrey LM test
##
## data:  Residuals of VAR object VAR_SP
## Chi-squared = 91.117, df = 80, p-value = 0.1858
```

```r
arch.test(VAR_SP, multivariate.only = FALSE)
```

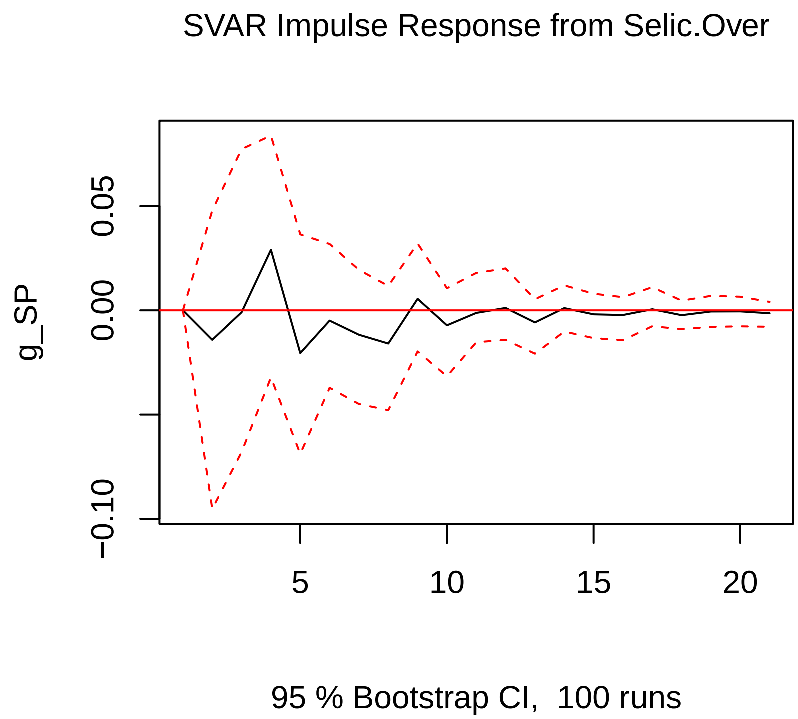
```
## $g_BR
##
##  ARCH test (univariate)
##
## data:  Residual of g_BR equation
## Chi-squared = 3.865, df = 16, p-value = 0.9991
##
##
## $g_SP
##
##  ARCH test (univariate)
##
## data:  Residual of g_SP equation
## Chi-squared = 4.43, df = 16, p-value = 0.9979
##
##
## $IPCA
##
##  ARCH test (univariate)
##
## data:  Residual of IPCA equation
## Chi-squared = 18.128, df = 16, p-value = 0.3165
##
##
## $Selic.Over
```

```
##
##  ARCH test (univariate)
##
## data:  Residual of Selic.Over equation
## Chi-squared = 53.497, df = 16, p-value = 6.263e-06
##
##
##
##  ARCH (multivariate)
##
## data:  Residuals of VAR object VAR_SP
## Chi-squared = 716.28, df = 500, p-value = 6.556e-10
```

```r
#Estimando o VAR Estrutural
SVAR_SP_pe <- SVAR(VAR_SP_pe, Amat=amat, Bmat = NULL, hessian = TRUE, estmethod ="scoring")
SVAR_SP_pe
```

```
##
## SVAR Estimation Results:
## ========================
##
##
## Estimated A matrix:
##               g_BR    g_SP    IPCA Selic.Over
## g_BR       1.00000 0.00000 0.00000          0
## g_SP       0.01196 1.00000 0.00000          0
## IPCA       0.08378 0.08105 1.00000          0
## Selic.Over 0.07179 0.07132 0.09542          1
```

```r
#Função Impulso-Resposta
SVAR_SP_irf_pe <- irf(SVAR_SP_pe, impulse = "Selic.Over", response = "g_SP", n.ahead=20, ortho = TRUE)
plot(SVAR_SP_irf_pe)
```


SVAR Impulse Response from Selic.Over
g_SP
0.05
0.00
−0.10
5
10
15
20
95 % Bootstrap CI, 100 runs