VAR SVAR

2024-11-01

library(vars)

## Warning: 패키지 'vars'는 R 버전 4.3.3에서 작성되었습니다

## 필요한 패키지를 로딩중입니다: MASS

## 필요한 패키지를 로딩중입니다: strucchange

## Warning: 패키지 'strucchange'는 R 버전 4.3.3에서 작성되었습니다

## 필요한 패키지를 로딩중입니다: zoo

## Warning: 패키지 'zoo'는 R 버전 4.3.2에서 작성되었습니다

##   
## 다음의 패키지를 부착합니다: 'zoo'

## The following objects are masked from 'package:base':  
##   
## as.Date, as.Date.numeric

## 필요한 패키지를 로딩중입니다: sandwich

## Warning: 패키지 'sandwich'는 R 버전 4.3.3에서 작성되었습니다

## 필요한 패키지를 로딩중입니다: urca

## Warning: 패키지 'urca'는 R 버전 4.3.3에서 작성되었습니다

## 필요한 패키지를 로딩중입니다: lmtest

## Warning: 패키지 'lmtest'는 R 버전 4.3.2에서 작성되었습니다

library(svars)

## Warning: 패키지 'svars'는 R 버전 4.3.3에서 작성되었습니다

## Registered S3 method overwritten by 'svars':  
## method from  
## stability.varest vars

library(readr)

## Warning: 패키지 'readr'는 R 버전 4.3.3에서 작성되었습니다

1. VAR

insurance = read\_csv("C:/Users/scw/Downloads/Robust\_Standardized\_Data.csv")

## Rows: 108 Columns: 9  
## ── Column specification ────────────────────────────────────────────────────────  
## Delimiter: ","  
## chr (1): date  
## dbl (8): CD, unemployment, CCI, CPI, KOSPI, whole, annuity, universal  
##   
## ℹ Use `spec()` to retrieve the full column specification for this data.  
## ℹ Specify the column types or set `show\_col\_types = FALSE` to quiet this message.

head(insurance)

## # A tibble: 6 × 9  
## CD unemployment CCI CPI KOSPI whole annuity universal date   
## <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <chr>   
## 1 0 -0.25 0.249 0.881 -0.245 0.371 -0.417 -0.387 2014\_01  
## 2 0 1 -0.749 -0.420 0.956 0.341 0.324 0.406 2014\_02  
## 3 0 -1.5 0.249 -0.0639 -0.213 -0.353 0.336 0.129 2014\_03  
## 4 0 1 -0.748 -0.134 -0.179 0.00464 -0.506 -0.523 2014\_04  
## 5 0 -0.75 -0.501 0.282 0.528 -0.355 0.162 0.338 2014\_05  
## 6 0 0.25 1.00 -0.464 -0.151 1.04 -0.0859 -0.0615 2014\_06

insurance = subset(insurance)  
str(insurance)

## tibble [108 × 9] (S3: tbl\_df/tbl/data.frame)  
## $ CD : num [1:108] 0 0 0 0 0 ...  
## $ unemployment: num [1:108] -0.25 1 -1.5 1 -0.75 0.25 0 0.25 -0.5 0.5 ...  
## $ CCI : num [1:108] 0.249 -0.749 0.249 -0.748 -0.501 ...  
## $ CPI : num [1:108] 0.8813 -0.4196 -0.0639 -0.1336 0.2823 ...  
## $ KOSPI : num [1:108] -0.245 0.956 -0.213 -0.179 0.528 ...  
## $ whole : num [1:108] 0.37123 0.34107 -0.35267 0.00464 -0.35499 ...  
## $ annuity : num [1:108] -0.417 0.324 0.336 -0.506 0.162 ...  
## $ universal : num [1:108] -0.387 0.406 0.129 -0.523 0.338 ...  
## $ date : chr [1:108] "2014\_01" "2014\_02" "2014\_03" "2014\_04" ...

insurance\_whole = subset(insurance, select = c(CD, unemployment, CCI, CPI, KOSPI, whole))  
head(insurance\_whole)

## # A tibble: 6 × 6  
## CD unemployment CCI CPI KOSPI whole  
## <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 0 -0.25 0.249 0.881 -0.245 0.371   
## 2 0 1 -0.749 -0.420 0.956 0.341   
## 3 0 -1.5 0.249 -0.0639 -0.213 -0.353   
## 4 0 1 -0.748 -0.134 -0.179 0.00464  
## 5 0 -0.75 -0.501 0.282 0.528 -0.355   
## 6 0 0.25 1.00 -0.464 -0.151 1.04

insurance\_annuity = subset(insurance, select = c(CD, unemployment, CCI, CPI, KOSPI, annuity))  
head(insurance\_annuity)

## # A tibble: 6 × 6  
## CD unemployment CCI CPI KOSPI annuity  
## <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 0 -0.25 0.249 0.881 -0.245 -0.417   
## 2 0 1 -0.749 -0.420 0.956 0.324   
## 3 0 -1.5 0.249 -0.0639 -0.213 0.336   
## 4 0 1 -0.748 -0.134 -0.179 -0.506   
## 5 0 -0.75 -0.501 0.282 0.528 0.162   
## 6 0 0.25 1.00 -0.464 -0.151 -0.0859

insurance\_universal = subset(insurance, select = c(CD, unemployment, CCI, CPI, KOSPI, universal))  
head(insurance\_universal)

## # A tibble: 6 × 6  
## CD unemployment CCI CPI KOSPI universal  
## <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 0 -0.25 0.249 0.881 -0.245 -0.387   
## 2 0 1 -0.749 -0.420 0.956 0.406   
## 3 0 -1.5 0.249 -0.0639 -0.213 0.129   
## 4 0 1 -0.748 -0.134 -0.179 -0.523   
## 5 0 -0.75 -0.501 0.282 0.528 0.338   
## 6 0 0.25 1.00 -0.464 -0.151 -0.0615

lag\_selection\_whole = VARselect(insurance\_whole, type = "const")  
print(lag\_selection\_whole$selection)

## AIC(n) HQ(n) SC(n) FPE(n)   
## 10 3 1 6

lag\_selection\_whole = VARselect(insurance\_whole, lag.max = 12, type = "const")  
print(lag\_selection\_whole$selection)

## AIC(n) HQ(n) SC(n) FPE(n)   
## 12 12 1 12

var\_model\_whole = VAR(insurance\_whole, p=1)  
summary(var\_model\_whole)

##   
## VAR Estimation Results:  
## =========================   
## Endogenous variables: CD, unemployment, CCI, CPI, KOSPI, whole   
## Deterministic variables: const   
## Sample size: 107   
## Log Likelihood: -848.599   
## Roots of the characteristic polynomial:  
## 0.5927 0.5927 0.5021 0.3944 0.3944 0.1216  
## Call:  
## VAR(y = insurance\_whole, p = 1)  
##   
##   
## Estimation results for equation CD:   
## ===================================   
## CD = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + whole.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 -0.392575 0.094784 -4.142 7.21e-05 \*\*\*  
## unemployment.l1 0.005966 0.103973 0.057 0.954   
## CCI.l1 0.058784 0.117316 0.501 0.617   
## CPI.l1 -0.034591 0.125963 -0.275 0.784   
## KOSPI.l1 -0.086919 0.094115 -0.924 0.358   
## whole.l1 0.026981 0.052910 0.510 0.611   
## const 0.016595 0.099730 0.166 0.868   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 1.022 on 100 degrees of freedom  
## Multiple R-Squared: 0.1774, Adjusted R-squared: 0.128   
## F-statistic: 3.593 on 6 and 100 DF, p-value: 0.00288   
##   
##   
## Estimation results for equation unemployment:   
## =============================================   
## unemployment = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + whole.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 -0.158749 0.073114 -2.171 0.0323 \*   
## unemployment.l1 -0.608760 0.080202 -7.590 1.71e-11 \*\*\*  
## CCI.l1 -0.005658 0.090495 -0.063 0.9503   
## CPI.l1 0.032697 0.097164 0.337 0.7372   
## KOSPI.l1 0.069846 0.072598 0.962 0.3383   
## whole.l1 -0.039641 0.040813 -0.971 0.3338   
## const -0.001961 0.076930 -0.025 0.9797   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 0.7882 on 100 degrees of freedom  
## Multiple R-Squared: 0.3897, Adjusted R-squared: 0.3531   
## F-statistic: 10.64 on 6 and 100 DF, p-value: 4.051e-09   
##   
##   
## Estimation results for equation CCI:   
## ====================================   
## CCI = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + whole.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 0.18310 0.07807 2.345 0.0210 \*  
## unemployment.l1 -0.04877 0.08564 -0.570 0.5703   
## CCI.l1 -0.18765 0.09663 -1.942 0.0549 .  
## CPI.l1 0.05066 0.10375 0.488 0.6264   
## KOSPI.l1 -0.05119 0.07752 -0.660 0.5105   
## whole.l1 0.04683 0.04358 1.075 0.2852   
## const -0.02479 0.08214 -0.302 0.7634   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 0.8416 on 100 degrees of freedom  
## Multiple R-Squared: 0.1091, Adjusted R-squared: 0.05563   
## F-statistic: 2.041 on 6 and 100 DF, p-value: 0.06711   
##   
##   
## Estimation results for equation CPI:   
## ====================================   
## CPI = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + whole.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 0.08212 0.07027 1.169 0.2453   
## unemployment.l1 0.09504 0.07708 1.233 0.2205   
## CCI.l1 0.07458 0.08697 0.857 0.3932   
## CPI.l1 -0.24458 0.09338 -2.619 0.0102 \*  
## KOSPI.l1 0.08187 0.06977 1.173 0.2434   
## whole.l1 0.08892 0.03922 2.267 0.0255 \*  
## const 0.10234 0.07394 1.384 0.1694   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 0.7576 on 100 degrees of freedom  
## Multiple R-Squared: 0.1344, Adjusted R-squared: 0.0825   
## F-statistic: 2.589 on 6 and 100 DF, p-value: 0.02255   
##   
##   
## Estimation results for equation KOSPI:   
## ======================================   
## KOSPI = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + whole.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 0.15266 0.08949 1.706 0.0911 .   
## unemployment.l1 0.07600 0.09817 0.774 0.4406   
## CCI.l1 0.05071 0.11076 0.458 0.6481   
## CPI.l1 -0.10465 0.11893 -0.880 0.3810   
## KOSPI.l1 -0.52521 0.08886 -5.911 4.75e-08 \*\*\*  
## whole.l1 0.06157 0.04995 1.233 0.2206   
## const 0.09985 0.09416 1.060 0.2915   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 0.9648 on 100 degrees of freedom  
## Multiple R-Squared: 0.2825, Adjusted R-squared: 0.2395   
## F-statistic: 6.563 on 6 and 100 DF, p-value: 7.21e-06   
##   
##   
## Estimation results for equation whole:   
## ======================================   
## whole = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + whole.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 0.25416 0.13648 1.862 0.0655 .   
## unemployment.l1 0.16824 0.14971 1.124 0.2638   
## CCI.l1 0.18597 0.16892 1.101 0.2736   
## CPI.l1 -0.24584 0.18137 -1.355 0.1783   
## KOSPI.l1 -0.05856 0.13551 -0.432 0.6666   
## whole.l1 -0.60162 0.07618 -7.897 3.78e-12 \*\*\*  
## const 0.02743 0.14360 0.191 0.8489   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 1.471 on 100 degrees of freedom  
## Multiple R-Squared: 0.462, Adjusted R-squared: 0.4297   
## F-statistic: 14.31 on 6 and 100 DF, p-value: 1.029e-11   
##   
##   
##   
## Covariance matrix of residuals:  
## CD unemployment CCI CPI KOSPI whole  
## CD 1.04420 -0.12249 0.00509 -0.06913 0.12144 -0.16779  
## unemployment -0.12249 0.62132 -0.06191 0.09935 -0.02744 -0.05602  
## CCI 0.00509 -0.06191 0.70836 -0.02585 0.04244 -0.12221  
## CPI -0.06913 0.09935 -0.02585 0.57390 -0.03909 0.12355  
## KOSPI 0.12144 -0.02744 0.04244 -0.03909 0.93081 0.02696  
## whole -0.16779 -0.05602 -0.12221 0.12355 0.02696 2.16487  
##   
## Correlation matrix of residuals:  
## CD unemployment CCI CPI KOSPI whole  
## CD 1.000000 -0.15207 0.005918 -0.08930 0.12318 -0.11160  
## unemployment -0.152073 1.00000 -0.093327 0.16638 -0.03608 -0.04831  
## CCI 0.005918 -0.09333 1.000000 -0.04055 0.05226 -0.09869  
## CPI -0.089299 0.16638 -0.040546 1.00000 -0.05349 0.11085  
## KOSPI 0.123183 -0.03608 0.052261 -0.05349 1.00000 0.01899  
## whole -0.111598 -0.04831 -0.098688 0.11085 0.01899 1.00000

var\_model\_annuity = VAR(insurance\_annuity, p=1)  
summary(var\_model\_annuity)

##   
## VAR Estimation Results:  
## =========================   
## Endogenous variables: CD, unemployment, CCI, CPI, KOSPI, annuity   
## Deterministic variables: const   
## Sample size: 107   
## Log Likelihood: -811.479   
## Roots of the characteristic polynomial:  
## 0.6423 0.6423 0.455 0.3611 0.3611 0.1214  
## Call:  
## VAR(y = insurance\_annuity, p = 1)  
##   
##   
## Estimation results for equation CD:   
## ===================================   
## CD = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + annuity.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 -0.406085 0.093155 -4.359 3.17e-05 \*\*\*  
## unemployment.l1 -0.001321 0.103191 -0.013 0.990   
## CCI.l1 0.040067 0.121071 0.331 0.741   
## CPI.l1 -0.034428 0.126074 -0.273 0.785   
## KOSPI.l1 -0.083314 0.094473 -0.882 0.380   
## annuity.l1 -0.022214 0.076672 -0.290 0.773   
## const 0.016362 0.099821 0.164 0.870   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 1.023 on 100 degrees of freedom  
## Multiple R-Squared: 0.1759, Adjusted R-squared: 0.1265   
## F-statistic: 3.558 on 6 and 100 DF, p-value: 0.003099   
##   
##   
## Estimation results for equation unemployment:   
## =============================================   
## unemployment = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + annuity.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 -0.142855 0.072131 -1.980 0.0504 .   
## unemployment.l1 -0.598578 0.079902 -7.491 2.77e-11 \*\*\*  
## CCI.l1 0.008677 0.093747 0.093 0.9264   
## CPI.l1 0.032622 0.097621 0.334 0.7389   
## KOSPI.l1 0.067512 0.073152 0.923 0.3583   
## annuity.l1 0.003125 0.059368 0.053 0.9581   
## const -0.001890 0.077292 -0.024 0.9805   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 0.7919 on 100 degrees of freedom  
## Multiple R-Squared: 0.384, Adjusted R-squared: 0.347   
## F-statistic: 10.39 on 6 and 100 DF, p-value: 6.289e-09   
##   
##   
## Estimation results for equation CCI:   
## ====================================   
## CCI = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + annuity.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 0.18093 0.07570 2.390 0.0187 \*  
## unemployment.l1 -0.05860 0.08386 -0.699 0.4863   
## CCI.l1 -0.14931 0.09839 -1.518 0.1323   
## CPI.l1 0.05005 0.10246 0.489 0.6262   
## KOSPI.l1 -0.06087 0.07677 -0.793 0.4298   
## annuity.l1 0.12022 0.06231 1.929 0.0565 .  
## const -0.02374 0.08112 -0.293 0.7704   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 0.8312 on 100 degrees of freedom  
## Multiple R-Squared: 0.1311, Adjusted R-squared: 0.07901   
## F-statistic: 2.516 on 6 and 100 DF, p-value: 0.02612   
##   
##   
## Estimation results for equation CPI:   
## ====================================   
## CPI = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + annuity.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 0.05113 0.07067 0.724 0.471   
## unemployment.l1 0.07282 0.07828 0.930 0.355   
## CCI.l1 0.05795 0.09185 0.631 0.530   
## CPI.l1 -0.24461 0.09564 -2.558 0.012 \*  
## KOSPI.l1 0.08362 0.07167 1.167 0.246   
## annuity.l1 0.02779 0.05817 0.478 0.634   
## const 0.10250 0.07573 1.354 0.179   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 0.7759 on 100 degrees of freedom  
## Multiple R-Squared: 0.09202, Adjusted R-squared: 0.03755   
## F-statistic: 1.689 on 6 and 100 DF, p-value: 0.1314   
##   
##   
## Estimation results for equation KOSPI:   
## ======================================   
## KOSPI = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + annuity.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 0.13535 0.08833 1.532 0.129   
## unemployment.l1 0.06116 0.09784 0.625 0.533   
## CCI.l1 0.05303 0.11480 0.462 0.645   
## CPI.l1 -0.10485 0.11954 -0.877 0.383   
## KOSPI.l1 -0.52712 0.08958 -5.884 5.34e-08 \*\*\*  
## annuity.l1 0.05027 0.07270 0.691 0.491   
## const 0.10024 0.09465 1.059 0.292   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 0.9698 on 100 degrees of freedom  
## Multiple R-Squared: 0.2751, Adjusted R-squared: 0.2316   
## F-statistic: 6.325 on 6 and 100 DF, p-value: 1.149e-05   
##   
##   
## Estimation results for equation annuity:   
## ========================================   
## annuity = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + annuity.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 0.007571 0.093174 0.081 0.9354   
## unemployment.l1 0.054614 0.103211 0.529 0.5979   
## CCI.l1 0.090874 0.121095 0.750 0.4548   
## CPI.l1 -0.258568 0.126099 -2.051 0.0429 \*   
## KOSPI.l1 0.008632 0.094492 0.091 0.9274   
## annuity.l1 -0.651547 0.076687 -8.496 1.92e-13 \*\*\*  
## const 0.020527 0.099840 0.206 0.8375   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 1.023 on 100 degrees of freedom  
## Multiple R-Squared: 0.4699, Adjusted R-squared: 0.438   
## F-statistic: 14.77 on 6 and 100 DF, p-value: 5.075e-12   
##   
##   
##   
## Covariance matrix of residuals:  
## CD unemployment CCI CPI KOSPI annuity  
## CD 1.04604 -0.12636 0.01455 -0.05908 0.12963 -0.10905  
## unemployment -0.12636 0.62716 -0.06951 0.08605 -0.03682 0.03473  
## CCI 0.01455 -0.06951 0.69083 -0.01627 0.04244 -0.13998  
## CPI -0.05908 0.08605 -0.01627 0.60202 -0.02116 -0.01561  
## KOSPI 0.12963 -0.03682 0.04244 -0.02116 0.94045 0.11421  
## annuity -0.10905 0.03473 -0.13998 -0.01561 0.11421 1.04646  
##   
## Correlation matrix of residuals:  
## CD unemployment CCI CPI KOSPI annuity  
## CD 1.00000 -0.15600 0.01712 -0.07445 0.13069 -0.10423  
## unemployment -0.15600 1.00000 -0.10560 0.14004 -0.04794 0.04287  
## CCI 0.01712 -0.10560 1.00000 -0.02522 0.05265 -0.16464  
## CPI -0.07445 0.14004 -0.02522 1.00000 -0.02812 -0.01966  
## KOSPI 0.13069 -0.04794 0.05265 -0.02812 1.00000 0.11513  
## annuity -0.10423 0.04287 -0.16464 -0.01966 0.11513 1.00000

var\_model\_universal = VAR(insurance\_universal, p=1)  
summary(var\_model\_universal)

##   
## VAR Estimation Results:  
## =========================   
## Endogenous variables: CD, unemployment, CCI, CPI, KOSPI, universal   
## Deterministic variables: const   
## Sample size: 107   
## Log Likelihood: -808.983   
## Roots of the characteristic polynomial:  
## 0.6766 0.5977 0.4386 0.3823 0.3823 0.1537  
## Call:  
## VAR(y = insurance\_universal, p = 1)  
##   
##   
## Estimation results for equation CD:   
## ===================================   
## CD = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + universal.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 -0.411055 0.092975 -4.421 2.5e-05 \*\*\*  
## unemployment.l1 -0.006321 0.103189 -0.061 0.951   
## CCI.l1 0.038895 0.116806 0.333 0.740   
## CPI.l1 -0.021968 0.126893 -0.173 0.863   
## KOSPI.l1 -0.081272 0.094109 -0.864 0.390   
## universal.l1 -0.056393 0.075334 -0.749 0.456   
## const 0.015403 0.099594 0.155 0.877   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 1.02 on 100 degrees of freedom  
## Multiple R-Squared: 0.1798, Adjusted R-squared: 0.1306   
## F-statistic: 3.654 on 6 and 100 DF, p-value: 0.002542   
##   
##   
## Estimation results for equation unemployment:   
## =============================================   
## unemployment = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + universal.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 -0.137975 0.072015 -1.916 0.0582 .   
## unemployment.l1 -0.595037 0.079926 -7.445 3.48e-11 \*\*\*  
## CCI.l1 0.014672 0.090473 0.162 0.8715   
## CPI.l1 0.024249 0.098286 0.247 0.8056   
## KOSPI.l1 0.064978 0.072893 0.891 0.3748   
## universal.l1 0.037601 0.058350 0.644 0.5208   
## const -0.001143 0.077141 -0.015 0.9882   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 0.7903 on 100 degrees of freedom  
## Multiple R-Squared: 0.3865, Adjusted R-squared: 0.3497   
## F-statistic: 10.5 on 6 and 100 DF, p-value: 5.183e-09   
##   
##   
## Estimation results for equation CCI:   
## ====================================   
## CCI = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + universal.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 0.17615 0.07649 2.303 0.0234 \*  
## unemployment.l1 -0.05304 0.08490 -0.625 0.5335   
## CCI.l1 -0.18713 0.09610 -1.947 0.0543 .  
## CPI.l1 0.03278 0.10440 0.314 0.7542   
## KOSPI.l1 -0.05490 0.07743 -0.709 0.4799   
## universal.l1 0.08042 0.06198 1.298 0.1974   
## const -0.02319 0.08194 -0.283 0.7778   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 0.8395 on 100 degrees of freedom  
## Multiple R-Squared: 0.1137, Adjusted R-squared: 0.06054   
## F-statistic: 2.139 on 6 and 100 DF, p-value: 0.0554   
##   
##   
## Estimation results for equation CPI:   
## ====================================   
## CPI = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + universal.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 0.04953 0.07076 0.700 0.4856   
## unemployment.l1 0.07376 0.07853 0.939 0.3498   
## CCI.l1 0.04850 0.08889 0.546 0.5866   
## CPI.l1 -0.24781 0.09657 -2.566 0.0118 \*  
## KOSPI.l1 0.08527 0.07162 1.191 0.2366   
## universal.l1 0.01503 0.05733 0.262 0.7938   
## const 0.10256 0.07579 1.353 0.1791   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 0.7765 on 100 degrees of freedom  
## Multiple R-Squared: 0.09058, Adjusted R-squared: 0.03601   
## F-statistic: 1.66 on 6 and 100 DF, p-value: 0.1387   
##   
##   
## Estimation results for equation KOSPI:   
## ======================================   
## KOSPI = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + universal.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 0.13134 0.08855 1.483 0.141   
## unemployment.l1 0.06212 0.09827 0.632 0.529   
## CCI.l1 0.03440 0.11124 0.309 0.758   
## CPI.l1 -0.10887 0.12085 -0.901 0.370   
## KOSPI.l1 -0.52354 0.08963 -5.841 6.48e-08 \*\*\*  
## universal.l1 0.01930 0.07175 0.269 0.788   
## const 0.10018 0.09485 1.056 0.293   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 0.9717 on 100 degrees of freedom  
## Multiple R-Squared: 0.2722, Adjusted R-squared: 0.2285   
## F-statistic: 6.232 on 6 and 100 DF, p-value: 1.379e-05   
##   
##   
## Estimation results for equation universal:   
## ==========================================   
## universal = CD.l1 + unemployment.l1 + CCI.l1 + CPI.l1 + KOSPI.l1 + universal.l1 + const   
##   
## Estimate Std. Error t value Pr(>|t|)   
## CD.l1 0.05431 0.08969 0.606 0.5462   
## unemployment.l1 0.02378 0.09954 0.239 0.8117   
## CCI.l1 0.06713 0.11268 0.596 0.5527   
## CPI.l1 -0.25263 0.12241 -2.064 0.0416 \*   
## KOSPI.l1 0.04698 0.09078 0.517 0.6060   
## universal.l1 -0.65760 0.07267 -9.049 1.2e-14 \*\*\*  
## const 0.02788 0.09607 0.290 0.7722   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
##   
## Residual standard error: 0.9843 on 100 degrees of freedom  
## Multiple R-Squared: 0.4993, Adjusted R-squared: 0.4693   
## F-statistic: 16.62 on 6 and 100 DF, p-value: 3.265e-13   
##   
##   
##   
## Covariance matrix of residuals:  
## CD unemployment CCI CPI KOSPI universal  
## CD 1.04108 -0.12259 0.01812 -0.05862 0.12964 -0.15991  
## unemployment -0.12259 0.62459 -0.07439 0.08517 -0.03787 0.02596  
## CCI 0.01812 -0.07439 0.70468 -0.01254 0.05034 -0.02087  
## CPI -0.05862 0.08517 -0.01254 0.60298 -0.01920 0.08578  
## KOSPI 0.12964 -0.03787 0.05034 -0.01920 0.94426 0.06162  
## universal -0.15991 0.02596 -0.02087 0.08578 0.06162 0.96876  
##   
## Correlation matrix of residuals:  
## CD unemployment CCI CPI KOSPI universal  
## CD 1.00000 -0.15203 0.02116 -0.07399 0.13075 -0.15923  
## unemployment -0.15203 1.00000 -0.11212 0.13878 -0.04931 0.03337  
## CCI 0.02116 -0.11212 1.00000 -0.01923 0.06172 -0.02526  
## CPI -0.07399 0.13878 -0.01923 1.00000 -0.02545 0.11224  
## KOSPI 0.13075 -0.04931 0.06172 -0.02545 1.00000 0.06442  
## universal -0.15923 0.03337 -0.02526 0.11224 0.06442 1.00000

# A\_mat 행렬 설정 (6x6)  
A\_mat <- matrix(NA, 6, 6) # 6x6 행렬 생성 및 NA로 초기화  
diag(A\_mat) <- 1 # 대각선은 모두 1로 설정  
  
# 첫 번째 행렬과 동일한 위치에 0 할당  
A\_mat[1, 2:6] <- 0  
A\_mat[2, c(1, 5, 6)] <- 0  
A\_mat[3, 6] <- 0  
A\_mat[4, c(1, 2, 3, 5, 6)] <- 0  
A\_mat[5, 6] <- 0  
  
# 결과 확인  
A\_mat

## [,1] [,2] [,3] [,4] [,5] [,6]  
## [1,] 1 0 0 0 0 0  
## [2,] 0 1 NA NA 0 0  
## [3,] NA NA 1 NA NA 0  
## [4,] 0 0 0 1 0 0  
## [5,] NA NA NA NA 1 0  
## [6,] NA NA NA NA NA 1

1. SVAR

svar\_model\_whole = SVAR(var\_model\_whole, Amat = A\_mat, method = "Nelder-Mead", optim.control = list(maxit = 2000))  
svar\_model\_whole

##   
## SVAR Estimation Results:  
## ========================   
##   
##   
## Estimated A matrix:  
## CD unemployment CCI CPI KOSPI whole  
## CD 1.00000 0.0000 0.0000 0.00000 0.00000 0  
## unemployment 0.00000 1.0000 -0.6601 -0.20286 0.00000 0  
## CCI 0.11212 0.7852 1.0000 -0.09566 -0.26843 0  
## CPI 0.00000 0.0000 0.0000 1.00000 0.00000 0  
## KOSPI -0.08974 0.2187 0.1963 0.02830 1.00000 0  
## whole 0.17314 0.1750 0.1823 -0.22087 -0.06399 1

svar\_model\_annuity = SVAR(var\_model\_annuity, Amat = A\_mat, method = "Nelder-Mead", optim.control = list(maxit = 2000))  
svar\_model\_annuity

##   
## SVAR Estimation Results:  
## ========================   
##   
##   
## Estimated A matrix:  
## CD unemployment CCI CPI KOSPI annuity  
## CD 1.00000 0.00000 0.0000 0.000000 0.0000 0  
## unemployment 0.00000 1.00000 -0.6603 -0.160781 0.0000 0  
## CCI 0.10989 0.77864 1.0000 -0.083264 -0.2780 0  
## CPI 0.00000 0.00000 0.0000 1.000000 0.0000 0  
## KOSPI -0.09761 0.24405 0.2137 -0.003547 1.0000 0  
## annuity 0.11920 -0.02263 0.2079 0.041303 -0.1472 1

svar\_model\_universal = SVAR(var\_model\_universal, Amat = A\_mat, method = "Nelder-Mead", optim.control = list(maxit = 2000))  
svar\_model\_universal

##   
## SVAR Estimation Results:  
## ========================   
##   
##   
## Estimated A matrix:  
## CD unemployment CCI CPI KOSPI universal  
## CD 1.0000 0.000000 0.0000 0.000000 0.00000 0  
## unemployment 0.0000 1.000000 -0.6479 -0.154722 0.00000 0  
## CCI 0.1034 0.782537 1.0000 -0.088293 -0.27039 0  
## CPI 0.0000 0.000000 0.0000 1.000000 0.00000 0  
## KOSPI -0.1001 0.240459 0.1959 -0.007772 1.00000 0  
## universal 0.1577 0.005201 0.0303 -0.129933 -0.09095 1

1. 충격반응함수 3-1. 변액종신 ##충격반응함수 : 12개월

# CD 충격반응 함수  
irf\_result\_whole\_CD <- irf(svar\_model\_whole, impulse = "CD", response = "whole", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0340069397516159 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.144930917055847 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 7.04090470091956e-05 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.447686960904067 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0819047235192322 .

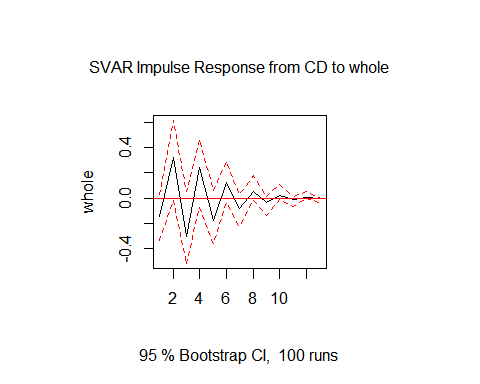
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.625208398641425 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.244346192049924 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.400946371335133 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.439628617774564 .

plot(irf\_result\_whole\_CD, main = "SVAR Impulse Response from CD to whole")



# unemployment 충격반응 함수  
irf\_result\_whole\_unemployment <- irf(svar\_model\_whole, impulse = "unemployment", response = "whole", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.115986576451796 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.284560764155954 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.559755966285535 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.883160529940804 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.648588004292546 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.224584360695738 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0761901557822938 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.323263675092224 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1.12358974332927e-07 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .  
  
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.515835280444088 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.685101366693175 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.19993362412722 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0523732884086974 .

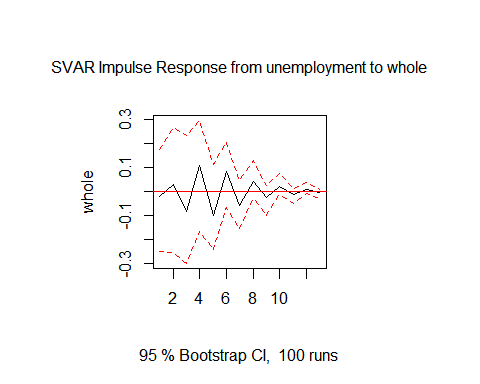
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0840042296870157 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.135200662313663 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0934263155993447 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.775843771795639 .

plot(irf\_result\_whole\_unemployment, main = "SVAR Impulse Response from unemployment to whole")



# CCI 충격반응 함수  
irf\_result\_whole\_CCI <- irf(svar\_model\_whole, impulse = "CCI", response = "whole", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.171687137190174 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.316214060778164 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.132731260717427 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.372182217788596 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.388817827187204 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.272868146192698 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.160523362287974 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.821238228817726 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.125757724351254 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.484727525714301 .

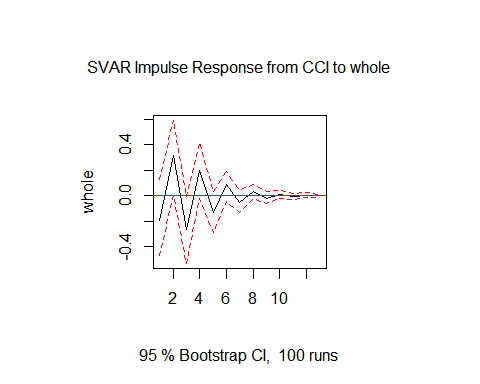
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.19850327978325 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0869268078254948 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.164403213379547 .

plot(irf\_result\_whole\_CCI, main = "SVAR Impulse Response from CCI to whole")



# CPI 충격반응 함수  
irf\_result\_whole\_CPI <- irf(svar\_model\_whole, impulse = "CPI", response = "whole", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.00071259686509495 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.990571699438118 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.011029619317937 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.319127838550254 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.48160065450148 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.39533049646899 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.338359503644784 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.14896911734732 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

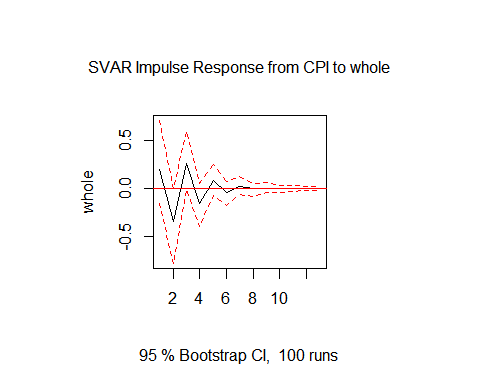
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.221953349521742 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .  
  
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0740307248803199 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.000225275621025256 .

plot(irf\_result\_whole\_CPI, main = "SVAR Impulse Response from CPI to whole")



# KOSPI 충격반응 함수  
irf\_result\_whole\_KOSPI <- irf(svar\_model\_whole, impulse = "KOSPI", response = "whole", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

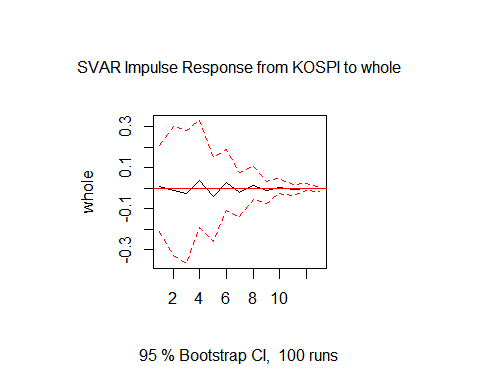
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.238075422213594 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .  
  
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .  
  
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.890231244778177 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0797685000400573 .

plot(irf\_result\_whole\_KOSPI, main = "SVAR Impulse Response from KOSPI to whole")



3-2. 변액연금 ##충격반응함수 : 12개월

# CD 충격반응 함수  
irf\_result\_annuity\_CD <- irf(svar\_model\_annuity, impulse = "CD", response = "annuity", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.113367589703746 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.14181632519242 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0134092986952259 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.403924340143135 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.431824391872707 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0889941712807979 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.841482598630405 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.195660693583021 .

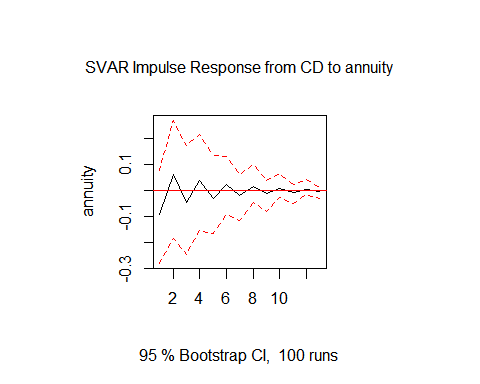
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.103254293227384 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0765236766697494 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.532191133932623 .

plot(irf\_result\_annuity\_CD, main = "SVAR Impulse Response from CD to annuity")



# unemployment 충격반응 함수  
irf\_result\_annuity\_unemployment <- irf(svar\_model\_annuity, impulse = "unemployment", response = "annuity", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 4.13053966805063e-05 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.258211036757124 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.332299279579545 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.000485406288812162 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.697624092738561 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.161326723791881 .

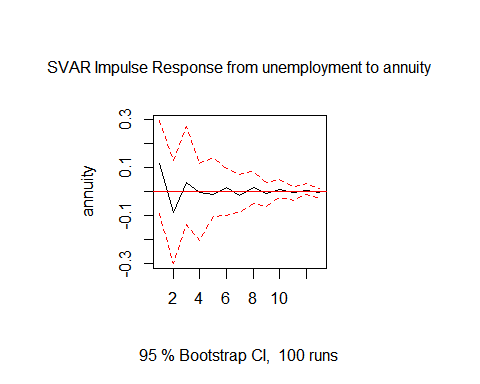
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0789283329690185 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.000301172774746949 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.809999122160424 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

plot(irf\_result\_annuity\_unemployment, main = "SVAR Impulse Response from unemployment to annuity")



# CCI 충격반응 함수  
irf\_result\_annuity\_CCI <- irf(svar\_model\_annuity, impulse = "CCI", response = "annuity", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.479925665101768 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.904279601059628 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0851752094565287 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.968666304752023 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.427010572577498 .

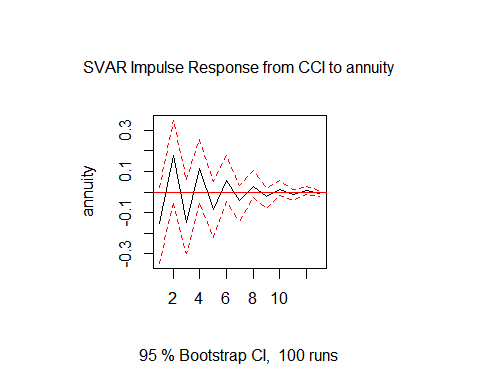
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.97428982806946 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.872820526220244 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.262590112390746 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.069445898746067 .

plot(irf\_result\_annuity\_CCI, main = "SVAR Impulse Response from CCI to annuity")



# CPI 충격반응 함수  
irf\_result\_annuity\_CPI <- irf(svar\_model\_annuity, impulse = "CPI", response = "annuity", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.121456103311048 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0921598436674676 .

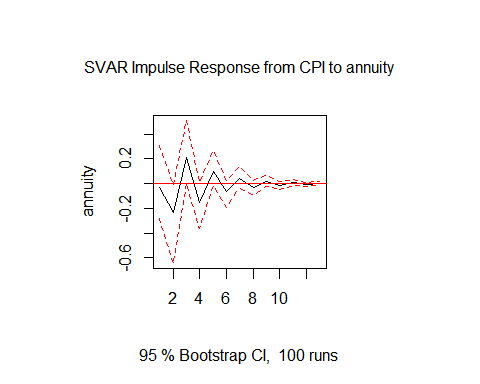
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.612981294173572 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.107746012365909 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 8.34709113173293e-06 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.141449381390075 .

plot(irf\_result\_annuity\_CPI, main = "SVAR Impulse Response from CPI to annuity")



# KOSPI 충격반응 함수  
irf\_result\_annuity\_KOSPI <- irf(svar\_model\_annuity, impulse = "KOSPI", response = "annuity", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0732866285091266 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.149613170839689 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.106167612752881 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.507472165338233 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0185219891071323 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.436631387735523 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

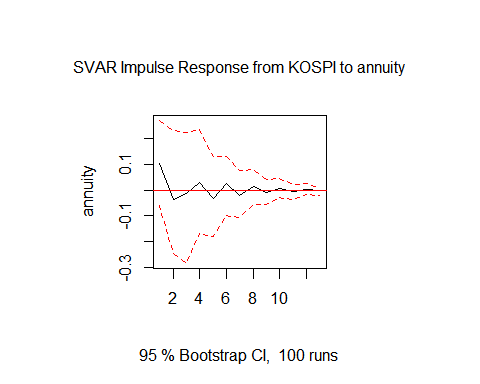
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.325225681014503 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.105932062034427 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.613831525335635 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.226740699326403 .

plot(irf\_result\_annuity\_KOSPI, main = "SVAR Impulse Response from KOSPI to annuity")



3-3. 변액유니버셜

# CD 충격반응 함수  
irf\_result\_universal\_CD <- irf(svar\_model\_universal, impulse = "CD", response = "universal", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .  
  
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.396648717648517 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.84493728887523 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.162457499179447 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0870688811527132 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.078273335005117 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.282564479545443 .

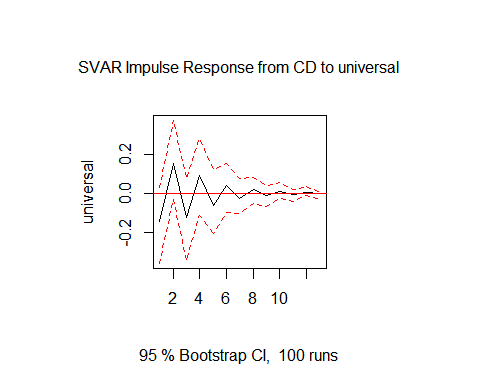
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.530719281272485 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.695786944601296 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

plot(irf\_result\_universal\_CD, main = "SVAR Impulse Response from CD to universal")



# unemployment 충격반응 함수  
irf\_result\_universal\_unemployment <- irf(svar\_model\_universal, impulse = "unemployment", response = "universal", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.126944702390653 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.6449440823462 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.182376957515667 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 2.08688812838517e-06 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.150379767645892 .

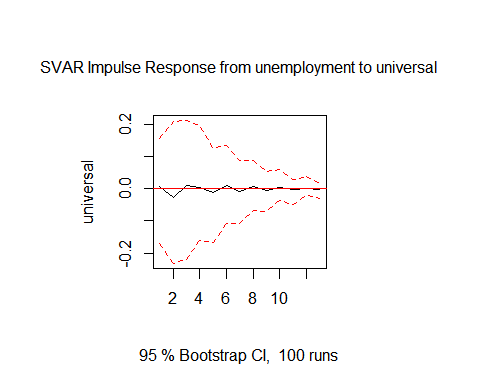
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.128589980414269 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0377091798034254 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1.85877583211425e-05 .

plot(irf\_result\_universal\_unemployment, main = "SVAR Impulse Response from unemployment to universal")



# CCI 충격반응 함수  
irf\_result\_universal\_CCI <- irf(svar\_model\_universal, impulse = "CCI", response = "universal", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.730168984529301 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.122285834459637 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.830849474587121 .

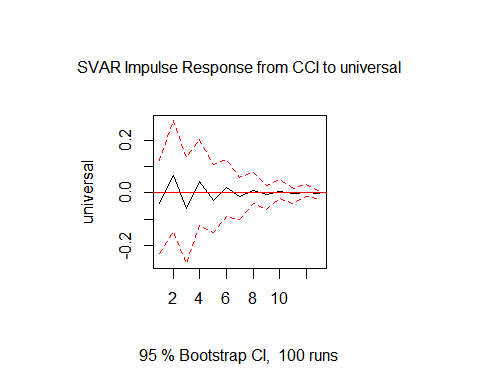
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.125985958390044 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0256032578162662 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.334696227047925 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

plot(irf\_result\_universal\_CCI, main = "SVAR Impulse Response from CCI to universal");



# CPI 충격반응 함수  
irf\_result\_universal\_CPI <- irf(svar\_model\_universal, impulse = "CPI", response = "universal", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0794484668461619 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.0638272838904387 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.355569900931521 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.116577054528857 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.14207670164614 .

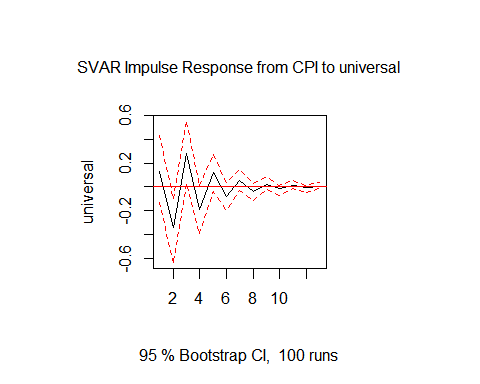
## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.166860539179961 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.291364527584743 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.324470216384762 .

plot(irf\_result\_universal\_CPI, main = "SVAR Impulse Response from CPI to universal");



# KOSPI 충격반응 함수  
irf\_result\_universal\_KOSPI <- irf(svar\_model\_universal, impulse = "KOSPI", response = "universal", n.ahead = 12, ortho = TRUE, cumulative = FALSE, boot = TRUE, ci = 0.95, runs = 100)

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.357793518157811 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.282283689142751 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 1.96103135563508e-07 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.59980534681609 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.178544021001975 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.952715589882337 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.833914735515537 .

## Warning in SVAR(x = varboot, Amat = A\_mat, method = "Nelder-Mead",  
## optim.control = list(maxit = 2000)): Convergence not achieved after 100  
## iterations. Convergence value: 0.105752403382214 .

plot(irf\_result\_universal\_KOSPI, main = "SVAR Impulse Response from KOSPI to universal")

