Assignment-6-REAL.R

Orachai

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```
setwd("/Users/Orachai/Documents/BE/4TH YEAR 2ND SEMESTER/EE435/Assignment 6")
cat(rep("\n",50))
```

```
#install.packages("quantmod")
#install.packages("fBasics")
#install.packages("sn")
#install.packages("PerformanceAnalytics")
#install.packages("car")
#install.packages("tseries")
#install.packages("forecast")

library(quantmod)
```

```
## Warning: package 'quantmod' was built under R version 4.0.4
```

```
## Loading required package: xts
```

```
## Loading required package: zoo
```

```
##
## Attaching package: 'zoo'
```

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

```
## Loading required package: TTR
```

```
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

```
library(fBasics)
```

```
## Warning: package 'fBasics' was built under R version 4.0.4
```

```
## Loading required package: timeDate
```

```
## Warning: package 'timeDate' was built under R version 4.0.4

## Loading required package: timeSeries

## Warning: package 'timeSeries' was built under R version 4.0.4

##
## Attaching package: 'timeSeries'

## The following object is masked from 'package:zoo':
##
##     time<-

##
## Attaching package: 'fBasics'

## The following object is masked from 'package:TTR':
##
##     volatility
```

```
library(sn)
```

```
## Warning: package 'sn' was built under R version 4.0.4

## Loading required package: stats4

##
## Attaching package: 'sn'

## The following objects are masked from 'package:fBasics':
##
##     tr, vech

## The following object is masked from 'package:stats':
##
##     sd
```

```
library(PerformanceAnalytics)
```

```
## Warning: package 'PerformanceAnalytics' was built under R version 4.0.4

##
## Attaching package: 'PerformanceAnalytics'

## The following objects are masked from 'package:timeDate':
##
##     kurtosis, skewness

## The following object is masked from 'package:graphics':
##
##     legend
```

```
library(car)
```

```
## Warning: package 'car' was built under R version 4.0.4
```

```
## Loading required package: carData
```

```
##
## Attaching package: 'car'
```

```
## The following object is masked from 'package:fBasics':
##
##     densityPlot
```

```
library(tseries)
```

```
## Warning: package 'tseries' was built under R version 4.0.4
```

```
library(forecast)
```

```
## Warning: package 'forecast' was built under R version 4.0.4
```

```
library(fGarch)
```

```
## Warning: package 'fGarch' was built under R version 4.0.5
```

```
library(fUnitRoots)
```

```
## Warning: package 'fUnitRoots' was built under R version 4.0.4
```

```
#install.packages("fGarch")
library(fGarch)
#install.packages('MTS')
require(MTS)
```

```
## Loading required package: MTS
```

```
## Warning: package 'MTS' was built under R version 4.0.5
```

```
##
## Attaching package: 'MTS'
```

```
## The following object is masked from 'package:TTR':
##
##     VMA
```

```r
#1
da=read.table("m-unrate-MIILIN.txt",header=T)
head(da)
```

```
##        Mon   MI  IL  IN
## 1 1976.083 10.0 6.9 7.0
## 2 1976.167 10.0 6.8 6.8
## 3 1976.250  9.9 6.7 6.5
## 4 1976.333  9.7 6.6 6.2
## 5 1976.417  9.6 6.5 6.0
## 6 1976.500  9.4 6.5 5.8
```

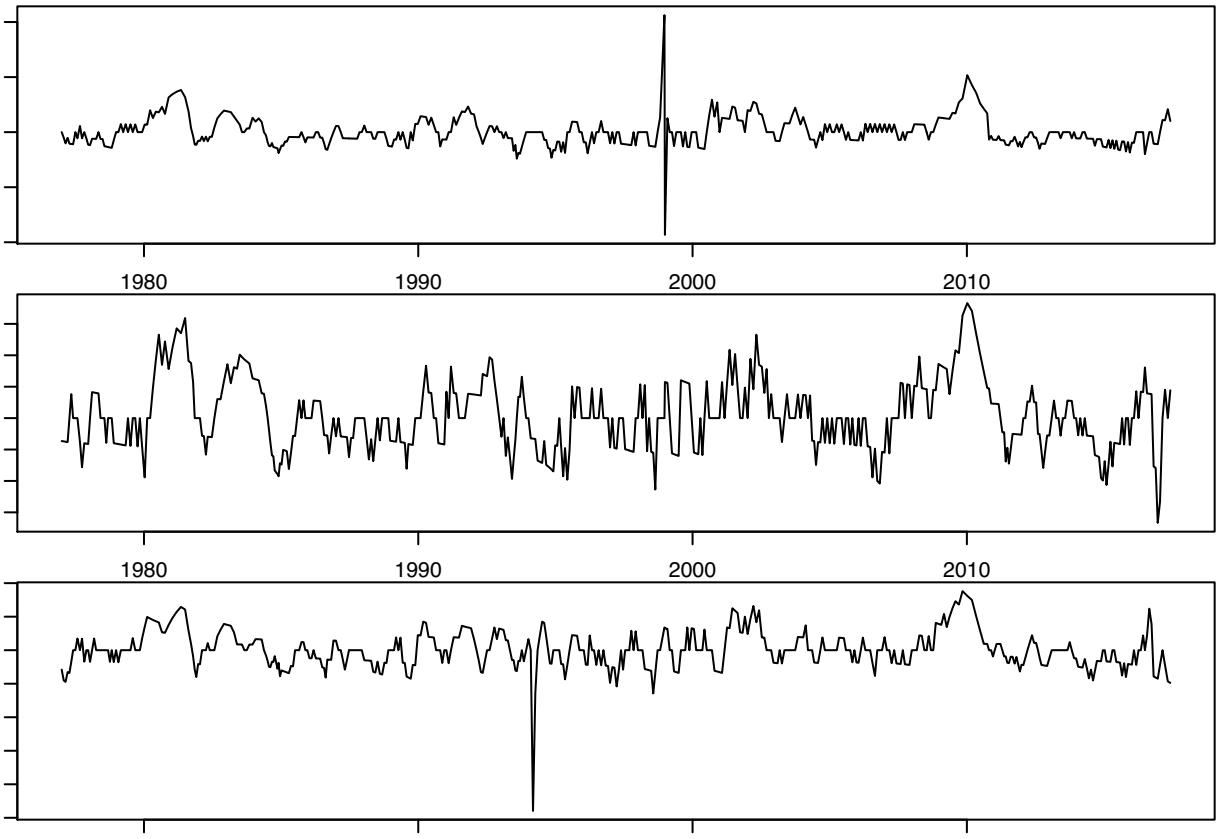
```r
x=cbind(da[,2],da[,3],da[,4])
x=log(x)
zt=diffM(x)*100
#colnames(zt)=c("MIg","ILg","NIg")
head(zt)
```

```
##           [,1]      [,2]      [,3]
## [1,]  0.000000 -1.459880 -2.898754
## [2,] -1.005034 -1.481509 -4.512044
## [3,] -2.040887 -1.503788 -4.725288
## [4,] -1.036279 -1.526747 -3.278982
## [5,] -2.105341  0.000000 -3.390155
## [6,] -2.150621  1.526747 -1.739174
```

```r
tdx=da[,1]+da[,2]/12
dim(da)
```

```
## [1] 492   4
```

```r
#QUESTION 1.1)final fitted model
par(mar=c(1,1,1,1))
MTSplot(zt,tdx[2:492])
```




```
VARorder(zt)
```

```
## selected order: aic =  6
## selected order: bic =  2
## selected order: hq =  6
## Summary table:
##        p    AIC    BIC     HQ     M(p) p-value
##  [1,]  0 4.5902 4.5902 4.5902   0.0000  0.0000
##  [2,]  1 3.1019 3.1788 3.1321 722.0353  0.0000
##  [3,]  2 2.9686 3.1225 3.0290  79.9726  0.0000
##  [4,]  3 2.9328 3.1636 3.0234  33.8750  0.0001
##  [5,]  4 2.9217 3.2294 3.0426  22.1688  0.0084
##  [6,]  5 2.9188 3.3034 3.0699  18.2649  0.0322
##  [7,]  6 2.8417 3.3033 3.0230  52.1535  0.0000
##  [8,]  7 2.8516 3.3900 3.0630  12.2266  0.2008
##  [9,]  8 2.8797 3.4951 3.1214   3.8389  0.9217
## [10,]  9 2.8736 3.5659 3.1455  19.2322  0.0233
## [11,] 10 2.8648 3.6340 3.1668  20.3222  0.0160
## [12,] 11 2.8775 3.7237 3.2098  10.5898  0.3049
## [13,] 12 2.8935 3.8165 3.2560   9.1179  0.4265
## [14,] 13 2.9094 3.9094 3.3021   9.0746  0.4304
```

```
m1=VAR(zt,2)
```

```
## Constant term:
```

```
## Estimates:  -0.04308488 0.02069438 -0.01722694
## Std.Error:  0.08968027 0.05526058 0.08400675
## AR coefficient matrix
## AR( 1 )-matrix
##       [,1]  [,2]  [,3]
## [1,] 0.199 0.276 0.131
## [2,] 0.106 0.528 0.101
## [3,] 0.151 0.274 0.568
## standard error
##        [,1]   [,2]   [,3]
## [1,] 0.0445 0.0735 0.0497
## [2,] 0.0274 0.0453 0.0306
## [3,] 0.0417 0.0689 0.0466
## AR( 2 )-matrix
##          [,1]   [,2]     [,3]
## [1,]  0.30910 -0.106  0.00562
## [2,]  0.04956  0.183 -0.08484
## [3,] -0.00612 -0.170  0.01388
## standard error
##        [,1]   [,2]   [,3]
## [1,] 0.0454 0.0720 0.0501
## [2,] 0.0280 0.0444 0.0309
## [3,] 0.0425 0.0675 0.0470
##
## Residuals cov-mtx:
##           [,1]      [,2]      [,3]
## [1,] 3.8551679 0.3071579 0.7144333
## [2,] 0.3071579 1.4637954 0.4019971
## [3,] 0.7144333 0.4019971 3.3828113
##
## det(SSE) =  17.57694
## AIC =  2.939907
## BIC =  3.093748
## HQ  =  3.000321
```

```
par("mar")
```

```
## [1] 1 1 1 1
```

```
par(mar=c(1,1,1,1))

m1a = refVAR(m1,thres=1.645)
```

```
## Constant term:
## Estimates:  0 0 0
## Std.Error:  0 0 0
## AR coefficient matrix
## AR( 1 )-matrix
##       [,1]  [,2]  [,3]
## [1,] 0.192 0.206 0.130
## [2,] 0.105 0.528 0.101
## [3,] 0.152 0.273 0.574
## standard error
```

```
##        [,1]   [,2]   [,3]
## [1,] 0.0441 0.0563 0.0427
## [2,] 0.0274 0.0453 0.0306
## [3,] 0.0405 0.0678 0.0392
## AR( 2 )-matrix
##        [,1]   [,2]    [,3]
## [1,] 0.3035  0.000  0.0000
## [2,] 0.0491  0.183 -0.0849
## [3,] 0.0000 -0.168  0.0000
## standard error
##        [,1]   [,2]   [,3]
## [1,] 0.0444 0.0000 0.0000
## [2,] 0.0279 0.0443 0.0309
## [3,] 0.0000 0.0661 0.0000
##
## Residuals cov-mtx:
##           [,1]      [,2]      [,3]
## [1,] 3.8745260 0.3062712 0.7153133
## [2,] 0.3062712 1.4642213 0.4016425
## [3,] 0.7153133 0.4016425 3.3837769
##
## det(SSE) =  17.68107
## AIC =  2.929521
## BIC =  3.049175
## HQ  =  2.976509
```

```
names(m1a)
```

```
##  [1] "data"      "order"     "cnst"      "coef"      "aic"       "bic"
##  [7] "hq"        "residuals" "secoef"    "Sigma"     "Phi"       "Ph0"
## [13] "fixed"
```

```
sig=m1a$Sigma
U=chol(sig)
names(U)
```

```
## NULL
```

```
U
```

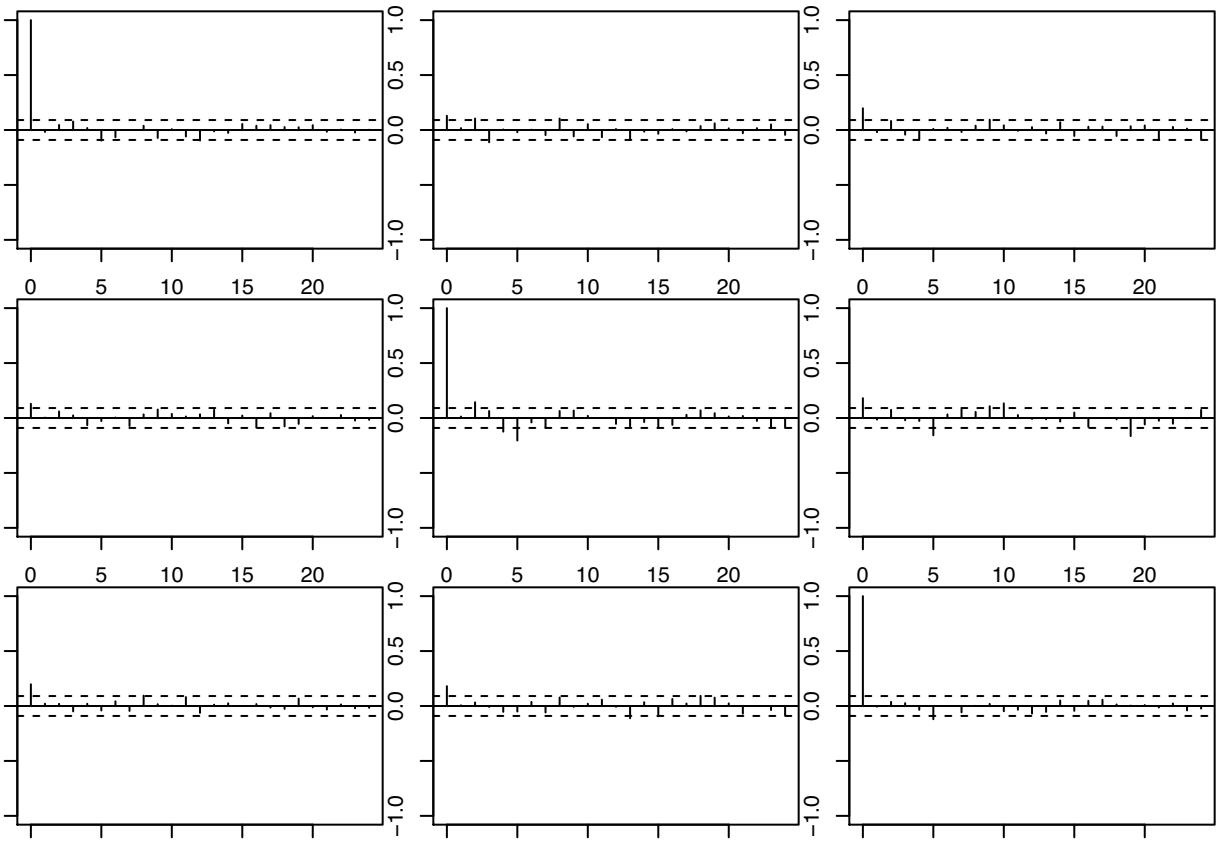
```
##          [,1]      [,2]      [,3]
## [1,] 1.968382 0.1555955 0.3634018
## [2,] 0.000000 1.2000047 0.2875813
## [3,] 0.000000 0.0000000 1.7801722
```

```
MTSdiag(m1)
```

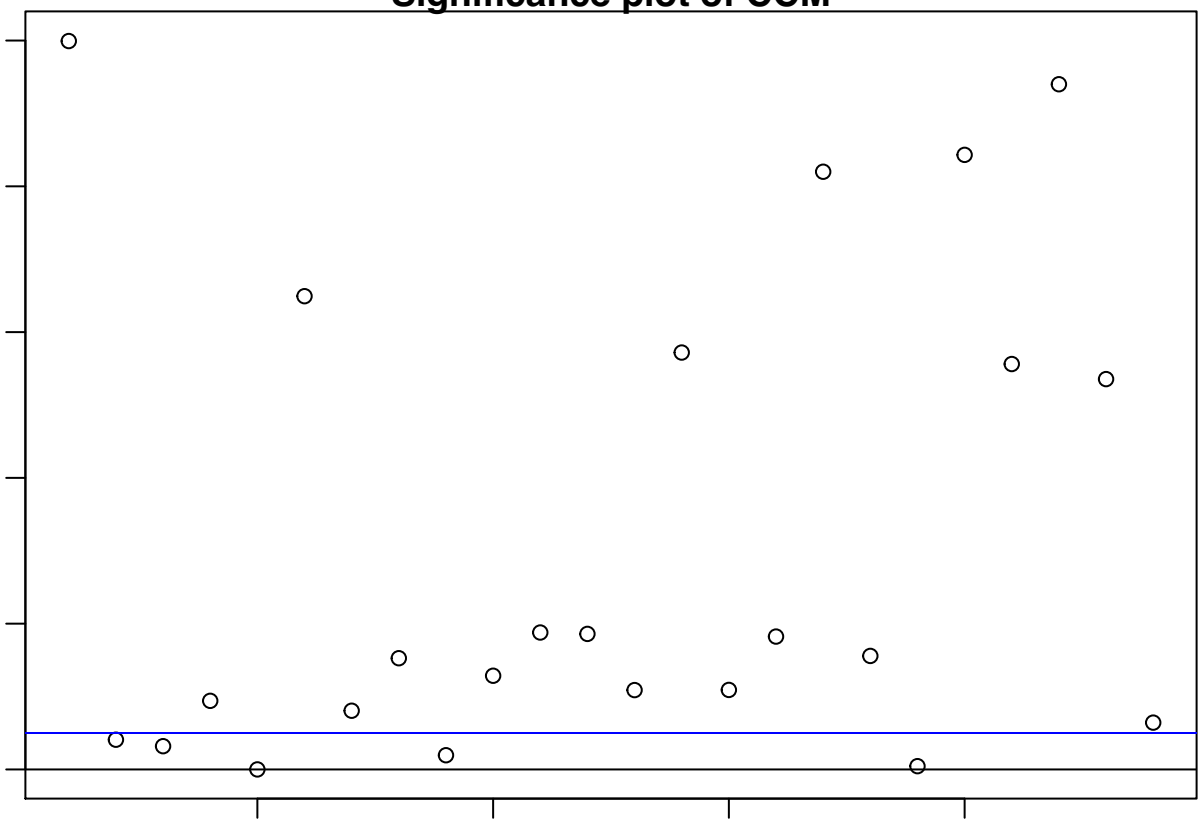
```
## [1] "Covariance matrix:"
##       [,1]  [,2]  [,3]
## [1,] 3.863 0.308 0.716
## [2,] 0.308 1.467 0.403
```

```
## [3,] 0.716 0.403 3.390
## CCM at lag:  0
##       [,1]  [,2]  [,3]
## [1,] 1.000 0.129 0.198
## [2,] 0.129 1.000 0.181
## [3,] 0.198 0.181 1.000
## Simplified matrix:
## CCM at lag:  1
## . . .
## . . .
## . . .
## CCM at lag:  2
## . + .
## . + .
## . . .
## CCM at lag:  3
## . - .
## . . .
## . . .
## CCM at lag:  4
## . . .
## . - .
## . . .
## CCM at lag:  5
## - . .
## . - -
## . . -
## CCM at lag:  6
## . . .
## . . .
## . . .
## CCM at lag:  7
## . . .
## . . .
## . . .
## CCM at lag:  8
## . + .
## . . .
## + . .
## CCM at lag:  9
## . . +
## . . +
## . . .
## CCM at lag:  10
## . . .
## . . +
## . . .
## CCM at lag:  11
## . . .
## . . .
## . . .
## CCM at lag:  12
## - . .
## . . .
```

```
## . . .
## CCM at lag:  13
## . . .
## . . .
## . - .
## CCM at lag:  14
## . . .
## . . .
## . . .
## CCM at lag:  15
## . . .
## . - .
## . - .
## CCM at lag:  16
## . . .
## . . .
## . . .
## CCM at lag:  17
## . . .
## . . .
## . . .
## CCM at lag:  18
## . . .
## . . .
## . + .
## CCM at lag:  19
## . . .
## . . -
## . . .
## CCM at lag:  20
## . . .
## . . .
## . . .
## CCM at lag:  21
## . . -
## . . .
## . . .
## CCM at lag:  22
## . . .
## . . .
## . . .
## CCM at lag:  23
## . . .
## . . .
## . . .
## CCM at lag:  24
## . . .
## . . .
## . . .
```

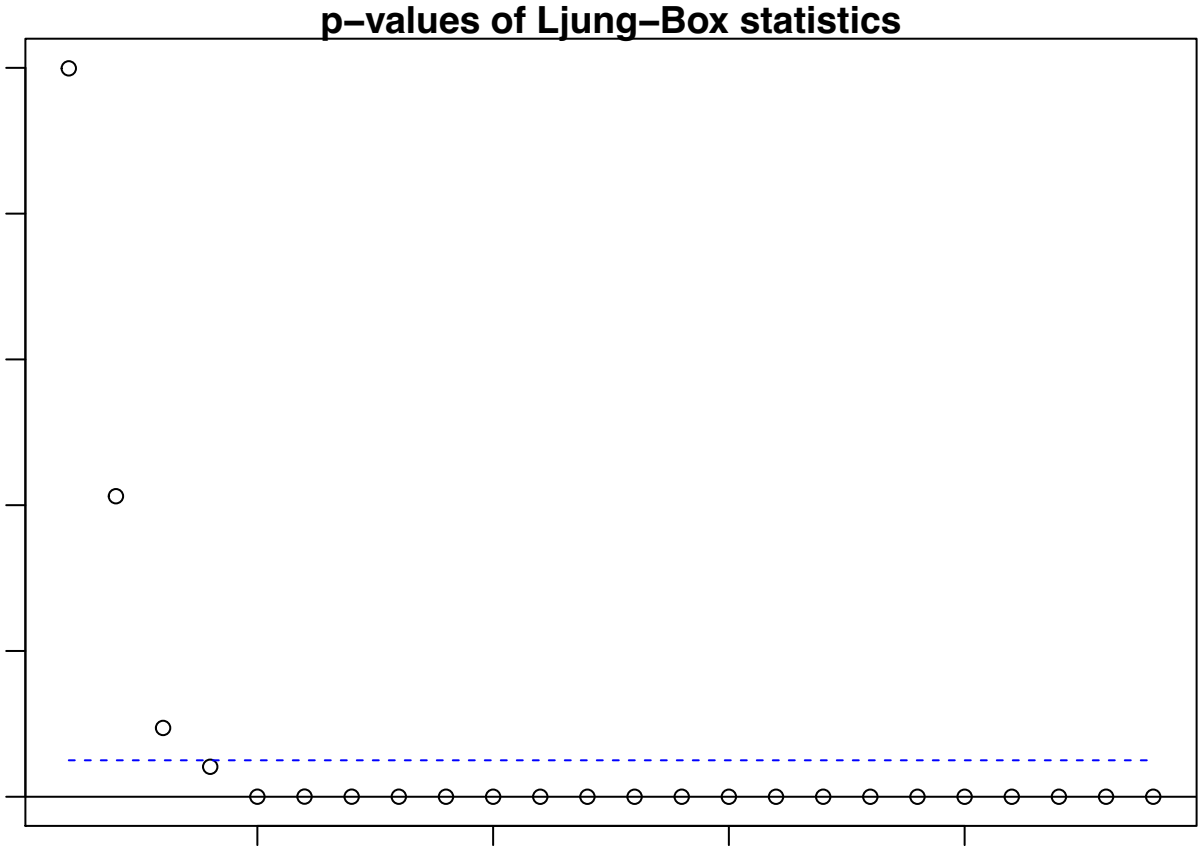



```
## Hit Enter for p-value plot of individual ccm:
```

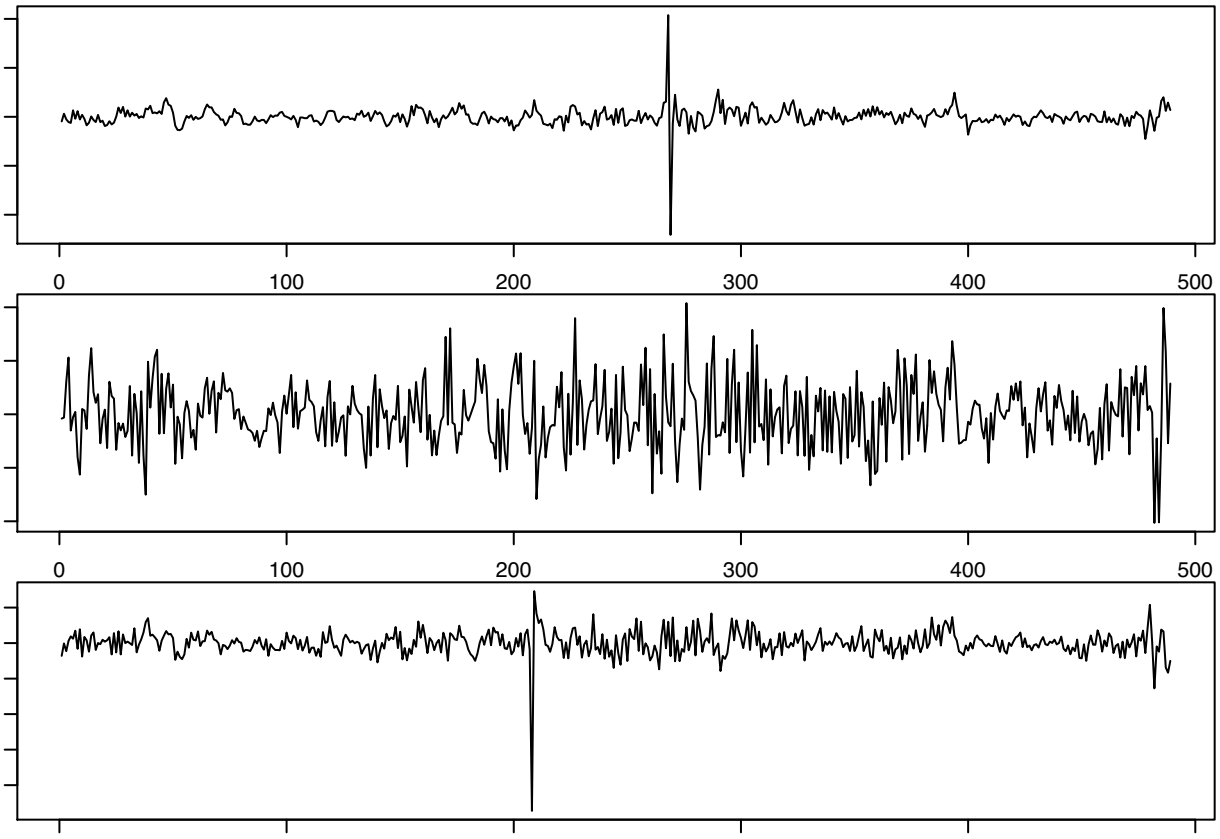



```
## Hit Enter to compute MQ-statistics:
##
## Ljung-Box Statistics:
##          m       Q(m)     df    p-value
##  [1,]   1.00      1.05    9.00     1.00
##  [2,]   2.00     18.67   18.00     0.41
##  [3,]   3.00     37.04   27.00     0.09
##  [4,]   4.00     52.00   36.00     0.04
##  [5,]   5.00     91.25   45.00     0.00
##  [6,]   6.00     98.16   54.00     0.00
##  [7,]   7.00    113.64   63.00     0.00
##  [8,]   8.00    126.92   72.00     0.00
##  [9,]   9.00    146.75   81.00     0.00
## [10,]  10.00    160.63   90.00     0.00
## [11,]  11.00    173.15   99.00     0.00
## [12,]  12.00    185.71  108.00     0.00
## [13,]  13.00    200.17  117.00     0.00
## [14,]  14.00    207.83  126.00     0.00
## [15,]  15.00    222.28  135.00     0.00
## [16,]  16.00    234.92  144.00     0.00
## [17,]  17.00    240.10  153.00     0.00
## [18,]  18.00    253.31  162.00     0.00
## [19,]  19.00    277.28  171.00     0.00
## [20,]  20.00    282.19  180.00     0.00
## [21,]  21.00    290.01  189.00     0.00
## [22,]  22.00    293.54  198.00     0.00
```

```
## [23,]  23.00    301.58  207.00     0.00
## [24,]  24.00    317.81  216.00     0.00
```




```
## Hit Enter to obtain residual plots:
```




```
#QUESTION b)Impulse response function

setwd("/Users/Orachai/Documents/BE/4TH YEAR 2ND SEMESTER/EE435/Assignment 6")
cat(rep("\n",50))
```

```
#install.packages('vars')
require(vars)
```

```
## Loading required package: vars

## Warning: package 'vars' was built under R version 4.0.5

## Loading required package: MASS

## Loading required package: strucchange

## Warning: package 'strucchange' was built under R version 4.0.5

## Loading required package: sandwich

## Warning: package 'sandwich' was built under R version 4.0.5

## Loading required package: urca
```

```
## Warning: package 'urca' was built under R version 4.0.4
```

```
##
## Attaching package: 'urca'
```

```
## The following objects are masked from 'package:fUnitRoots':
##
##     punitroot, qunitroot, unitrootTable
```

```
## Loading required package: lmtest
```

```
##
## Attaching package: 'vars'
```

```
## The following object is masked from 'package:MTS':
##
##     VAR
```

```
da=read.table("m-unrate-MIILIN.txt",header=T)
head(da)
```

```
##        Mon   MI  IL  IN
## 1 1976.083 10.0 6.9 7.0
## 2 1976.167 10.0 6.8 6.8
## 3 1976.250  9.9 6.7 6.5
## 4 1976.333  9.7 6.6 6.2
## 5 1976.417  9.6 6.5 6.0
## 6 1976.500  9.4 6.5 5.8
```

```
x=cbind(da[,2],da[,3],da[,4])
head(x)
```

```
##      [,1] [,2] [,3]
## [1,] 10.0  6.9  7.0
## [2,] 10.0  6.8  6.8
## [3,]  9.9  6.7  6.5
## [4,]  9.7  6.6  6.2
## [5,]  9.6  6.5  6.0
## [6,]  9.4  6.5  5.8
```

```
x=log(x)
rt=diff(x)*100
colnames(rt)=c("MIg","ILg","NIg")
head(rt)
```

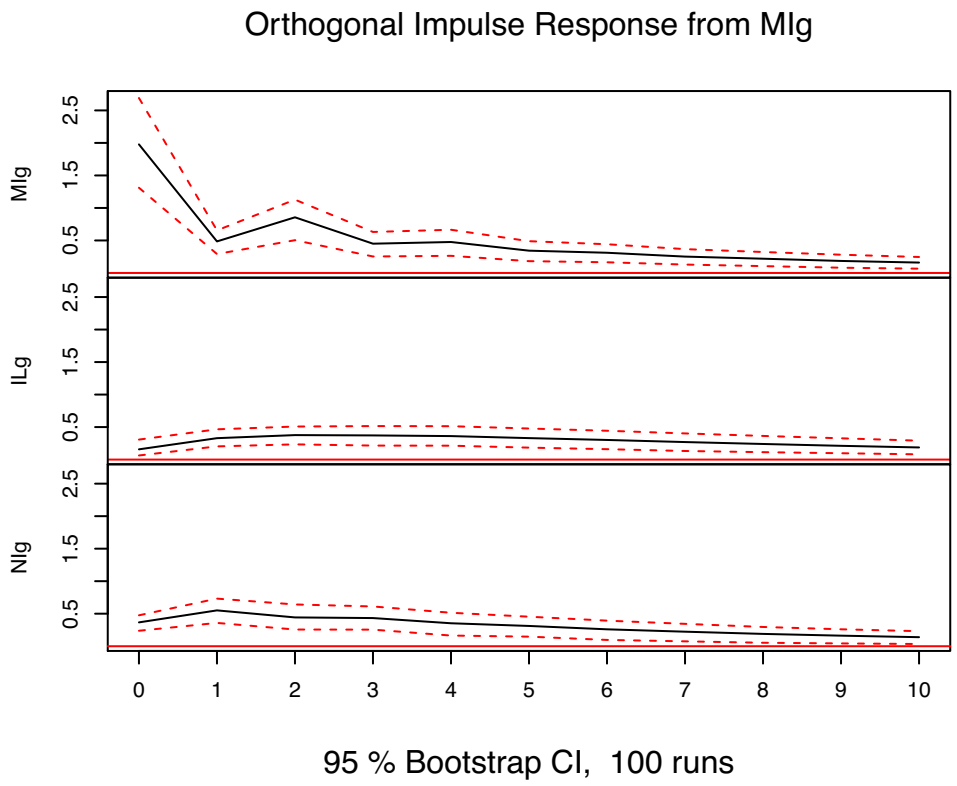
```
##            MIg       ILg       NIg
## [1,]  0.000000 -1.459880 -2.898754
## [2,] -1.005034 -1.481509 -4.512044
## [3,] -2.040887 -1.503788 -4.725288
## [4,] -1.036279 -1.526747 -3.278982
## [5,] -2.105341  0.000000 -3.390155
## [6,] -2.150621  1.526747 -1.739174
```

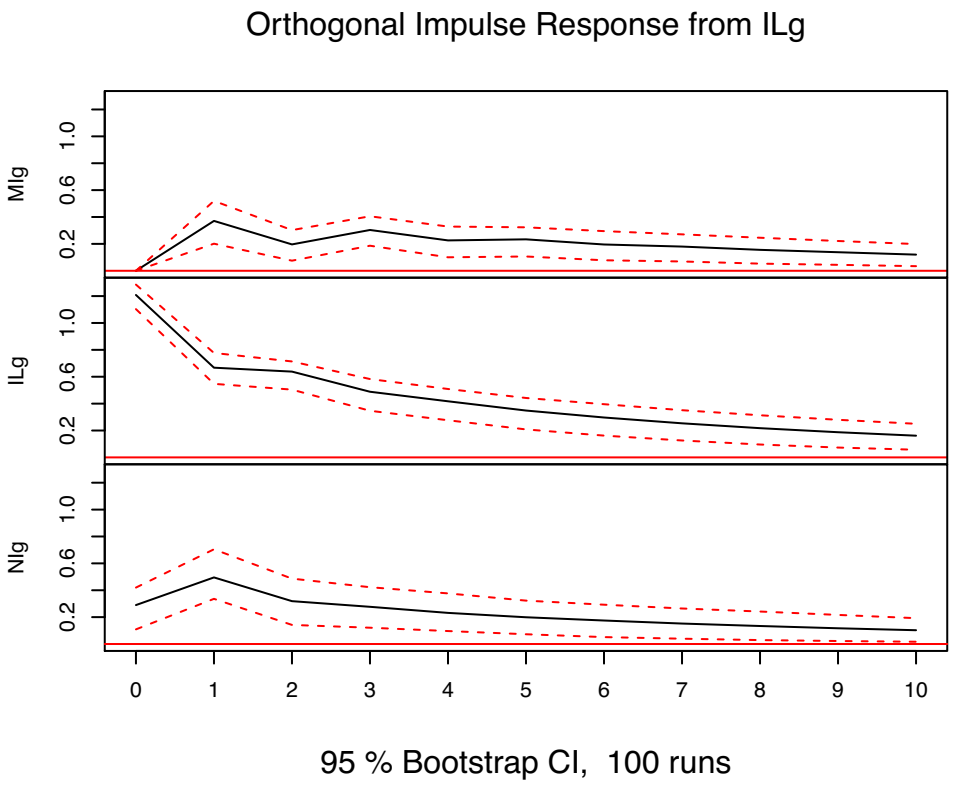
```r
varfit=VAR(rt,p=2)

summary(varfit)
```

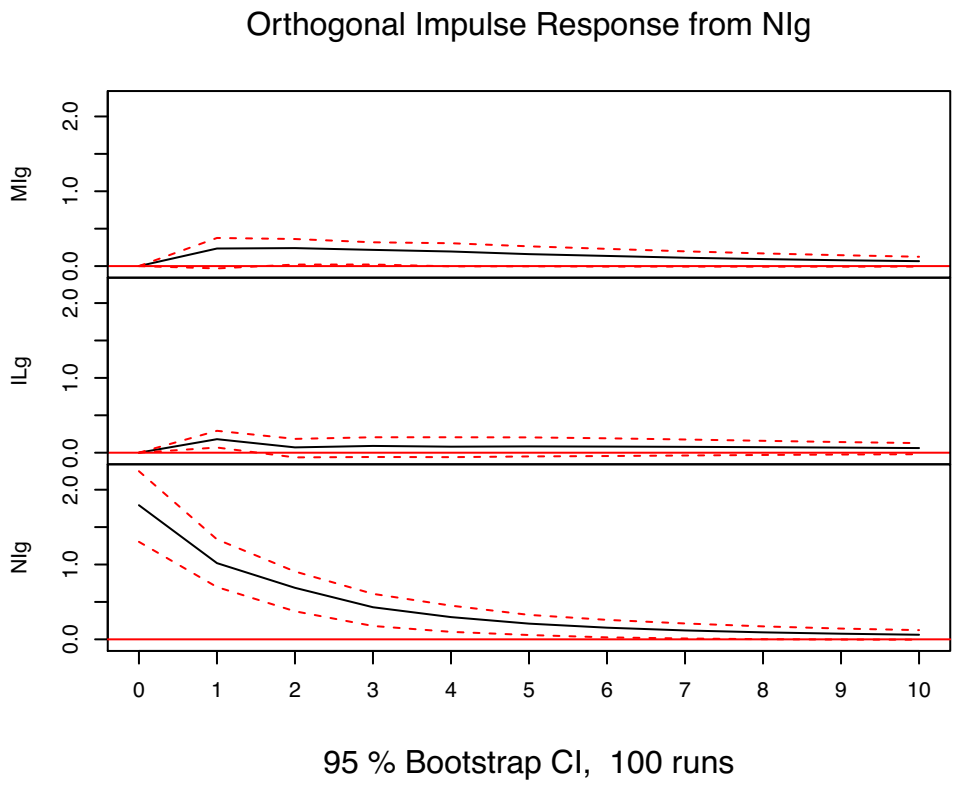
```
##
## VAR Estimation Results:
## ========================
## Endogenous variables: MIg, ILg, NIg
## Deterministic variables: const
## Sample size: 489
## Log Likelihood: -2782.463
## Roots of the characteristic polynomial:
## 0.8686 0.6789 0.4943 0.4486 0.3738 0.0756
## Call:
## VAR(y = rt, p = 2)
##
##
## Estimation results for equation MIg:
## ====================================
## MIg = MIg.l1 + ILg.l1 + NIg.l1 + MIg.l2 + ILg.l2 + NIg.l2 + const
##
##         Estimate Std. Error t value Pr(>|t|)
## MIg.l1  0.198967   0.044522   4.469 9.81e-06 ***
## ILg.l1  0.275604   0.073512   3.749 0.000199 ***
## NIg.l1  0.130995   0.049704   2.635 0.008673 **
## MIg.l2  0.309097   0.045360   6.814 2.84e-11 ***
## ILg.l2 -0.106027   0.072016  -1.472 0.141604
## NIg.l2  0.005618   0.050137   0.112 0.910836
## const  -0.043085   0.089680  -0.480 0.631141
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Residual standard error: 1.978 on 482 degrees of freedom
## Multiple R-Squared: 0.4075,  Adjusted R-squared: 0.4001
## F-statistic: 55.24 on 6 and 482 DF,  p-value: < 2.2e-16
##
##
## Estimation results for equation ILg:
## ====================================
## ILg = MIg.l1 + ILg.l1 + NIg.l1 + MIg.l2 + ILg.l2 + NIg.l2 + const
##
##        Estimate Std. Error t value Pr(>|t|)
## MIg.l1  0.10580    0.02743   3.856 0.000131 ***
## ILg.l1  0.52800    0.04530  11.656  < 2e-16 ***
## NIg.l1  0.10090    0.03063   3.294 0.001059 **
## MIg.l2  0.04956    0.02795   1.773 0.076841 .
## ILg.l2  0.18303    0.04438   4.125 4.37e-05 ***
## NIg.l2 -0.08484    0.03089  -2.746 0.006255 **
## const   0.02069    0.05526   0.374 0.708207
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
##
## Residual standard error: 1.219 on 482 degrees of freedom
## Multiple R-Squared: 0.6581,  Adjusted R-squared: 0.6539
## F-statistic: 154.7 on 6 and 482 DF,  p-value: < 2.2e-16
##
##
## Estimation results for equation NIg:
## ====================================
## NIg = MIg.l1 + ILg.l1 + NIg.l1 + MIg.l2 + ILg.l2 + NIg.l2 + const
##
##         Estimate Std. Error t value Pr(>|t|)
## MIg.l1  0.151449   0.041706   3.631 0.000312 ***
## ILg.l1  0.273801   0.068861   3.976 8.08e-05 ***
## NIg.l1  0.568094   0.046560  12.201  < 2e-16 ***
## MIg.l2 -0.006117   0.042490  -0.144 0.885584
## ILg.l2 -0.169976   0.067460  -2.520 0.012069 *
## NIg.l2  0.013880   0.046965   0.296 0.767705
## const  -0.017227   0.084007  -0.205 0.837607
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Residual standard error: 1.853 on 482 degrees of freedom
## Multiple R-Squared: 0.5205,  Adjusted R-squared: 0.5145
## F-statistic:  87.2 on 6 and 482 DF,  p-value: < 2.2e-16
##
##
##
## Covariance matrix of residuals:
##        MIg    ILg    NIg
## MIg 3.9112 0.3116 0.7248
## ILg 0.3116 1.4851 0.4078
## NIg 0.7248 0.4078 3.4319
##
## Correlation matrix of residuals:
##        MIg    ILg    NIg
## MIg 1.0000 0.1293 0.1978
## ILg 0.1293 1.0000 0.1807
## NIg 0.1978 0.1807 1.0000
```

```
impresp=irf(varfit)
plot(impresp)
```


Orthogonal Impulse Response from MIg
MIg
ILg
NIg
0.5
1.5
2.5
0
1
2
3
4
5
6
7
8
9
10
95 % Bootstrap CI, 100 runs


Orthogonal Impulse Response from ILg
MIg
ILg
NIg
0.2
0.6
1.0
0
1
2
3
4
5
6
7
8
9
10
95 % Bootstrap CI, 100 runs



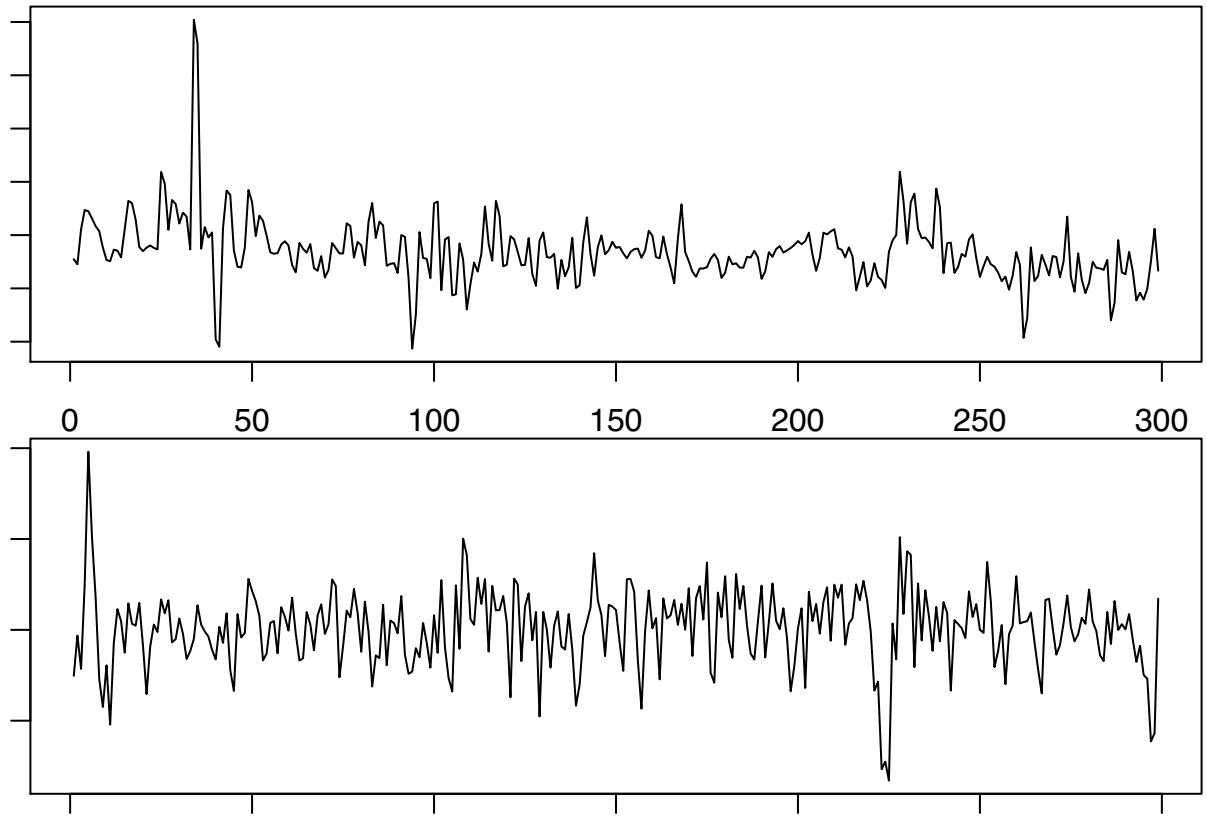

```
#QUESTION 2

#install.packages('MTS')
require(MTS)

da1=read.table("m-m1cnwti.txt",header=T)
#2.1
zt1=cbind(da1$X1.45525,da1$X.0.08098541)
#colnames(zt1)=c("M1","OILg")
head(zt1)
```

```
##           [,1]        [,2]
## [1,] 1.0966060 -0.10106480
## [2,] 0.9046052 -0.01255818
## [3,] 2.2153860 -0.08601287
## [4,] 2.9415170  0.09965565
## [5,] 2.8970190  0.39218860
## [6,] 2.6270590  0.20459100
```

```
dim(da1)
```

```
## [1] 299   2
```

```
#install.packages("MTS")
require(MTS)
MTSplot(zt1)
```




```
#2.2
par(mar=c(1,1,1,1))
VARorder(zt1)
```

```
## selected order: aic =  13
## selected order: bic =  3
## selected order: hq =  3
## Summary table:
##        p     AIC     BIC      HQ     M(p) p-value
##  [1,]  0 -4.6540 -4.6540 -4.6540   0.0000  0.0000
##  [2,]  1 -4.9923 -4.9428 -4.9725 103.1240  0.0000
##  [3,]  2 -5.0115 -4.9125 -4.9719  12.8939  0.0118
##  [4,]  3 -5.1508 -5.0023 -5.0914  46.2528  0.0000
##  [5,]  4 -5.1455 -4.9475 -5.0663   5.9353  0.2040
##  [6,]  5 -5.1320 -4.8845 -5.0330   3.6356  0.4576
##  [7,]  6 -5.1299 -4.8329 -5.0110   6.7041  0.1524
##  [8,]  7 -5.1478 -4.8013 -5.0091  12.0868  0.0167
##  [9,]  8 -5.1239 -4.7278 -4.9654   0.7566  0.9442
## [10,]  9 -5.1631 -4.7176 -4.9848  17.5987  0.0015
## [11,] 10 -5.1673 -4.6722 -4.9692   8.1724  0.0855
## [12,] 11 -5.1464 -4.6019 -4.9284   1.5391  0.8197
```

```
## [13,] 12 -5.1472 -4.5532 -4.9095   7.1847  0.1264
## [14,] 13 -5.1799 -4.5364 -4.9223  15.3696  0.0040
```

```
m1=VAR(zt1,3)
```

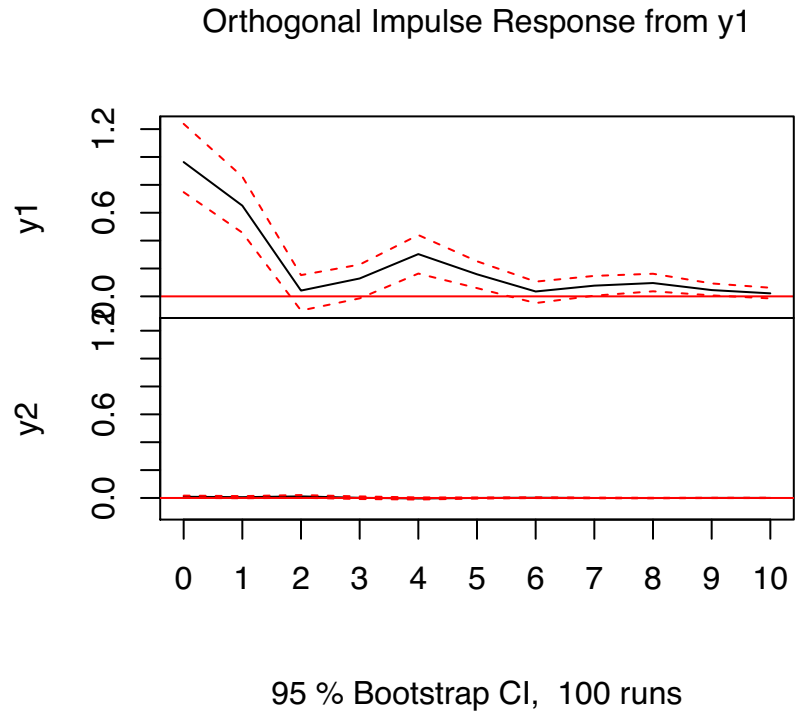
VARpred(m1,6)
orig 299
Forecasts at origin: 299
M1 OILg
[1,] 0.7892 0.0386772
[2,] 1.6560 0.0163976
[3,] 1.4798 0.0062335
[4,] 1.0862 0.0094402
[5,] 1.2440 0.0027013
[6,] 1.4385 0.0002121
Standard Errors of predictions:
 [,1] [,2]
[1,] 0.9521 0.07963
[2,] 1.1503 0.08325
[3,] 1.1513 0.08451
[4,] 1.1616 0.08453
[5,] 1.2006 0.08463
[6,] 1.2108 0.08465
Root mean square errors of predictions:
[,1] [,2]
[1,] 0.9632 0.08056
[2,] 4.0150 0.16682
[3,] 1.1860 0.12121
[4,] 1.4818 0.08507
[5,] 2.1707 0.08824
[6,] 1.5297 0.08543

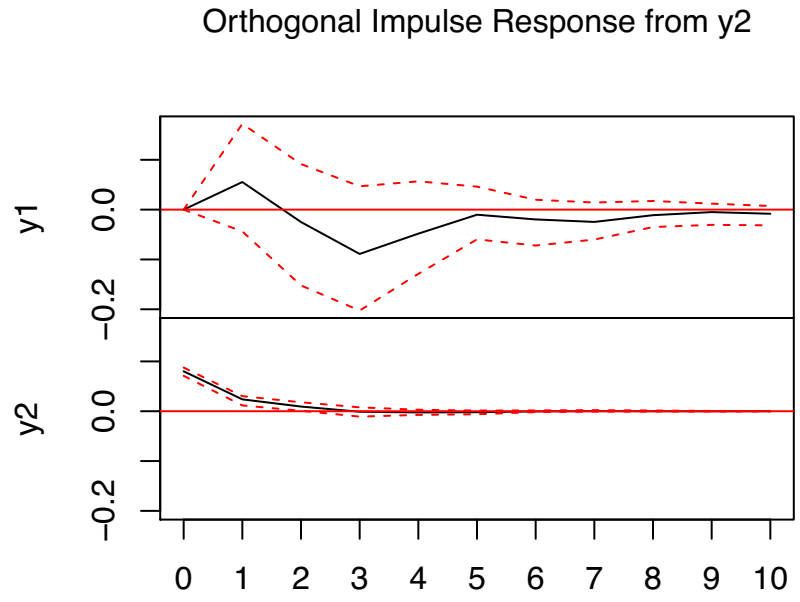
```
summary(varfit1)
```

```
##
## VAR Estimation Results:
## ========================
## Endogenous variables: y1, y2
## Deterministic variables: const
## Sample size: 296
## Log Likelihood: -74.772
## Roots of the characteristic polynomial:
## 0.7754 0.696 0.696 0.4539 0.4539 0.3305
## Call:
## VAR(y = zt1, p = 3)
##
##
## Estimation results for equation y1:
## ===================================
## y1 = y1.l1 + y2.l1 + y1.l2 + y2.l2 + y1.l3 + y2.l3 + const
##
##       Estimate Std. Error t value Pr(>|t|)
## y1.l1  0.66929    0.05468  12.241  < 2e-16 ***
## y2.l1  0.69191    0.70290   0.984    0.326
## y1.l2 -0.40444    0.06297  -6.423 5.50e-10 ***
## y2.l2 -0.97908    0.73802  -1.327    0.186
## y1.l3  0.37920    0.05476   6.925 2.83e-11 ***
## y2.l3 -0.41208    0.71623  -0.575    0.566
## const  0.49394    0.10317   4.787 2.70e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Residual standard error: 0.9636 on 289 degrees of freedom
## Multiple R-Squared: 0.3909,  Adjusted R-squared: 0.3782
## F-statistic: 30.91 on 6 and 289 DF,  p-value: < 2.2e-16
##
##
## Estimation results for equation y2:
## ===================================
```

```
## y2 = y1.l1 + y2.l1 + y1.l2 + y2.l2 + y1.l3 + y2.l3 + const
##
##        Estimate Std. Error t value Pr(>|t|)
## y1.l1  0.003384   0.004573   0.740    0.460
## y2.l1  0.297613   0.058789   5.062 7.38e-07 ***
## y1.l2  0.007497   0.005267   1.424    0.156
## y2.l2  0.026116   0.061726   0.423    0.673
## y1.l3 -0.007046   0.004580  -1.538    0.125
## y2.l3 -0.059805   0.059903  -0.998    0.319
## const -0.002393   0.008629  -0.277    0.782
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Residual standard error: 0.08059 on 289 degrees of freedom
## Multiple R-Squared: 0.1152,  Adjusted R-squared: 0.09682
## F-statistic: 6.271 on 6 and 289 DF,  p-value: 3.282e-06
##
##
##
## Covariance matrix of residuals:
##          y1       y2
## y1 0.928480 0.008383
## y2 0.008383 0.006495
##
## Correlation matrix of residuals:
##       y1    y2
## y1 1.000 0.108
## y2 0.108 1.000
```

```
impresp1=irf(varfit1)
plot(impresp1)
```


Orthogonal Impulse Response from y1
y1
y2
1.2
0.6
0.0
1.2
0.6
0.0
0 1 2 3 4 5 6 7 8 9 10
95 % Bootstrap CI, 100 runs




```
#2.4
#VARpred(m1,6)
#2.5
fevd(varfit1,n.ahead=6)
```

```
## $y1
##              y1          y2
## [1,] 1.0000000 0.000000000
## [2,] 0.9977325 0.002267505
## [3,] 0.9972818 0.002718202
## [4,] 0.9916084 0.008391579
## [5,] 0.9905725 0.009427541
## [6,] 0.9906617 0.009338315
##
## $y2
##               y1        y2
## [1,] 0.01165362 0.9883464
## [2,] 0.01548546 0.9845145
## [3,] 0.03277481 0.9672252
## [4,] 0.03297827 0.9670217
## [5,] 0.03458534 0.9654147
## [6,] 0.03456746 0.9654325
```