sim2.R

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# rm(list = ls())  
   
library(tseries)

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

library(forecast)  
library(fGarch)

## Loading required package: timeDate

## Loading required package: timeSeries

## Loading required package: fBasics

set.seed(3)  
   
bagging = function(series ,h){  
 model = forecast::Arima(series, order = c(2,0,0))  
 fcast = forecast::forecast(model, h = h)$mean  
 return(fcast)}  
   
# AR(2) -------------------------------------------------------------------  
  
n = 200 #50 #100 #300  
nsim = 100   
  
ar = c(.5,.45) # stationary, unit roottei oiroltsoo  
  
h = 1 # 6, 12   
  
nb = 50  
b = round( n/10 )  
order = c(2,0,0) ### table eer report hiih  
e <- rnorm(n+h,0,1) # sd up or down 100,15,1  
  
train = vector(mode = 'list', length = nsim)  
real = vector(mode = 'list', length = h)  
for(i in 1:nsim){  
 ar.sim = arima.sim( list(order= order, ar = ar),innov = e  
 ,n = n + h )  
 train[[i]] = head( ar.sim, n)  
 real[[i]] = tail(ar.sim, h)}  
  
  
va = lapply(train , tsbootstrap ,nb = nb, b = b,  
 type = 'block', statistic = bagging, h = h)  
  
ba = tsbootstrap(train[[1]], nb=10, b=b, type ='block'  
 ,statistic = bagging, h=h)  
mean(ba$statistic)

## [1] 1.405154

ba$orig.statistic

## Time Series:  
## Start = 201   
## End = 201   
## Frequency = 1   
## t1   
## 0.2917488

bag = c()  
org = c()  
rel = c()  
for( i in 1:nsim ){  
 bag[i] = mean(va[[i]]$statistic)  
 org[i] = va[[i]]$orig.statistic  
 rel[i] = real[[i]] }  
  
  
MSE\_bag = mean ((rel - bag)^2 )  
MSE\_orig = mean ((rel - org)^2 )  
  
MSE\_bag < MSE\_orig

## [1] FALSE

knitr::kable(cbind(h = h,nsim, nb , MSE\_orig, MSE\_bag))

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| h | nsim | nb | MSE\_orig | MSE\_bag |
| 1 | 100 | 50 | 1.788757 | 2.482541 |

# TAR(2) ------------------------------------------------------------------  
  
### y[t-1] > g == y[t] = a0 + a1 \* y[t-1] + a2 \* y[t-2] + e[t]  
### y[t-1]<= g == y[t] = b0 + b1 \* y[t-1] + b2 \* y[t-2] + e[t]  
  
tar2.sim = function(y0, e , n, p1, p2, th){  
 y = rep(0 ,n)  
 a0 = p1[1]; a1 = p1[2]; a2 = p1[3]   
 b0 = p2[1]; b1 = p2[2]; b2 = p2[3]  
 for(t in 3:n){  
 if(y[t-1] > th) y[t] = a0 + a1 \* y[t-1] + a2 \* y[t-2] + e[t]  
 else y[t] = b0 + b1\* y[t-1] + b2 \* y[t-2] + e[t]  
 }  
 return(y)  
}  
  
n = 100  
nsim = 100  
h=1  
train = vector(mode = 'list', length = nsim)  
real = rep(NA , nsim)  
  
for(i in 1:nsim){  
 tar.sim = tar2.sim(0, rnorm(n = n + h), n = n+1,   
 c(0.1,.09,.07),   
 c(0.2 , .05 , .04), th = 0)  
 train[[i]] = head( tar.sim, n)  
 real[i] = tail(tar.sim,h) }  
  
  
nb = 100  
va = lapply(train , tsbootstrap ,nb = nb, b = round( n/3),  
 type = 'block', statistic = bagging, h= h)  
  
bag = c()  
org = c()  
rel = c()  
for( i in 1:nsim ){  
 bag[i] = mean(va[[i]]$statistic)  
 org[i] = va[[i]]$orig.statistic  
 rel[i] = real[i] }  
  
  
MSE\_bag = mean ( (rel - bag)^2 )  
MSE\_orig = mean( (rel - org)^2 )  
  
MSE\_bag < MSE\_orig

## [1] TRUE

knitr::kable(cbind(h = h,nsim, nb , MSE\_orig, MSE\_bag))

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| h | nsim | nb | MSE\_orig | MSE\_bag |
| 1 | 100 | 100 | 0.8951716 | 0.8767593 |

# GARCH(2,2) --------------------------------------------------------------  
  
spec = garchSpec(model = list(alpha = c(0.12, 0.04),  
 beta = c(0.08,.05)),  
 cond.dist = 'norm')  
  
train = vector(mode = 'list', length = nsim)  
real = rep(NA , nsim)  
  
for(i in 1:nsim){  
 garch.sim = garchSim(spec, n = n + 1, extended = F)$garch  
 train[[i]] = head( tar.sim, n)  
 real[i] = tail(tar.sim,h) }  
  
  
nb = 100  
va = lapply(train , tsbootstrap ,nb = nb, b = round( n/3),  
 type = 'block', statistic = bagging, h= h)  
  
bag = c()  
org = c()  
rel = c()  
for( i in 1:nsim ){  
 bag[i] = mean(va[[i]]$statistic)  
 org[i] = va[[i]]$orig.statistic  
 rel[i] = real[i] }  
  
MSE\_bag = mean ( (rel - bag)^2 )  
MSE\_orig = mean( (rel - org)^2 )  
  
MSE\_bag < MSE\_orig

## [1] TRUE

knitr::kable(cbind(h = h,nsim, nb , MSE\_orig, MSE\_bag))

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| h | nsim | nb | MSE\_orig | MSE\_bag |
| 1 | 100 | 100 | 0.1178223 | 0.0844844 |