Time Series Analysis: Fourth laboratory

19 de febrero de 2020

Laboratory contents.

- Performance of the four methods for estimation of AR(p).
- Performance of MLE versus sample size

Performance of the four methods.

```
arfun<-function(N,n,phi,s,c){
#simulates N AR(p) processes with n observations,parameter phi standard deviation of a=s
phiest=matrix(nrow=N,ncol=4)
colnames(phiest)<-c("OLS","BURGS","YW","MLE")
for (i in 1:N){
x=arima.sim(list(ar=phi),sd=s,n)
f.ar.ols<-ar.ols(x,aic=F,inter=F,order=1)
phiest[i,1]=f.ar.ols$ar
f.ar.burg<-ar.burg(x,aic=F,inter=F,order=1)
phiest[i,2]=f.ar.burg$ar
f.ar.yw<-ar.burg(x,aic=F,inter=F,order=1)
phiest[i,3]=f.ar.yw$ar
f.ar.mle<-arima(x,order=c(1,0,0))
phiest[i,4]=f.ar.mle$coef[1]

}
#boxplots for the phi estimates
boxplot(phiest,main="Phi estimation versus method", col=c("green","red","blue","yellow"))


}
```

Performance of the four methods.

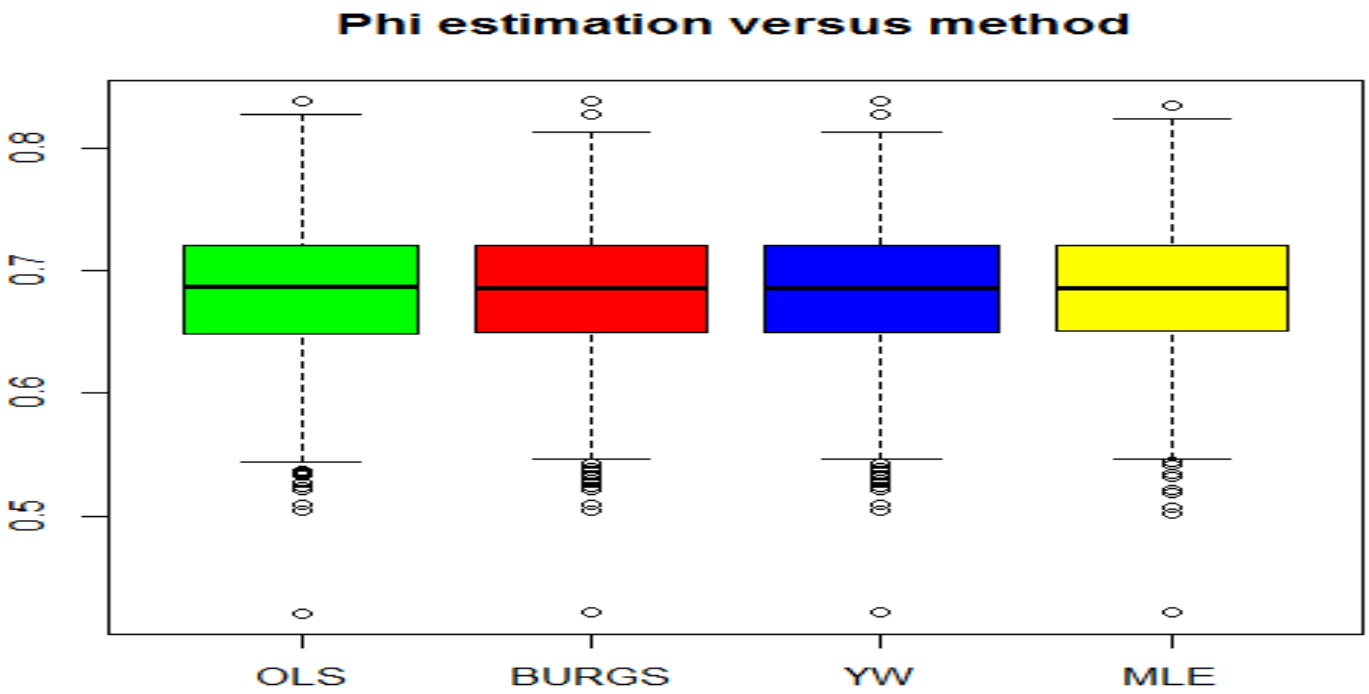

Figura: 1000 replications of an AR(1) with phi=0.7 and 200 observations

Performance of the four methods.

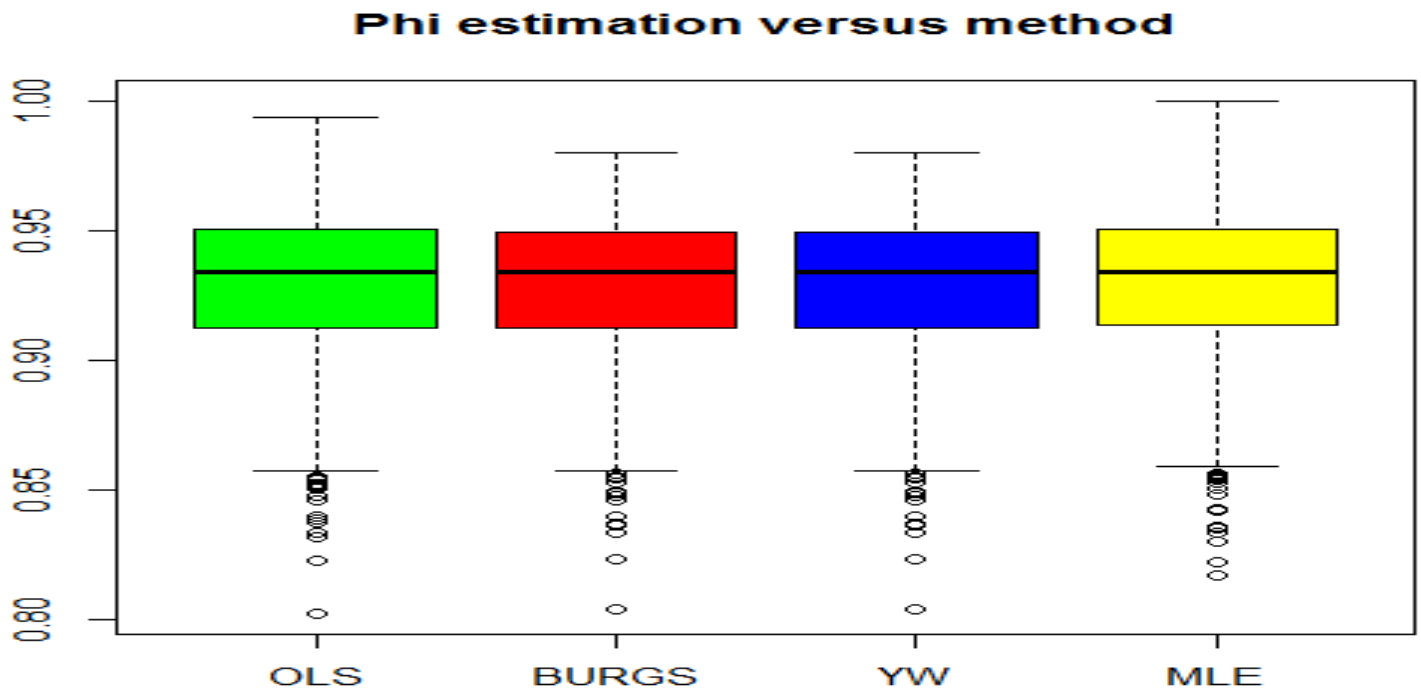

Figura: 1000 replications of an AR(1) with phi=0.95 and 200 observations

Performance of the four methods.

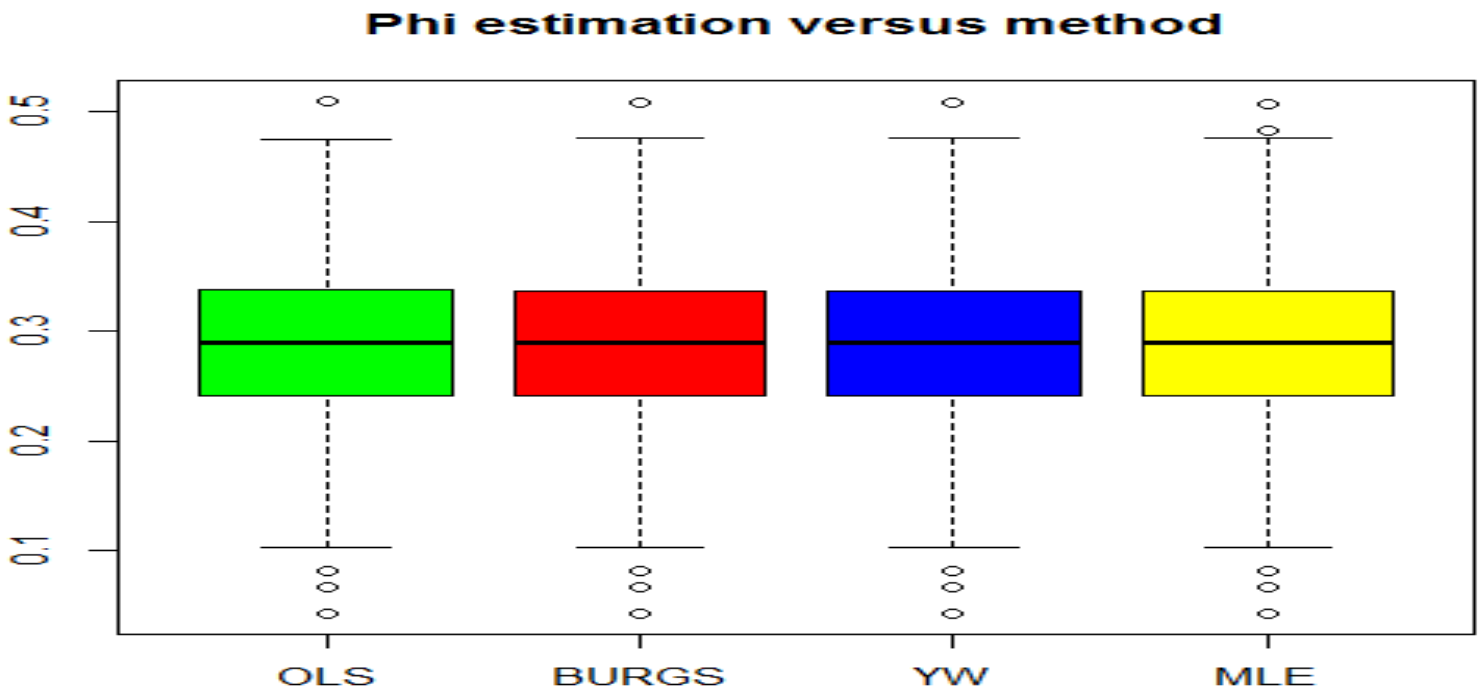

Figura: 1000 replications of an AR(1) with phi=0.3 and 200 observations

Performance of MLE vs sample size.

```
arfun<-function(N,n1,n2,n3,n4,phi,s,c){
#simulates N AR(p) processes with n observations,parameter phi standard deviation of a=s
phiest=matrix(nrow=N,ncol=4)
colnames(phiest)<-c("n=20","n=60","n=100","n=200")
for (i in 1:N){
x1=arima.sim(list(ar=phi),sd=s,n1)
x2=arima.sim(list(ar=phi),sd=s,n2)
x3=arima.sim(list(ar=phi),sd=s,n3)
x4=arima.sim(list(ar=phi),sd=s,n4)
f.ar.mle<-arima(x1,order=c(1,0,0))
phiest[i,1]=f.ar.mle$coef[1]
f.ar.mle<-arima(x2,order=c(1,0,0))
phiest[i,2]=f.ar.mle$coef[1]
f.ar.mle<-arima(x3,order=c(1,0,0))
phiest[i,3]=f.ar.mle$coef[1]
f.ar.mle<-arima(x4,order=c(1,0,0))
phiest[i,4]=f.ar.mle$coef[1]

}

boxplot(phiest,main="Phi estimation versus n",col=c("green","red","blue","yellow"))

}
```

Performance of MLE vs sample size.

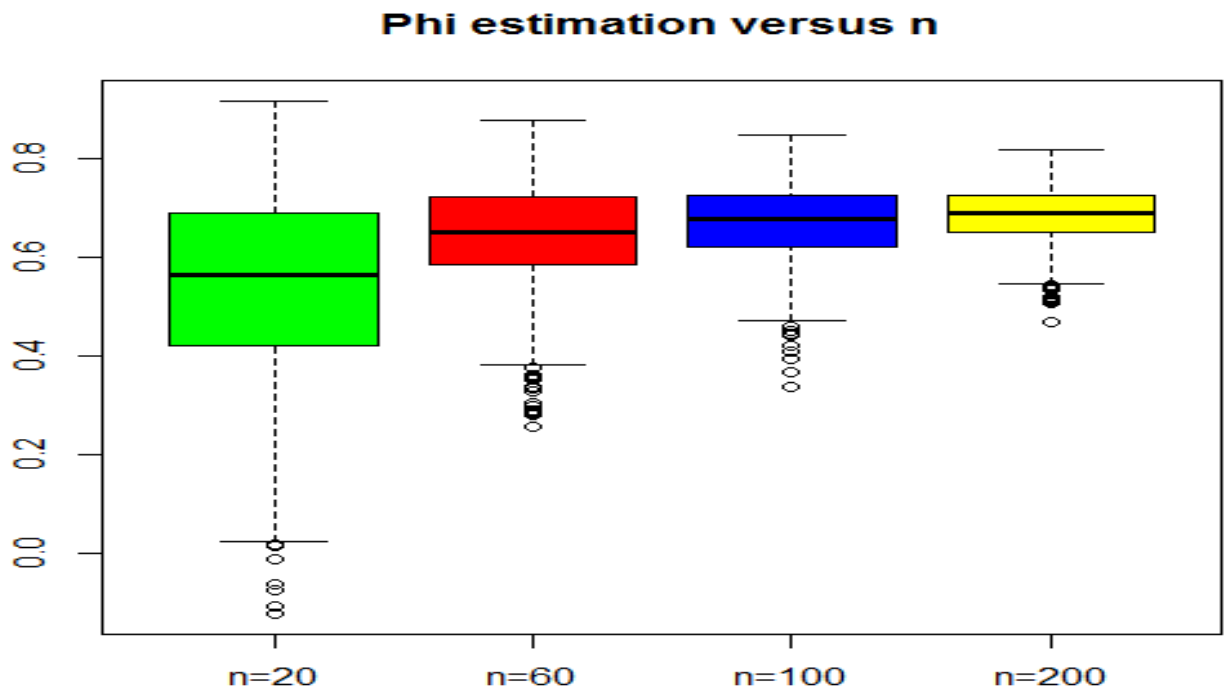

Figura: 1000 replications of an AR(1) with phi=0.7 and MLE

Performance of MLE vs sample size.

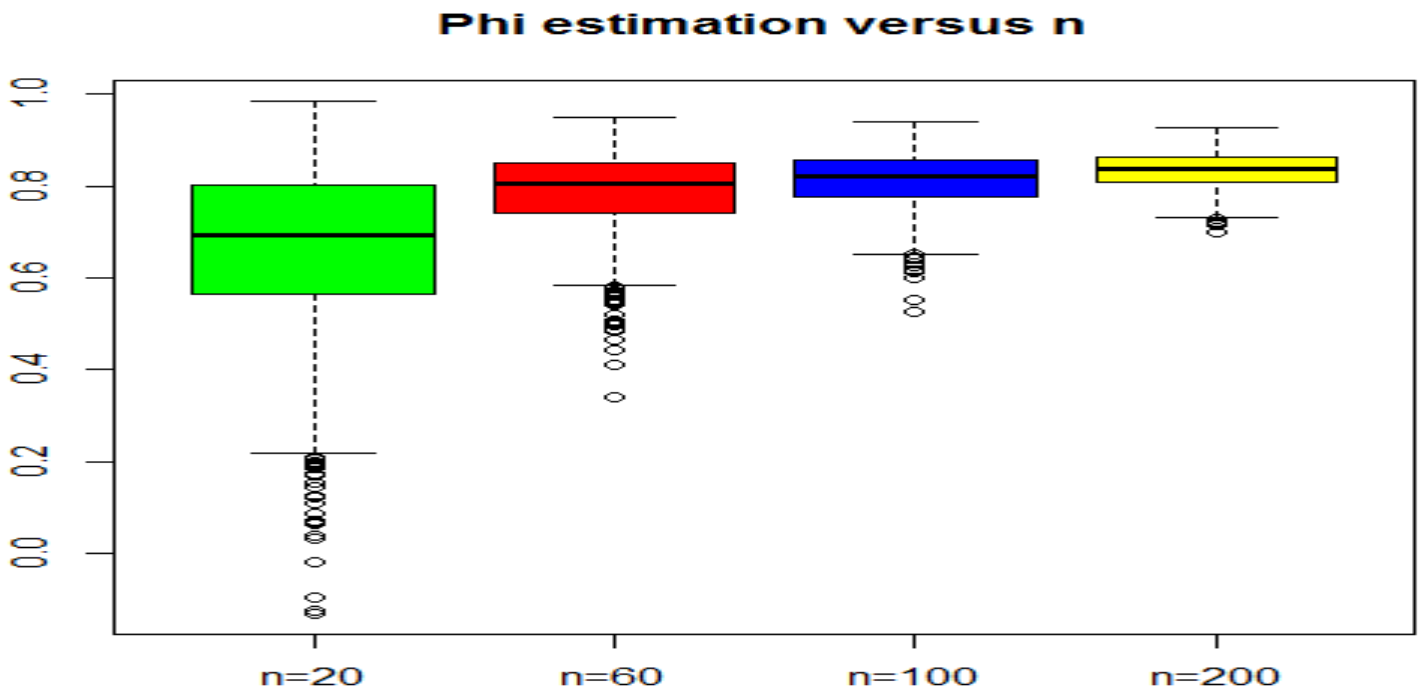

Figura: 1000 replications of an AR(1) with phi=0.85 and MLE

Performance of MLE vs sample size.

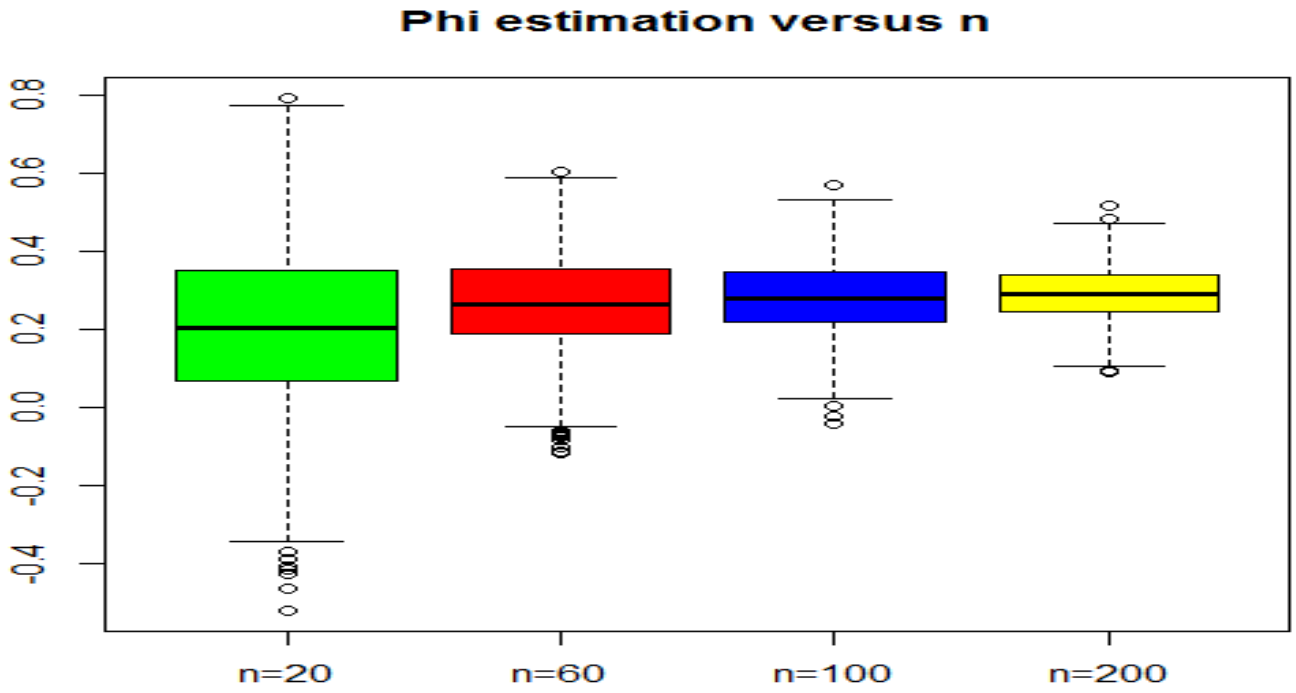

Figura: 1000 replications of an AR(1) with phi=0.3 and MLE

Performance of MLE vs sample size.

```
arfun<-function(N,n1,n2,n3,n4,phi,s,c){
#simulates N AR(p) processes with n observations,parameter phi standard deviation of a=s
phiest=matrix(nrow=N,ncol=4)
colnames(phiest)<-c("n=20","n=60","n=100","n=200")
for (i in 1:N){
x1=arima.sim(list(ar=phi),sd=s,n1)
x2=arima.sim(list(ar=phi),sd=s,n2)
x3=arima.sim(list(ar=phi),sd=s,n3)
x4=arima.sim(list(ar=phi),sd=s,n4)
f.ar.mle<-arima(x1,order=c(1,0,0))
phiest[i,1]=f.ar.mle$sigma
f.ar.mle<-arima(x2,order=c(1,0,0))
phiest[i,2]=f.ar.mle$sigma
f.ar.mle<-arima(x3,order=c(1,0,0))
phiest[i,3]=f.ar.mle$sigma
f.ar.mle<-arima(x4,order=c(1,0,0))
phiest[i,4]=f.ar.mle$sigma

}

boxplot(phiest,main="Sigma estimation versus n",col=c("green","red","blue","yellow"))

}
```

Performance of MLE vs sample size.

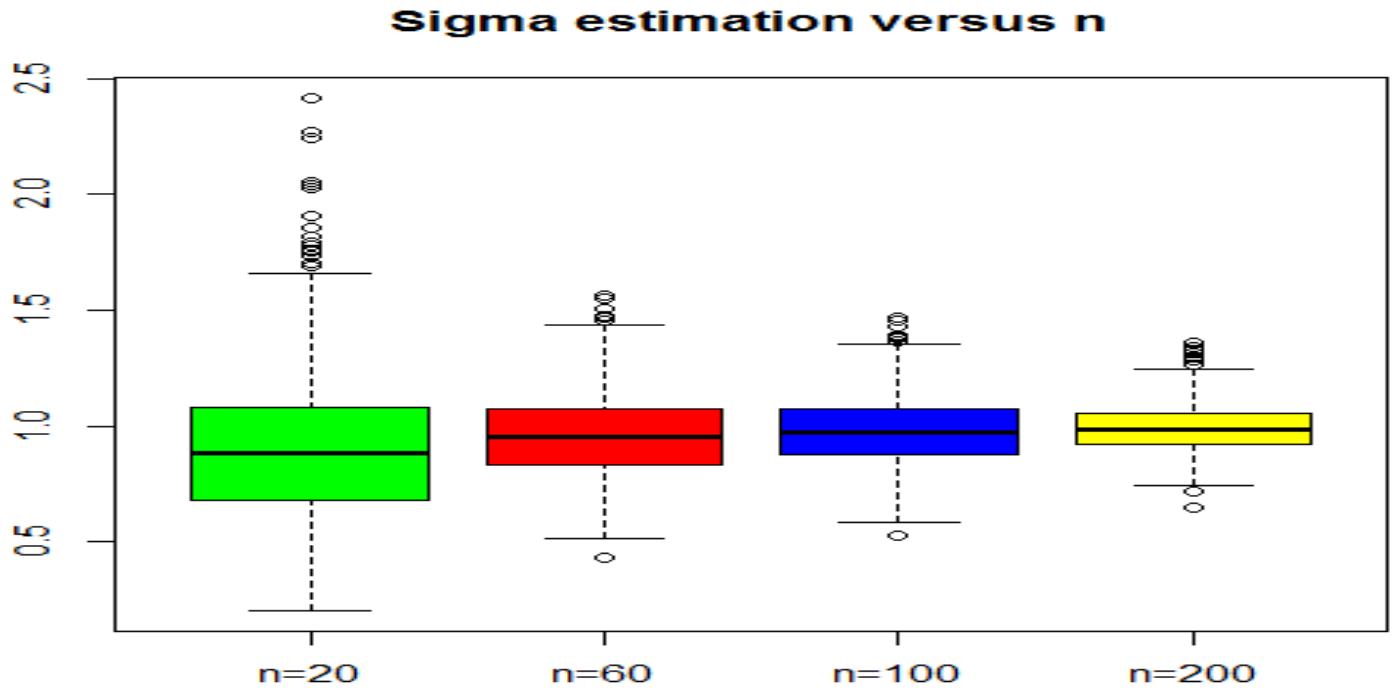

Figura: 1000 replications of an AR(1) with phi=0.4 and MLE

Performance of MLE vs sample size.

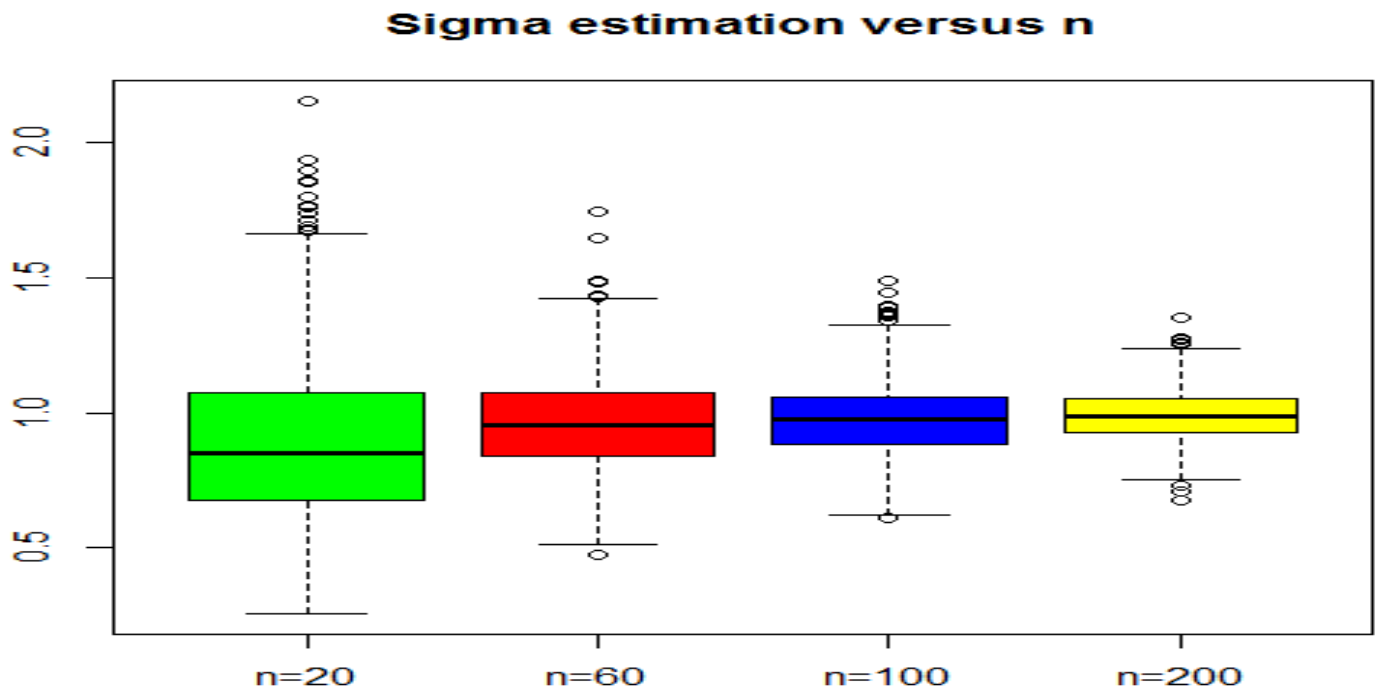

Figura: 1000 replications of an AR(1) with phi=0.85 and MLE