Actividad 7 - Series estacionarias

Paola Sofia Reyes Mancheno

2023-11-02

1. Problema 1: Ventas de Gasolina

```
y = c(17,21,19,23,18,16,20,18,22,20,15,22)
t = c(1,2,3,4,5,6,7,8,9,10,11,12)
```

1.1. Promedios móviles

```
pmov = NA
emov = NA
for(i in 1:9){pmov[i+3]=(y[i]+y[i+1]+y[i+2])/3; emov[i+3] = pmov[i+3] - y[i+3]}
```

```
pmov
```

```
##  [1] NA NA NA 19 21 20 19 18 18 20 20 19
```

```
emov
```

```
##  [1] NA NA NA -4  3  4 -1  0 -4  0  5 -3
```

```
CME2_mov=mean(emov^2,na.rm=TRUE)
CME2_mov
```

```
## [1] 10.22222
```

1.2. Promedios móviles ponderados

```
p_pond = NA
e_pond = NA
for(i in 1:9){p_pond[i+3]=(1/6)*y[i]+(2/6)*y[i+1]+(3/6)*y[i+2]; e_pond[i+3] = p_pond[i+3] - y[i+3]}
```

```
p_pond
```

```
##  [1]       NA       NA       NA 19.33333 21.33333 19.83333 17.83333 18.33333
##  [9] 18.33333 20.33333 20.33333 17.83333
```

```
e_pond
```

```
##  [1]         NA         NA         NA -3.6666667  3.3333333  3.8333333
##  [7] -2.1666667  0.3333333 -3.6666667  0.3333333  5.3333333 -4.1666667
```

```
CME2_pond=mean(e_pond^2,na.rm=TRUE)
CME2_pond
```

```
## [1] 11.49074
```

1.3. Exponencial

```
p_exp = NA
e_exp = NA
p_exp[1]=y[1]
p_exp[2]=y[1]
a=0.20
for(i in 3:12){p_exp[i]=a*y[i-1]+(1-a)*p_exp[i-1]; e_exp[i] = y[i]- p_exp[i]}
```

```
p_exp
```

```
##  [1] 17.00000 17.00000 17.80000 18.04000 19.03200 18.82560 18.26048 18.60838
##  [9] 18.48671 19.18937 19.35149 18.48119
```

```
e_exp
```

```
##  [1]         NA         NA  1.2000000  4.9600000 -1.0320000 -2.8256000
##  [7]  1.7395200 -0.6083840  3.5132928  0.8106342 -4.3514926  3.5188059
```

```
CME2_exp=mean(e_exp^2,na.rm=TRUE)
CME2_exp
```

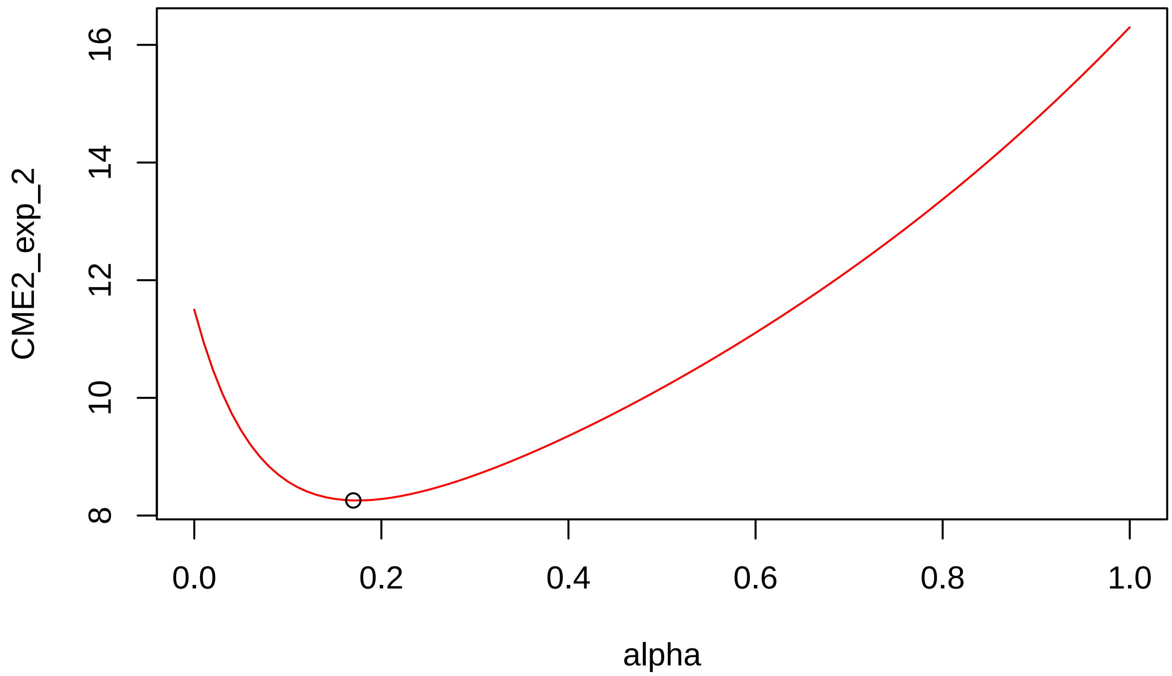
```
## [1] 8.280454
```

1.3.1. Distintos valores de alpha

```
alpha = seq(0, 1, by=0.01)
CME2_exp_2 = c()
for(a in alpha){
  p_exp = NA
  e_exp = NA
  p_exp[1]=y[1]
  p_exp[2]=y[1]

  for(i in 3:12){p_exp[i]=a*y[i-1]+(1-a)*p_exp[i-1]; e_exp[i] = y[i]- p_exp[i]}
  CME2_exp_2 <- c(CME2_exp_2, mean(e_exp^2,na.rm=TRUE))
}
```

```
plot(alpha, CME2_exp_2, type="l", col="red")
points(alpha[which.min(CME2_exp_2)], min(CME2_exp_2))
```




```
cat('El mejor alpha es:', alpha[which.min(CME2_exp_2)])
```

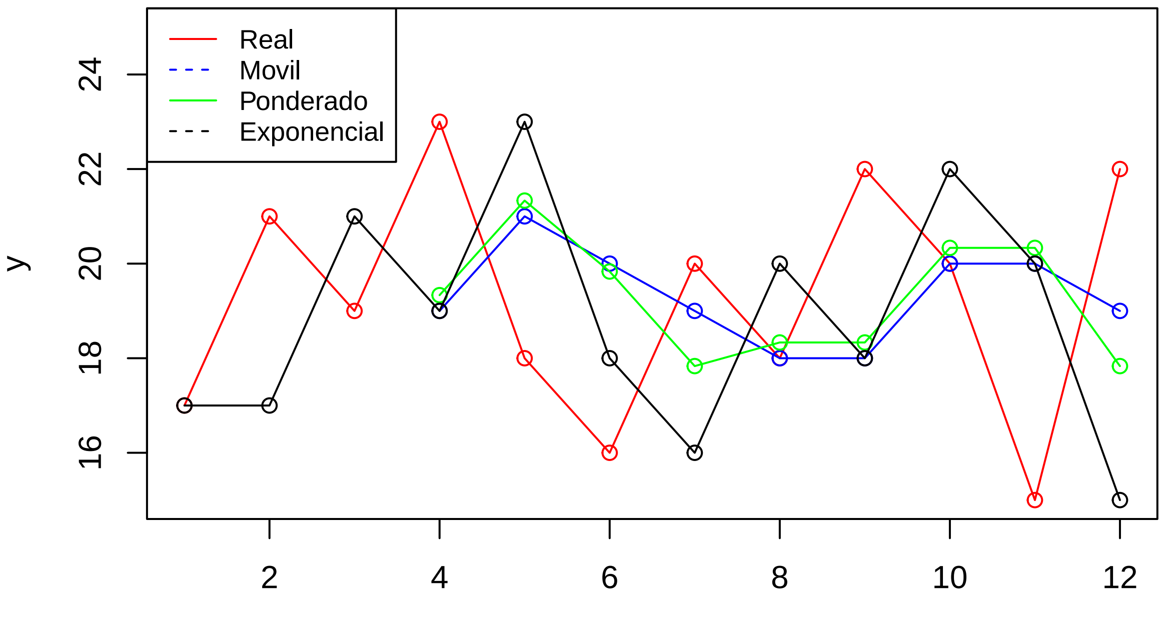
```
## El mejor alpha es: 0.17
```

```
cat('CME2 asociado:', min(CME2_exp_2))
```

```
## CME2 asociado: 8.256687
```

1.4. Predicción

```
x = 1:12
x2 = 3:12
plot(t, y, type="o", col="red", ylim = c(15, 25))
lines(x2,pmov[x2],type="o",col="blue")
lines(x2,p_pond[x2],type="o",col="green")
lines(x,p_exp[x],type="o",col="black")
legend('topleft',legend = c('Real', 'Movil','Ponderado','Exponencial'),  col=c("red", "blue",'green','bl
```



Al basarse en el CME, el mejor modelo es el exponencial, al tener un alpha de 0.17. Después, en segundo lugar está el de Promedio Móvil Ponderado, y por último el de promedio móvil.

```
p_exp = NA
e_exp = NA
p_exp[1]=y[1]
p_exp[2]=y[1]
a=0.17
for(i in 3:12){p_exp[i]=a*y[i-1]+(1-a)*p_exp[i-1]; e_exp[i] = y[i]- p_exp[i]}
```

```
cat('Predicción de la semana 13:', a*y[12] + (1-a)*p_exp[12])
```

```
## Predicción de la semana 13: 19.07608
```

2. Problema 2

```
y = c(81.32,81.1, 80.38, 81.34, 80.54, 80.62, 79.54, 79.46, 81.02, 80.98, 80.80, 81.44,81.48, 80.75, 80
```

2.1. Promedio movil

```
pmov = NA
emov = NA
for(i in 1:14){pmov[i+3]=(y[i]+y[i+1]+y[i+2])/3; emov[i+3] = pmov[i+3] - y[i+3]}
```

```
pmov
```

```
##  [1]       NA       NA       NA 80.93333 80.94000 80.75333 80.83333 80.23333
##  [9] 79.87333 80.00667 80.48667 80.93333 81.07333 81.24000 81.22333 80.90333
## [17] 80.41333
```

```
emov
```

```
##  [1]          NA          NA          NA -0.40666667  0.40000000  0.13333333
##  [7]  1.29333333  0.77333333 -1.14666667 -0.97333333 -0.31333333 -0.50666667
```

```
## [13] -0.40666667  0.49000000  0.74333333  0.89333333  0.08333333
```

2.1.1. Predicción

```r
cat('Predicción 19/sept/2005:',(y[15]+y[16]+y[17])/3)
```

```
## Predicción 19/sept/2005: 80.27333
```

2.1.2. Error promedio movil

```r
CME2_mov=mean(emov^2,na.rm=TRUE)
CME2_mov
```

```
## [1] 0.4995738
```

2.2. Exponencial con alpha = 0.6

```r
p_exp = NA
e_exp = NA
p_exp[1]=y[1]
p_exp[2]=y[1]
a=0.6
for(i in 3:17){p_exp[i]=a*y[i-1]+(1-a)*p_exp[i-1]; e_exp[i] = y[i]- p_exp[i]}
```

```r
p_exp
```

```
##  [1] 81.32000 81.32000 81.18800 80.70320 81.08528 80.75811 80.67524 79.99410
##  [9] 79.67364 80.48146 80.78058 80.79223 81.18089 81.36036 80.99414 80.68566
## [17] 80.28026
```

```r
e_exp
```

```
##  [1]          NA          NA -0.80800000  0.63680000 -0.54528000 -0.13811200
##  [7] -1.13524480 -0.53409792  1.34636083  0.49854433  0.01941773  0.64776709
## [13]  0.29910684 -0.61035727 -0.51414291 -0.67565716  0.04973714
```

```r
cat('Predicción 19/sept/2005:', a*y[17] + (1-a)*y[17])
```

```
## Predicción 19/sept/2005: 80.33
```

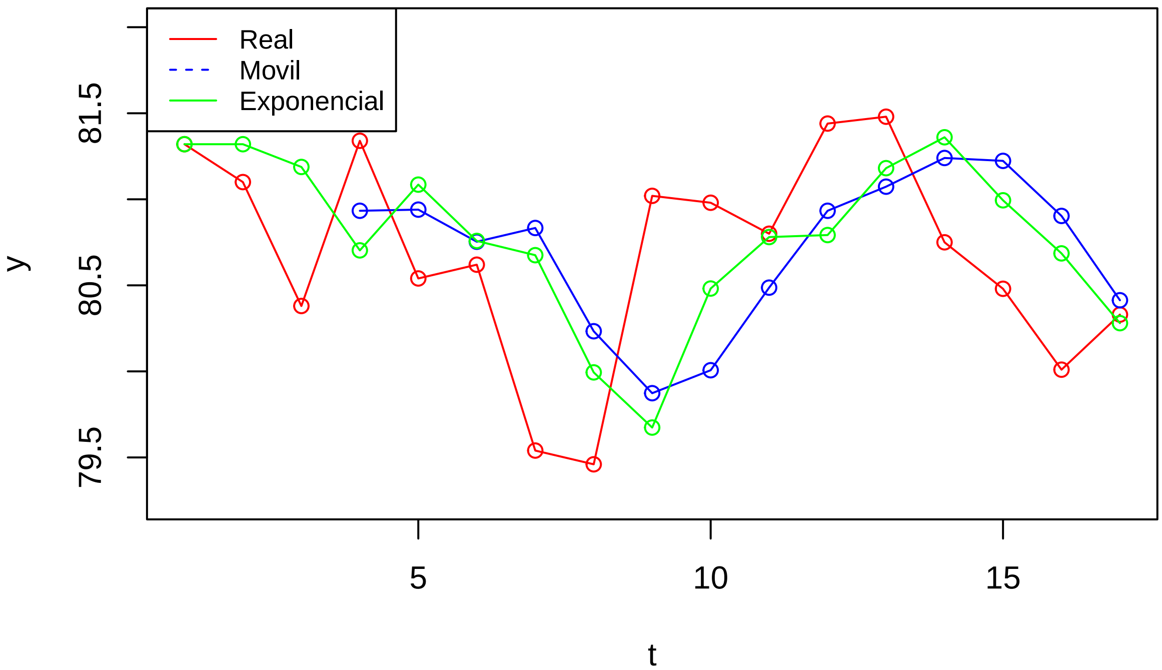
2.2.1. Error exponencial

```r
CME2_exp=mean(e_exp^2,na.rm=TRUE)
CME2_exp
```

```
## [1] 0.4410245
```

2.3. Comparación

```r
x = 1:17
x2 = 3:17
t = 1:17
plot(t, y, type="o", col="red", ylim = c(79.25,82))
lines(x2,pmov[x2],type="o",col="blue")
lines(x,p_exp[x],type="o",col="green")
legend('topleft',legend = c('Real', 'Movil','Exponencial'),  col=c("red", "blue",'green'), lty=1:2, cex=
```



Basándose en el error CME2, es el de promedio Exponencial con alpha de 0.6, y el segundo es el modelo con promedios móviles.