Series de tiempo

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

#Promedios móviles

```
n=12
k=3
p=NA
e=NA
for(i in 1:(n-3)){p[i+3]=(y[i]+y[i+1]+y[i+2])/3; e[i+3] = p[i+3] -
y[i+3]}
T=data.frame(t,p,y,e^2)
CME=mean(e^2,na.rm=TRUE)
T
```

```
##     t  p  y e.2
## 1   1 NA 17  NA
## 2   2 NA 21  NA
## 3   3 NA 19  NA
## 4   4 19 23  16
## 5   5 21 18   9
## 6   6 20 16  16
## 7   7 19 20   1
## 8   8 18 18   0
## 9   9 18 22  16
## 10 10 20 20   0
## 11 11 20 15  25
## 12 12 19 22   9
```

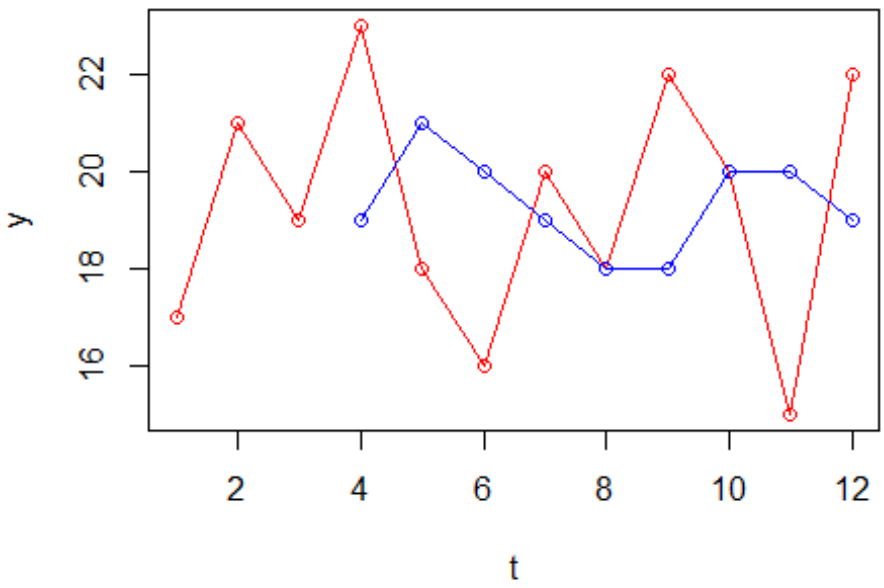
```
print("el cuadrado medio de los errores sin NA es:")
```

```
## [1] "el cuadrado medio de los errores sin NA es:"
```

```
print(CME)
```

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

```
plot(t, y, type='o', col='red')
x = (3+1):n
lines(x,p[x],type='o',col ='blue')
```



#Promedio móviles ponderados

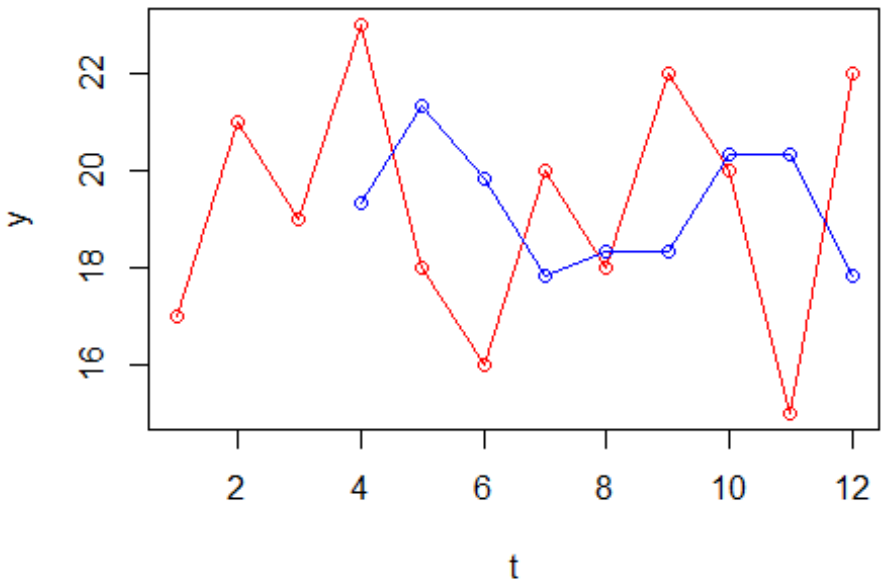
```
p2 = NA
e2 = NA
for(i in 1:(n-3)){p2[i+3]=(1/6)*y[i]+(2/6)*y[i+1]+(3/6)*y[i+2];
e2[i+3] = p2[i+3] - y[i+3]}
T2=data.frame(t,p2,y,e2^2)
T2
```

```
##     t       p2  y       e2.2
## 1   1       NA 17         NA
## 2   2       NA 21         NA
## 3   3       NA 19         NA
## 4   4 19.33333 23 13.4444444
## 5   5 21.33333 18 11.1111111
## 6   6 19.83333 16 14.6944444
## 7   7 17.83333 20  4.6944444
## 8   8 18.33333 18  0.1111111
## 9   9 18.33333 22 13.4444444
## 10 10 20.33333 20  0.1111111
## 11 11 20.33333 15 28.4444444
## 12 12 17.83333 22 17.3611111
```

```
CME2=mean(e2^2,na.rm=TRUE)
cat('El cuadrado medio de los errores sin NA es:', CME2)
```

```
## El cuadrado medio de los errores sin NA es: 11.49074
```

```
plot(t, y, type='o', col='red')
x = (3+1):n
lines(x,p2[x],type='o',col ='blue')
```



#Suavizamiento exponencial ## a = 0.2

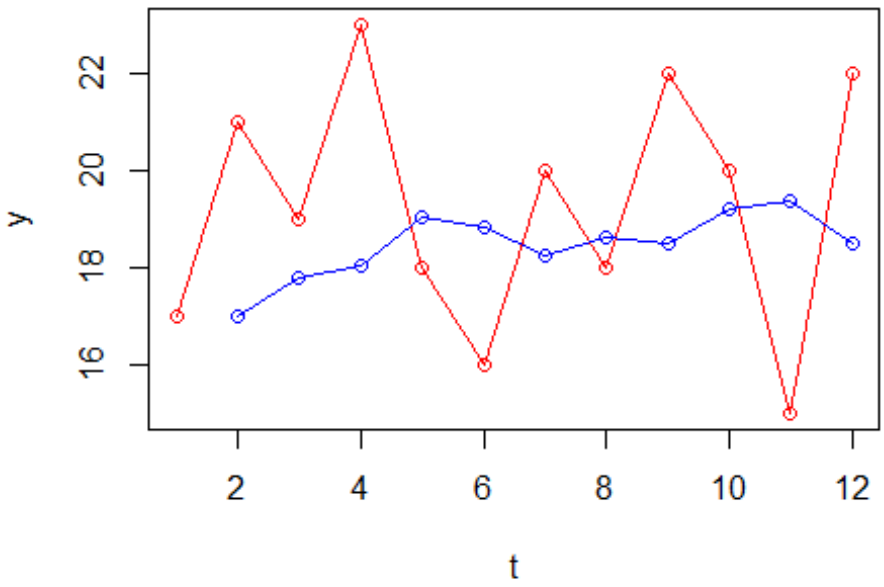
```
p3 = NA
e3= NA
p3[1]=y[1]
p3[2]=y[1]
a=0.20
for(i in 2:n){p3[i]=a*y[i-1]+(1-a)*p3[i-1];e3[i] = y[i]- p3[i]}
T3=data.frame(t,p3,y,e3^2)
T3
```

```
##     t       p3  y       e3.2
## 1   1 17.00000 17         NA
## 2   2 17.00000 21 16.0000000
## 3   3 17.80000 19  1.4400000
## 4   4 18.04000 23 24.6016000
## 5   5 19.03200 18  1.0650240
## 6   6 18.82560 16  7.9840154
## 7   7 18.26048 20  3.0259298
## 8   8 18.60838 18  0.3701311
## 9   9 18.48671 22 12.3432263
## 10 10 19.18937 20  0.6571279
## 11 11 19.35149 15 18.9354879
## 12 12 18.48119 22 12.3819951
```

```
CME3=mean(e3^2,na.rm=TRUE)
cat('El cuadrado medio de los errores sin NA es:', CME3)

## El cuadrado medio de los errores sin NA es: 8.982231

plot(t, y, type='o', col='red')
x = 2:n
lines(x,p3[x],type='o',col ='blue')
```



a = 0.05:0.5

```
p4 = NA
e4 = NA
p4[1]=y[1]
p4[2]=y[1]
j=seq(0.1,0.5,0.01)
for (a in j){
for(i in 2:n){p4[i]=a*y[i-1]+(1-a)*p4[i-1];e4[i] = y[i]- p4[i]}
CME4=mean(e4^2,na.rm=TRUE)
cat('a=',a,' ',CME4,'\n')}

## a= 0.1   9.252776
## a= 0.11   9.168434
## a= 0.12   9.101534
## a= 0.13   9.049843
## a= 0.14   9.011444
## a= 0.15   8.984687
## a= 0.16   8.968154
```

```
## a= 0.17   8.960625
## a= 0.18   8.961046
## a= 0.19   8.968509
## a= 0.2   8.982231
## a= 0.21   9.001533
## a= 0.22   9.025827
## a= 0.23   9.054606
## a= 0.24   9.087428
## a= 0.25   9.123907
## a= 0.26   9.16371
## a= 0.27   9.206545
## a= 0.28   9.252158
## a= 0.29   9.300326
## a= 0.3   9.350855
## a= 0.31   9.403574
## a= 0.32   9.458334
## a= 0.33   9.515003
## a= 0.34   9.573467
## a= 0.35   9.633624
## a= 0.36   9.695385
## a= 0.37   9.758674
## a= 0.38   9.82342
## a= 0.39   9.889566
## a= 0.4   9.957057
## a= 0.41   10.02585
## a= 0.42   10.0959
## a= 0.43   10.16718
## a= 0.44   10.23966
## a= 0.45   10.31331
## a= 0.46   10.38812
## a= 0.47   10.46405
## a= 0.48   10.54111
## a= 0.49   10.61927
## a= 0.5   10.69854
```

a=0.17 da el menor error. Esto quiere decir que el modelo exponencial con a=0.17 es el mejor modelo para predecir las ventas de gasolina.

#Pronóstico

```
sem13=p3[12]+0.17*(y[12]-p3[12])
print('El pronóstico para la semana 13 es:')

## [1] "El pronóstico para la semana 13 es:"

sem13

## [1] 19.07939
```