TIME SERIES TP 2

2020-09-21

Contents


```
library(ggplot2)
library(astsa)
library(dplyr)
library(xts)
```

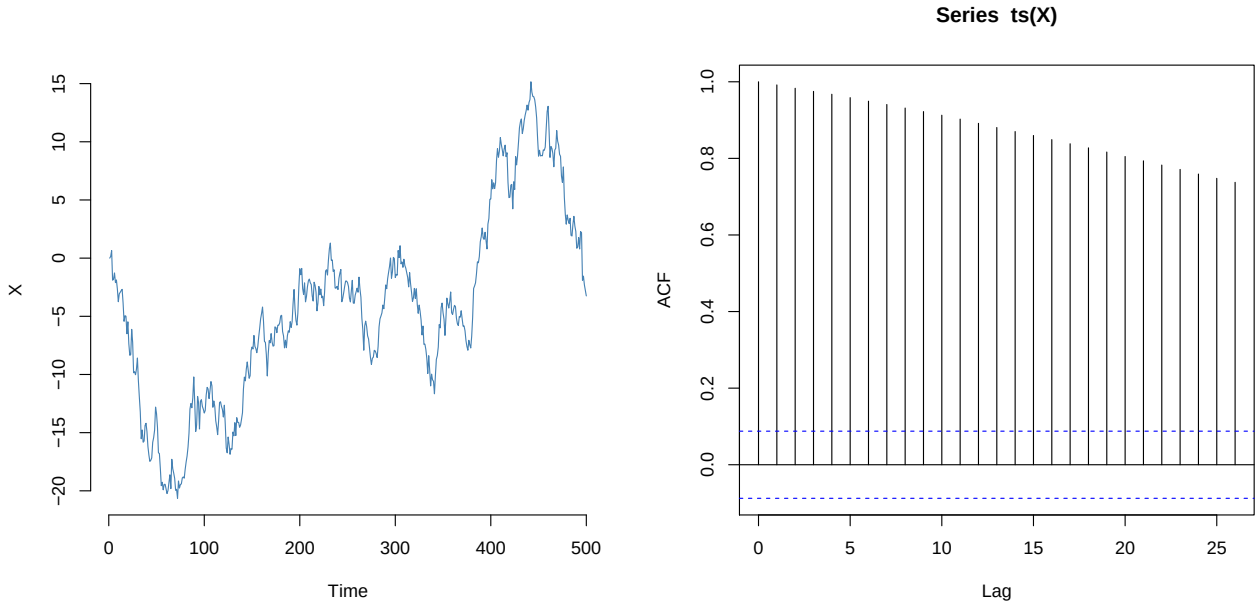
EXERCISE 1

Question 1

$$X_t = X_{t_1} + \epsilon_t, \quad X_0 = 0$$

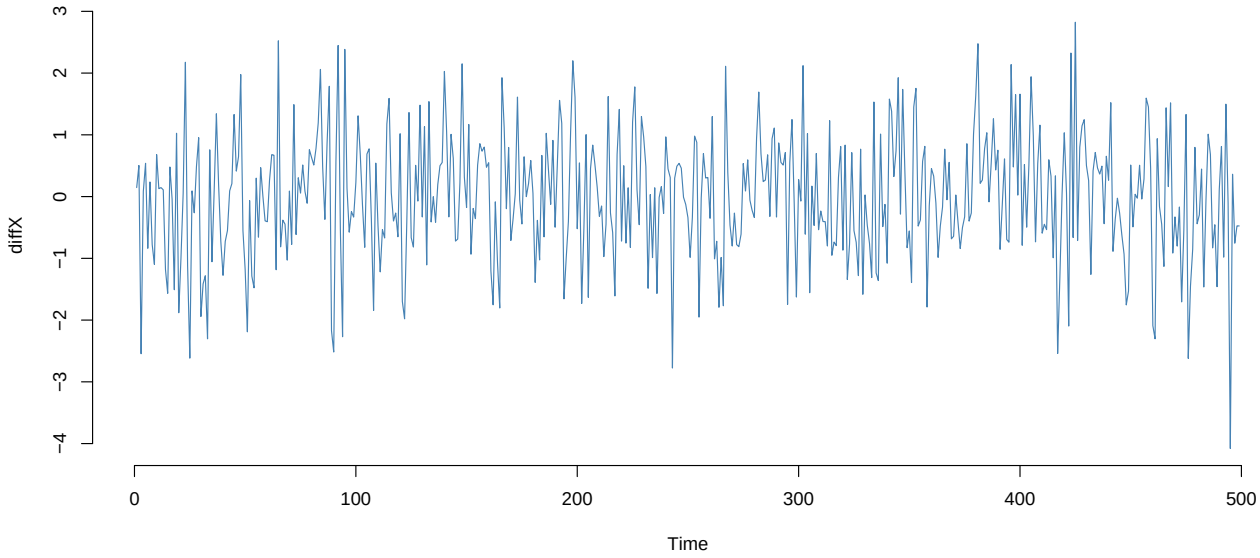
```
par(mfrow=c(1,2))
X=numeric()
X[1]=0
n<-500
for (k in 2:n)
{
  X[k]=X[k-1]+rnorm(1)
}

plot.ts(X,col='steel blue',frame=FALSE)
acf(ts(X))
```



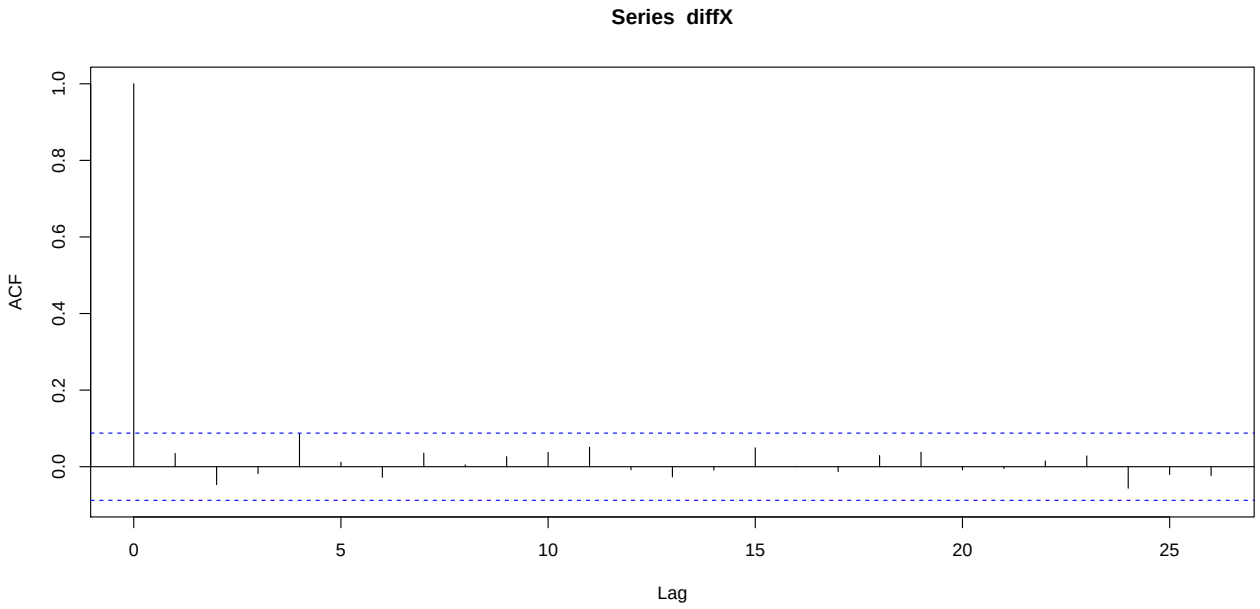
Question 2

```
diffX<-diff(X)
plot.ts(diffX,col='steel blue',frame=FALSE)
```



There is no trend and the autocorrelation is nearly zero.

```
acf(diffX)
```



EXERCISE 2

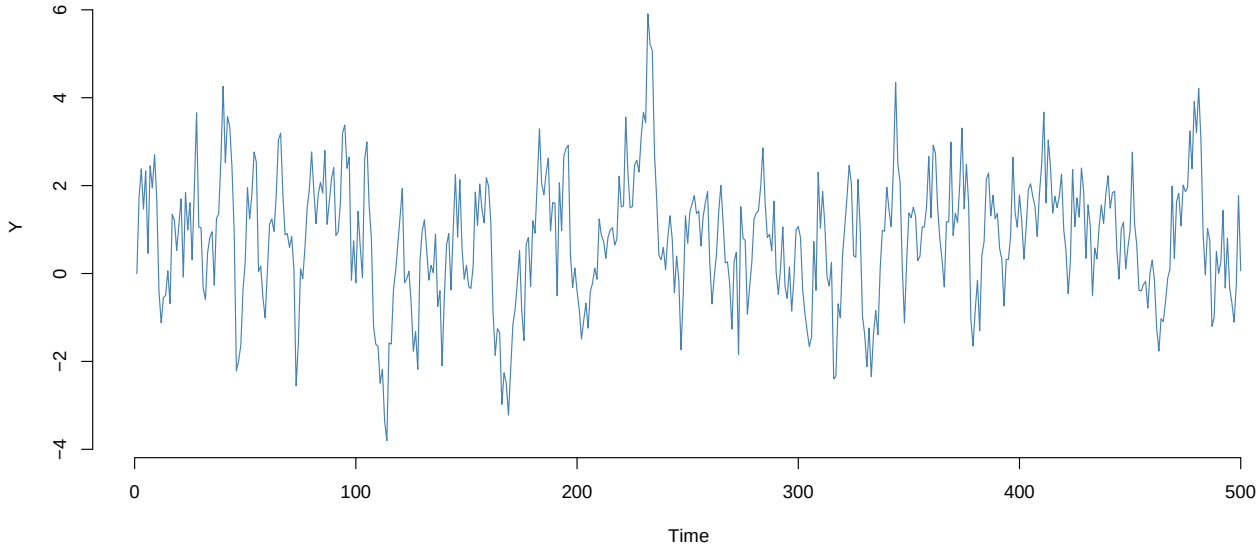
$$Y_t = 0.25 + 0.75Y_{t-1} + \epsilon_t$$

```
Y=numeric()
Y[1]=0
print(Y)
```

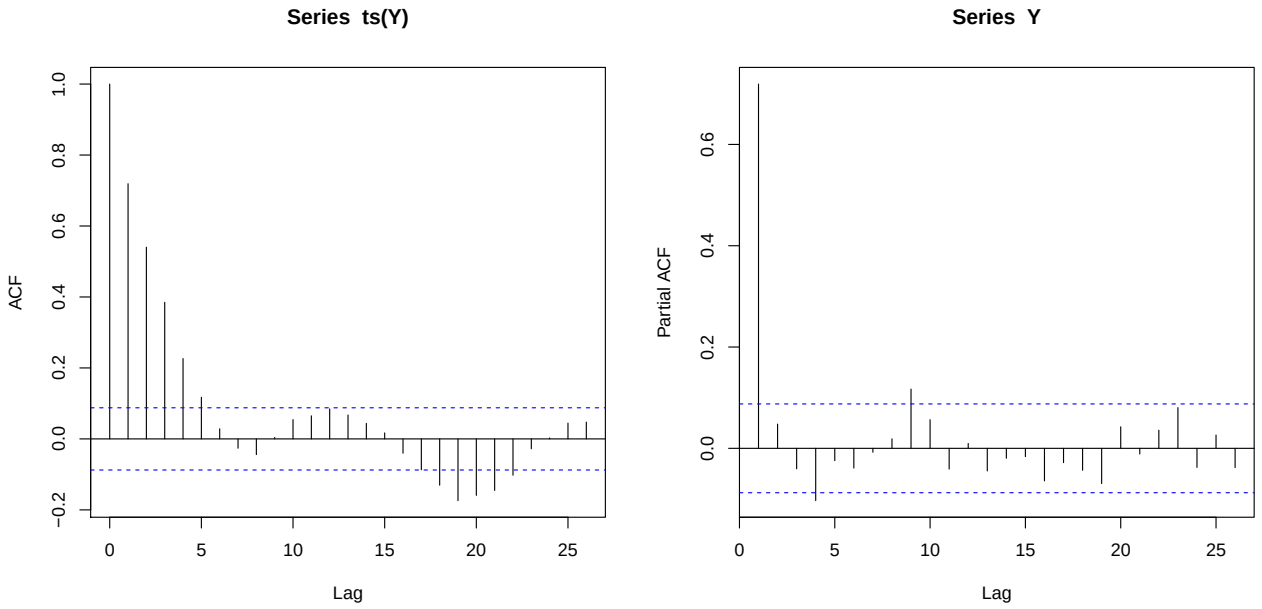
```
[1] 0
```

```
for (k in 2:n)
{
  Y[k]=0.25+0.75*Y[k-1]+rnorm(1)
}

plot.ts(Y,col='steel blue',frame=FALSE)
```



```
par(mfrow=c(1,2))
acf(ts(Y))
pacY<-pacf(Y)
```




```
pacY
```

```
Partial autocorrelations of series 'Y', by lag

     1      2      3      4      5      6      7      8      9     10     11
 0.719  0.048 -0.040 -0.103 -0.024 -0.039 -0.008  0.019  0.117  0.056 -0.041
    12     13     14     15     16     17     18     19     20     21     22
 0.010 -0.045 -0.020 -0.016 -0.064 -0.028 -0.043 -0.070  0.043 -0.011  0.036
    23     24     25     26
 0.080 -0.038  0.026 -0.038
```

We notice the autocorrelation in $t > 1$ results in autocorrelation in $t = 1$