CAT1_2448143

sanjay(2448143)

2025-02-24

INTRODUCTION:

To Visualize and analyze using ACF plots to bring out its stationary version by the giving following data set.

OBJECTIVE:

Visualize the dataset and convert it into stationary.

CODE

```
library(forecast)
```

```
## Warning: package 'forecast' was built under R version 4.4.2
```

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

```
library(tseries)
```

```
## Warning: package 'tseries' was built under R version 4.4.2
```

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 4.4.2
```

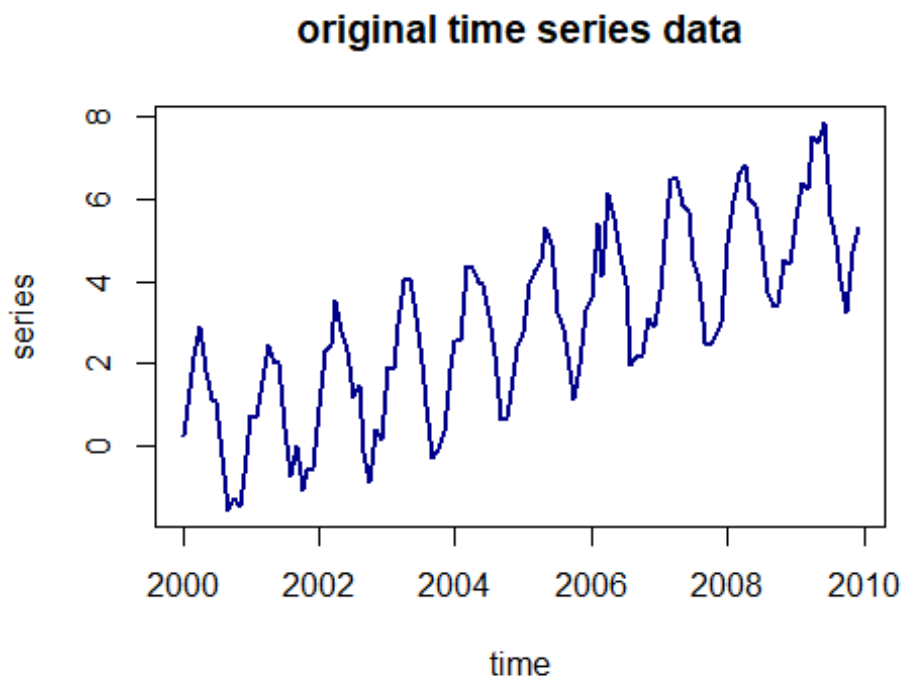
```
data=read.csv("C:/Users/sanja/Downloads/data_set_i.csv")
head(data)
```

```
##         Time    series
## 1 31-01-2000 0.2483571
## 2 29-02-2000 0.9808678
## 3 31-03-2000 2.1558951
## 4 30-04-2000 2.9115149
## 5 31-05-2000 1.8149741
## 6 30-06-2000 1.1329315
```

```
#convert into time-series data
ts_data=ts(data$series,start =c(2000,1),frequency = 12)
ts_data
```

```
##               Jan          Feb          Mar          Apr          May
## 2000  0.248357077  0.980867849  2.155895077  2.911514928  1.814974120
## 2001  0.720981136  0.693359878  1.569591891  2.468856235  2.025635247
## 2002  0.927808638  2.305461295  2.456554019  3.537849009  2.831731463
```

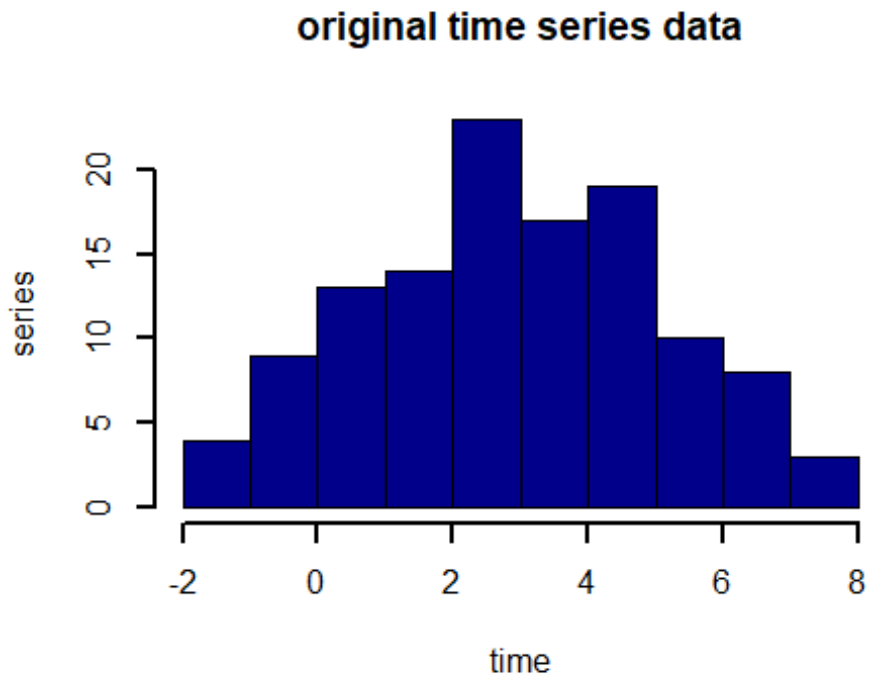
```
## 2003  1.904431798  1.870164938  2.967957783  4.048430618  4.101284098
## 2004  2.571809145  2.568479922  4.394092792  4.357458860  3.993589807
## 2005  2.760412881  3.957170512  4.278883321  4.551896688  5.338313719
## 2006  3.582086980  5.432321828  4.122178256  6.160951252  5.575574342
## 2007  3.795753199  4.999121478  6.489751866  6.514375555  5.867170706
## 2008  4.948060139  5.980527636  6.634607536  6.832706433  6.024365437
## 2009  5.528775195  6.412777042  6.272665200  7.536743062  7.362165913
##               Jun          Jul          Aug          Sep          Oct
## 2000  1.132931522  1.089606408 -0.266282635 -1.566788001 -1.278719978
## 2001  2.007123666  0.445987962 -0.756151851  0.000773577 -1.062888150
## 2002  2.304153125  1.199146694  1.476139092 -0.138799420 -0.878855464
## 2003  3.135684141  2.042175859  0.999448152 -0.271311803 -0.109922104
## 2004  3.955838144  3.215499761  2.215640060  0.648340431  0.695393812
## 2005  4.928120014  3.263994939  2.851766449  1.848767205  1.127440123
## 2006  4.700496325  3.945880388  1.956215543  2.158113249  2.228556286
## 2007  5.706633717  4.548538775  4.034322495  2.516922645  2.486168927
## 2008  5.839677339  4.928642742  3.748861365  3.387306337  3.452025428
## 2009  7.881621056  5.603819518  4.900773671  4.050593308  3.265660981
##               Nov          Dec
## 2000 -1.463759654 -0.682864877
## 2001 -0.598286705 -0.562374093
## 2002  0.379221648  0.139578175
## 2003  0.337629807  1.878561113
## 2004  1.333580908  2.437772564
## 2005  1.948646995  3.319018283
## 2006  3.106896215  2.890864891
## 2007  2.771895116  3.018242526
## 2008  4.511042143  4.437288906
## 2009  4.739360600  5.325966516

plot(ts_data,type="l",main="original time series
data",xlab="time",ylab="series",col="darkblue",lwd=2)
```



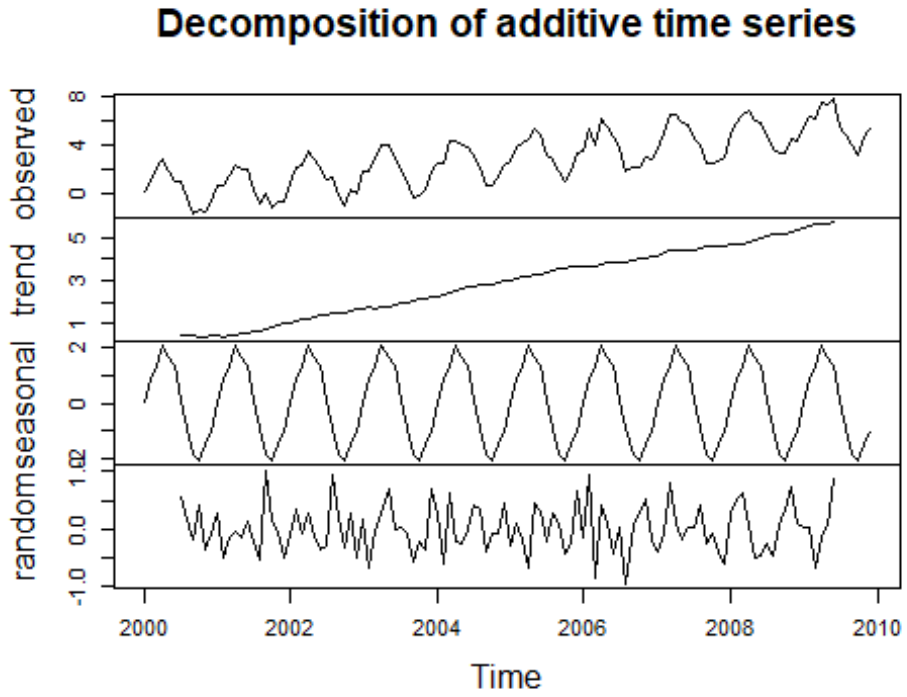
INTERPREATION:

The time series data set model is addictive model and its non-stationary

```
hist(ts_data,type="l",main="original time series
data",xlab="time",ylab="series",col="darkblue",lwd=2)

## Warning in plot.window(xlim, ylim, "", ...): graphical parameter "type" is
## obsolete

## Warning in title(main = main, sub = sub, xlab = xlab, ylab = ylab, ...):
## graphical parameter "type" is obsolete

## Warning in axis(1, ...): graphical parameter "type" is obsolete

## Warning in axis(2, at = yt, ...): graphical parameter "type" is obsolete
```



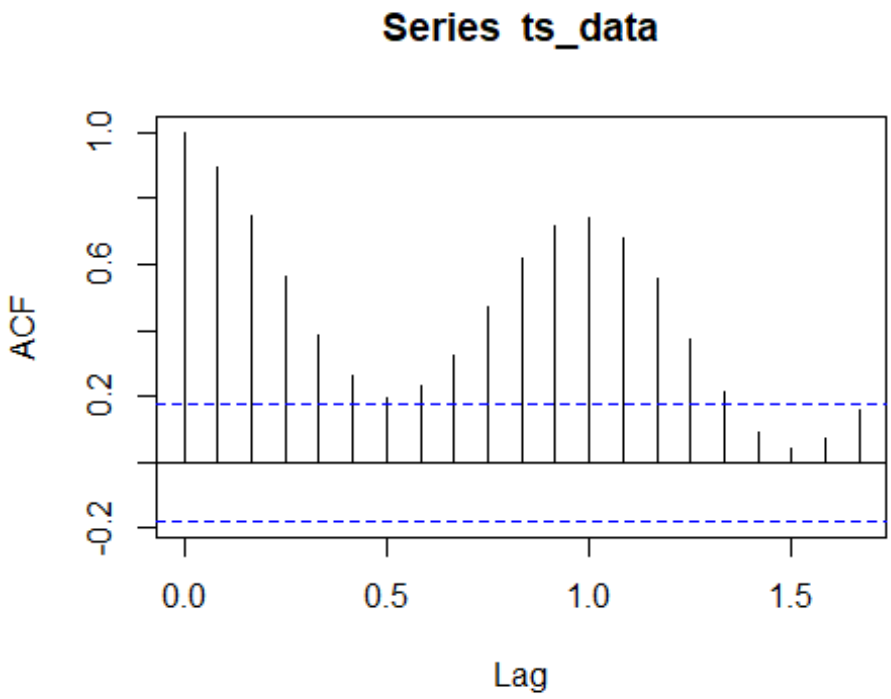

```r
#decomposition of original time_series data
decompose_addict=decompose(ts_data)
plot(decompose_addict)
```



INTERPRETATION:

This plot shows that the model has some irregular variations like seasonal,trend,random walk.

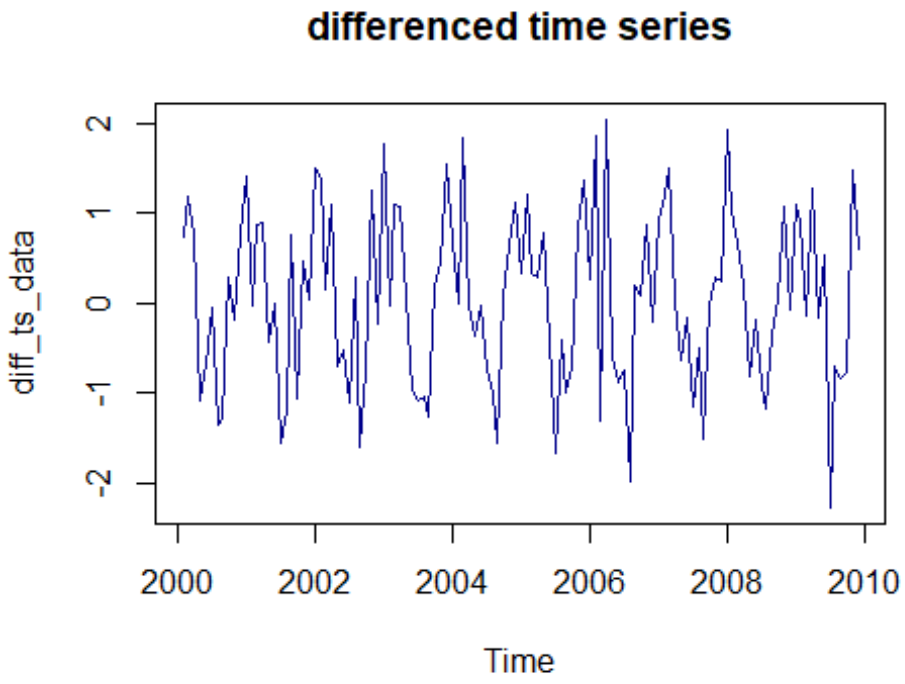
```
acf(ts_data)
```



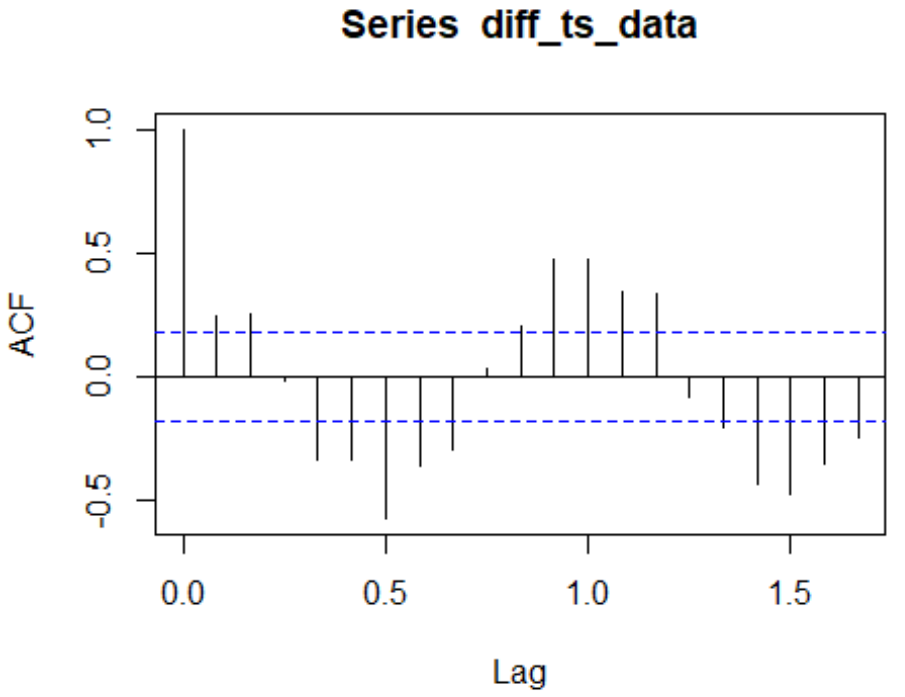
INTERPRETATION:

This plot shows that the significant autocorrelation-because there are more values above the threshold.

```
#apply first order differencing
p_order=1
diff_ts_data=diff(ts_data,p_order)
plot(diff_ts_data,main="differenced time series",col="darkblue",type="l")
```




```
acf(diff_ts_data)
```

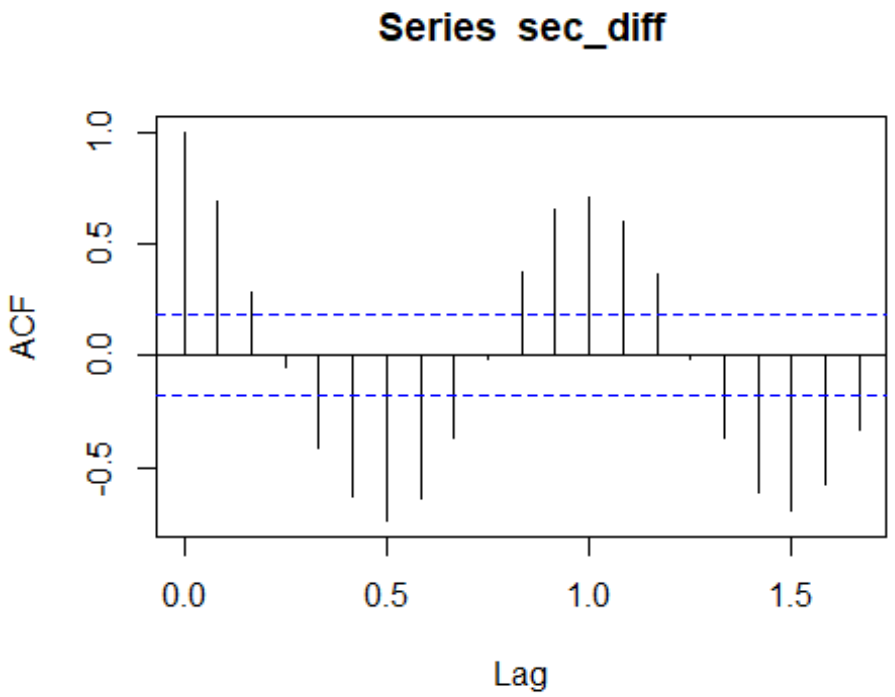


INTERPRETATION:

After applying first order differencing ,the tend is eliminated but the auto correlation function remains the same so we move on to second order differencing method.

```
#apply second order differencing
p_order=2
sec_diff=diff(ts_data,p_order)
plot(sec_diff,main="second order differencing",col="darkblue",type="l")
```

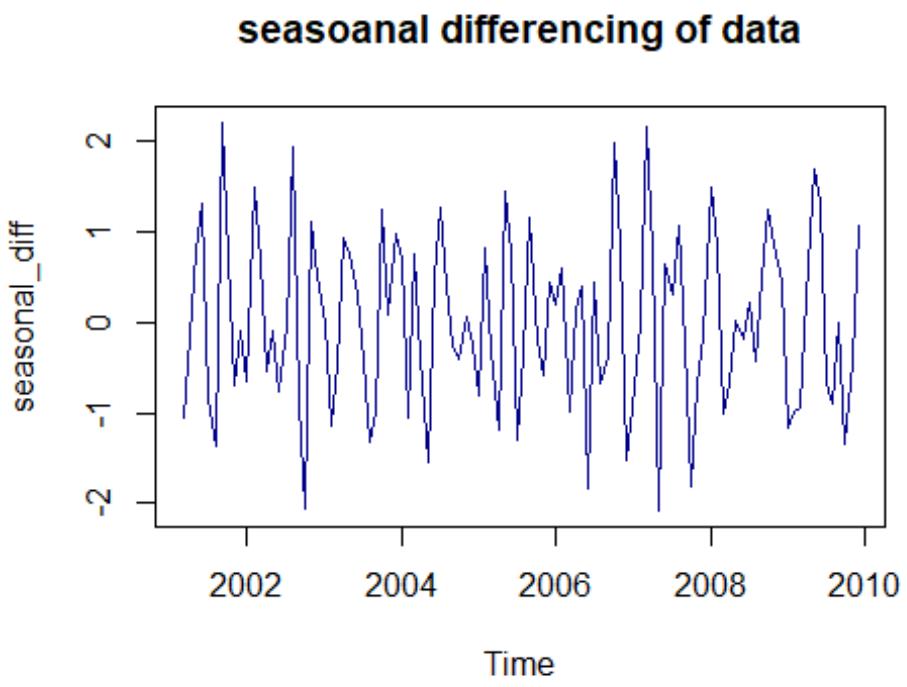

```
acf(sec_diff)
```



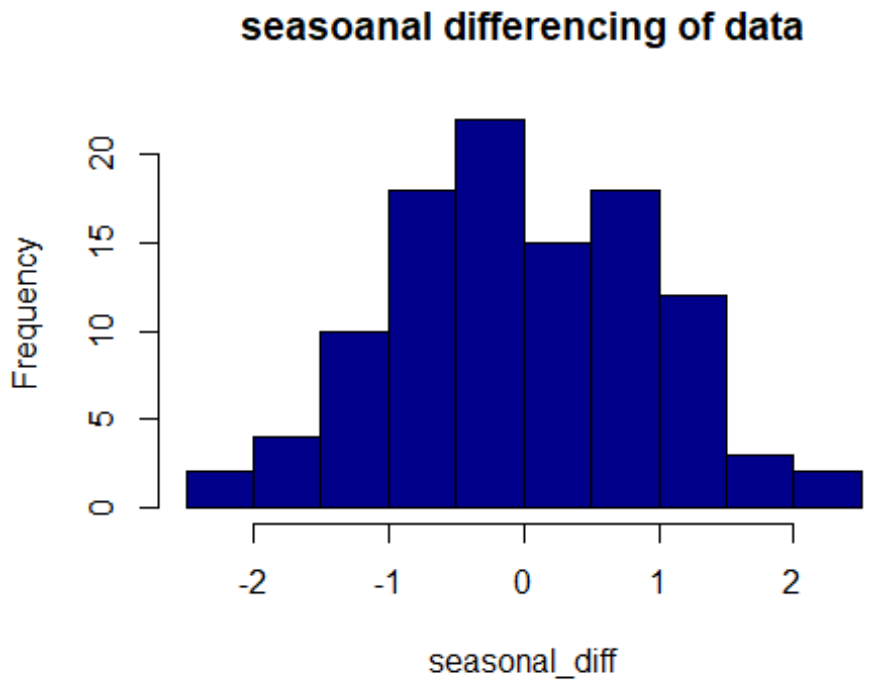
INTERPRETATION:

After applying the second_order differencing the acf plot remains the same ,most of the values are above the threshold and remains to be stationary.

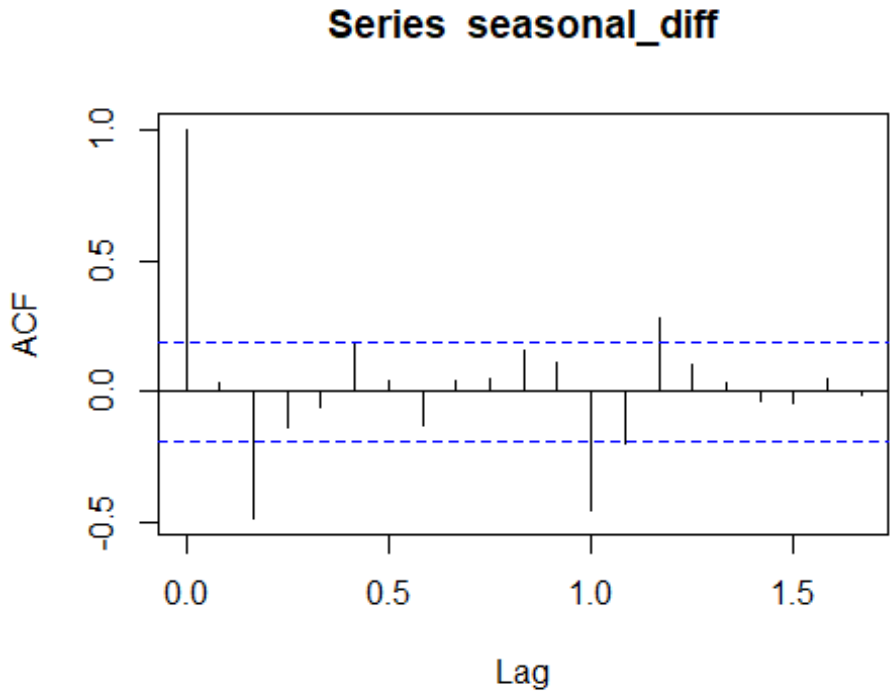
```
#apply seasonal differencing
k_order=1
seasonal_diff=diff(sec_diff,lag = 12,k_order)
plot(seasonal_diff,main="seasoanal differencing of
data",col="darkblue",type="l")
```




```
hist(seasonal_diff,main="seasoanal differencing of
data",col="darkblue",type="l")

## Warning in plot.window(xlim, ylim, "", ...): graphical parameter "type" is
## obsolete

## Warning in title(main = main, sub = sub, xlab = xlab, ylab = ylab, ...):
## graphical parameter "type" is obsolete

## Warning in axis(1, ...): graphical parameter "type" is obsolete

## Warning in axis(2, at = yt, ...): graphical parameter "type" is obsolete
```




```
acf(seasonal_diff)
```



INTERPRETATION:

After applying seasonal differencing the autocorrelation significantly reduced.in acf plot most of the values are below the threshold and it attains the stationary.

```
#adf test
adf.test(seasonal_diff)
```

```
## Warning in adf.test(seasonal_diff): p-value smaller than printed p-value
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  seasonal_diff
## Dickey-Fuller = -6.3492, Lag order = 4, p-value = 0.01
## alternative hypothesis: stationary
```

INTERPRETATION:

AUGMENTED DICKEY FULLER TEST

NULL HYPOTHESIS:THE DATA IS NON-STATIONARY

ALTERNATIVE HYPOTHESIS:THE DATA IS STATIONARY

In this test,p-value is less than 0.05

So,we reject the null hypothesis and accept the alternative hypothesis and its stationary.

CONCLUSION:

Visualize the data and attain it stationary by using acf plot and adf test.