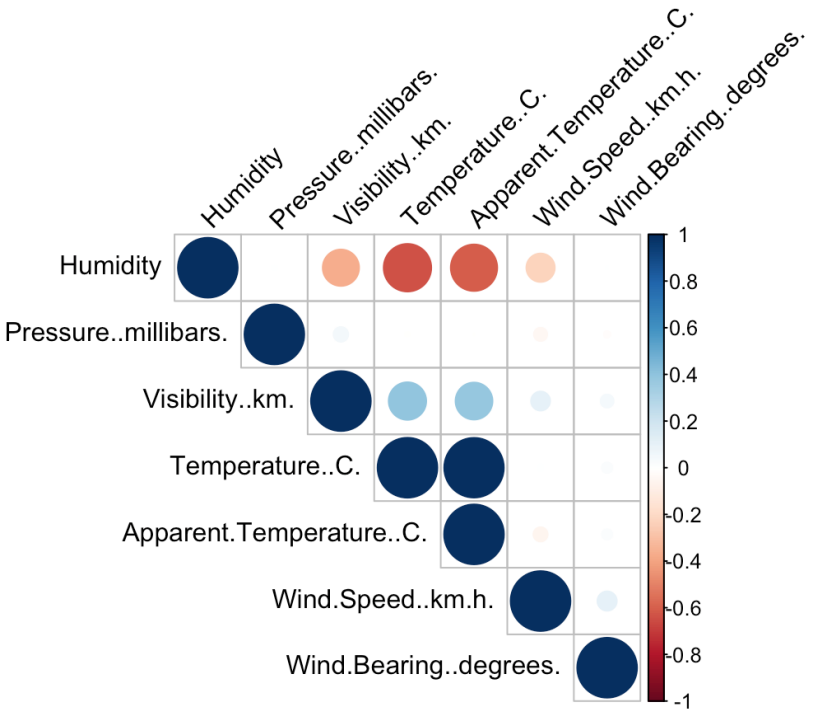
Appendix

Plot 1.1

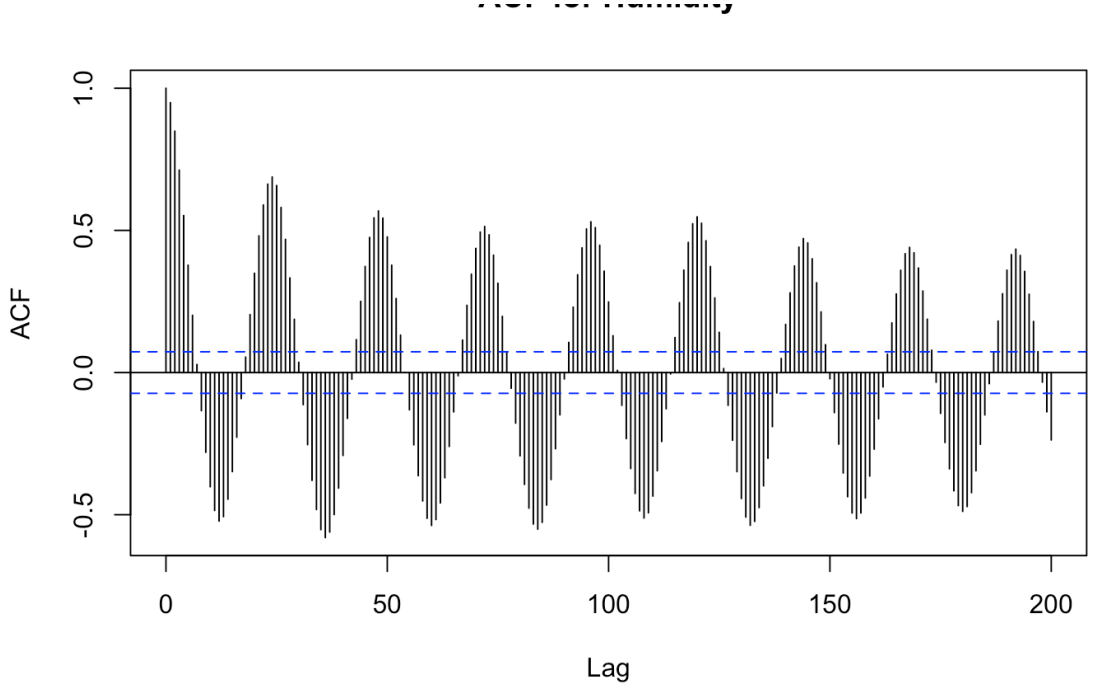
	Temperature..C.	Apparent.Temperature..C.	Humidity	Wind.Speed..km.h.
Temperature..C.	1.000000000	0.9926285642	-0.6322546750	0.008956968
Apparent.Temperature..C.	0.992628564	1.0000000000	-0.6025709956	-0.056649698
Humidity	-0.632254675	-0.6025709956	1.0000000000	-0.224951456
Wind.Speed..km.h.	0.008956968	-0.0566496983	-0.2249514559	1.000000000
Wind.Bearing..degrees.	0.029988204	0.0290305198	0.0007346454	0.103821508
Visibility..km.	0.392846572	0.3817184705	-0.3691725006	0.100749284
Pressure..millibars.	-0.005447106	-0.0002189998	0.0054542633	-0.049262806

	Wind.Bearing..degrees.	Visibility..km.	Pressure..millibars.
Temperature..C.	0.0299882045	0.39284657	-0.0054471062
Apparent.Temperature..C.	0.0290305198	0.38171847	-0.0002189998
Humidity	0.0007346454	-0.36917250	0.0054542633
Wind.Speed..km.h.	0.1038215077	0.10074928	-0.0492628055
Wind.Bearing..degrees.	1.0000000000	0.04759418	-0.0116508848
Visibility..km.	0.0475941753	1.00000000	0.0598183810
Pressure..millibars.	-0.0116508848	0.05981838	1.0000000000

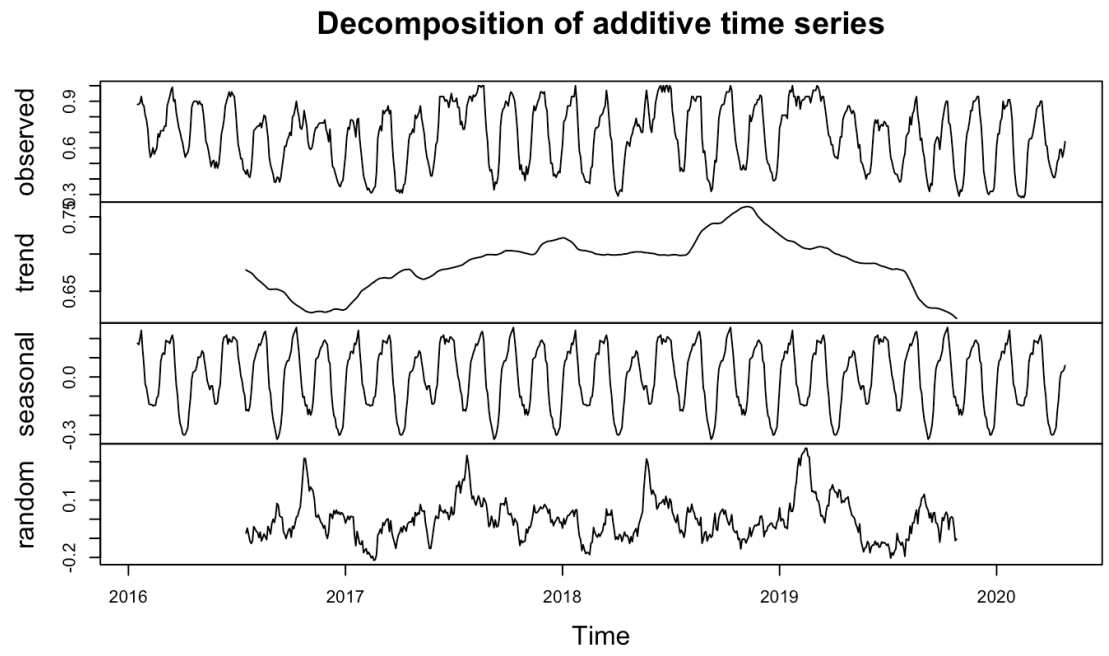
Plot 1.2



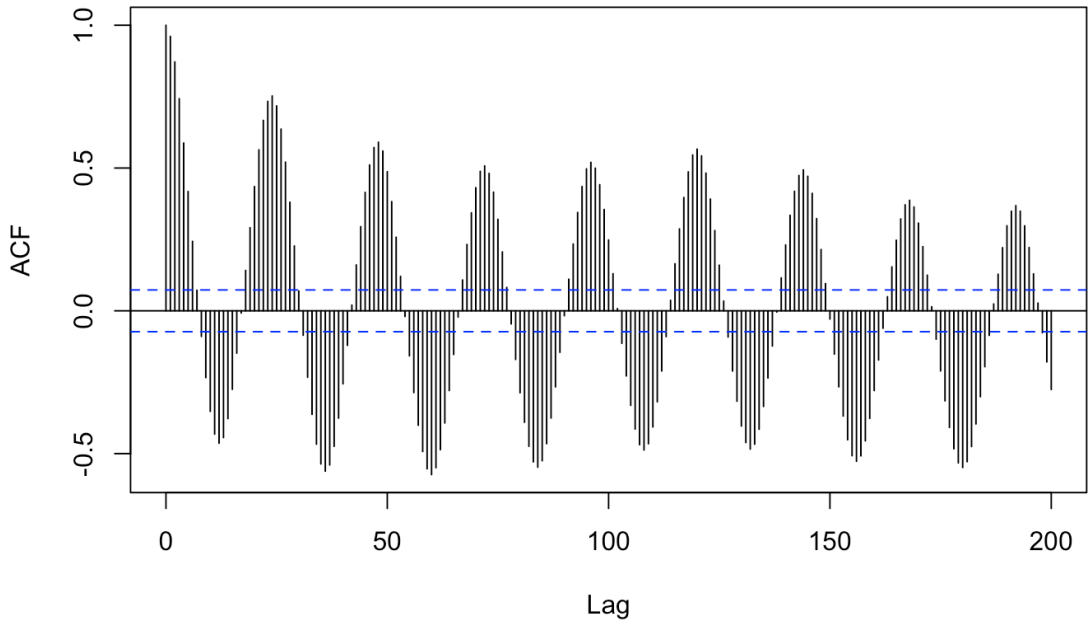
Plot 1.3



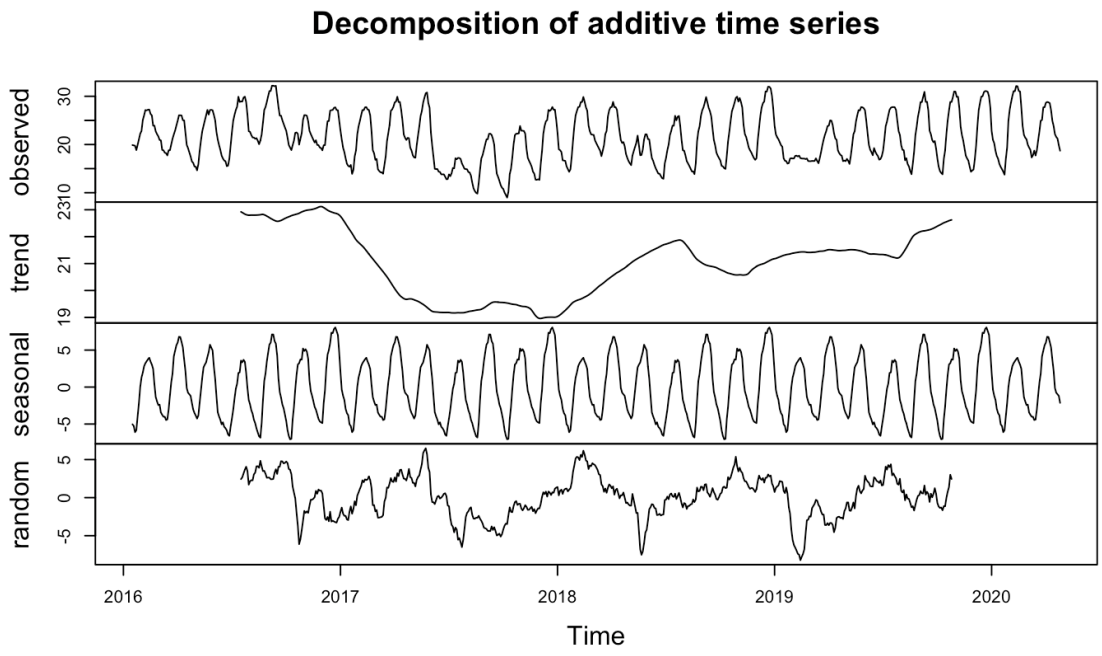
Plot 1.4



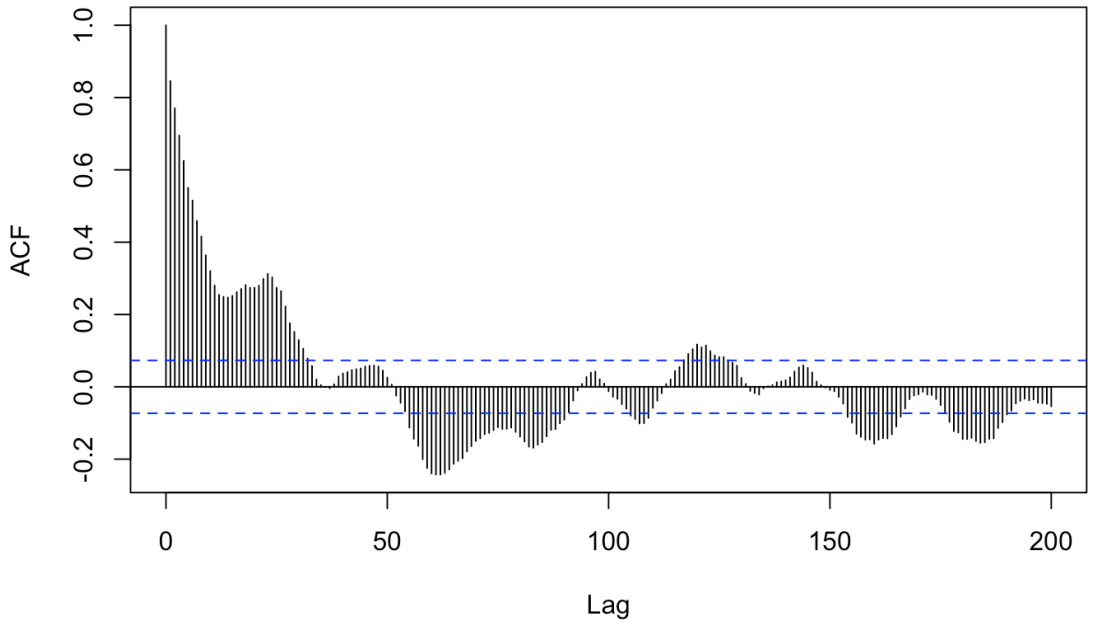
Plot 1.5



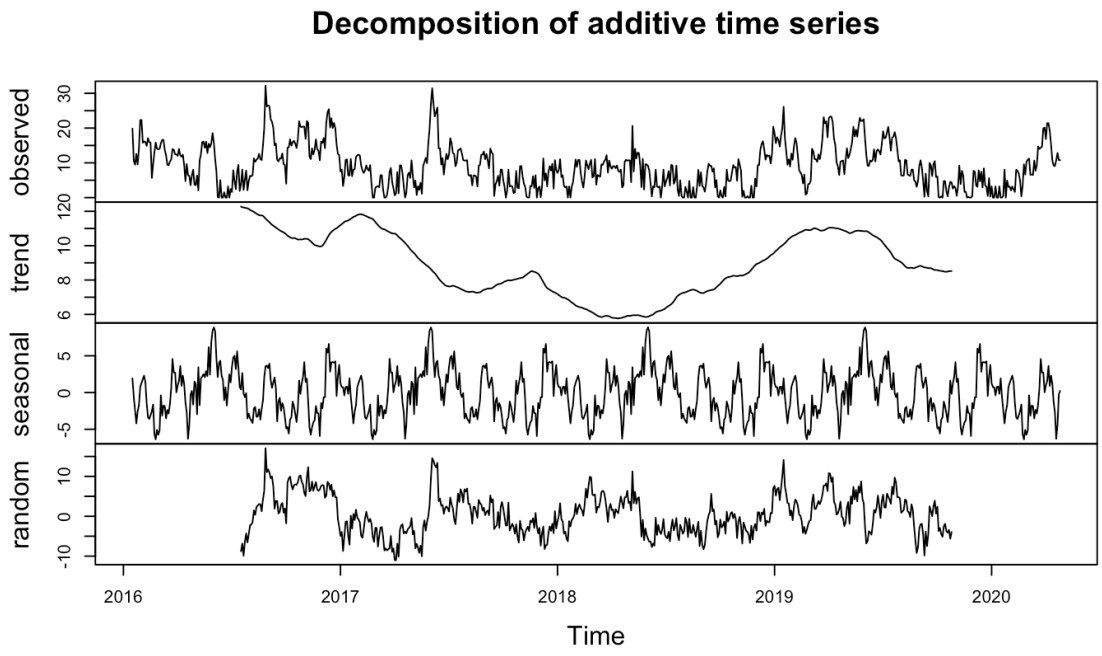
Plot 1.6



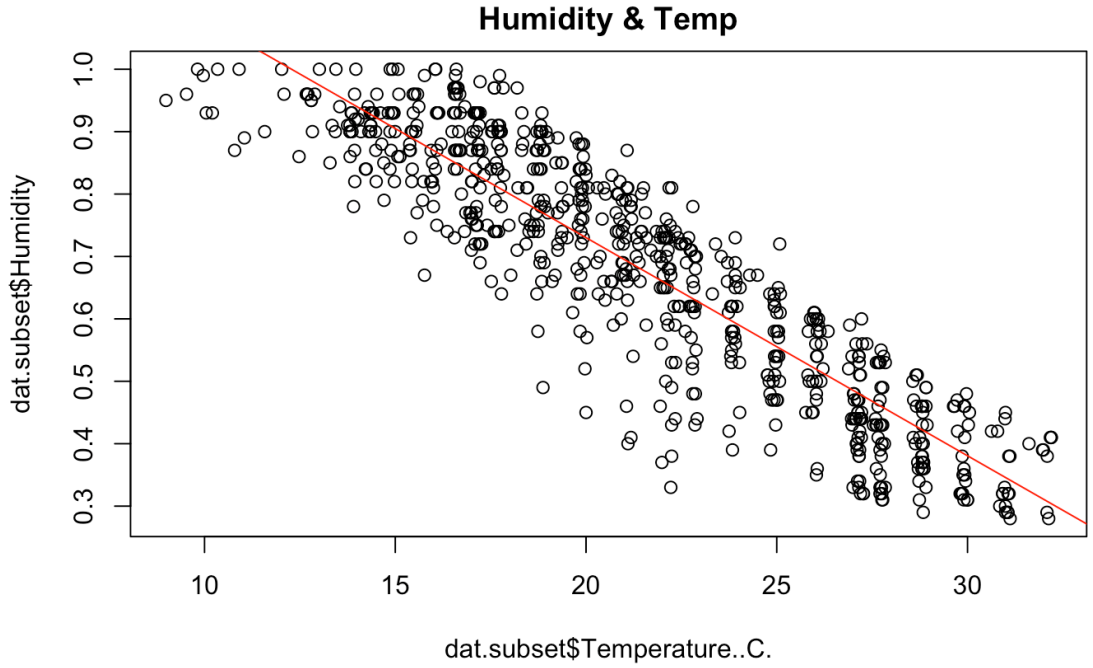
Plot 1.7



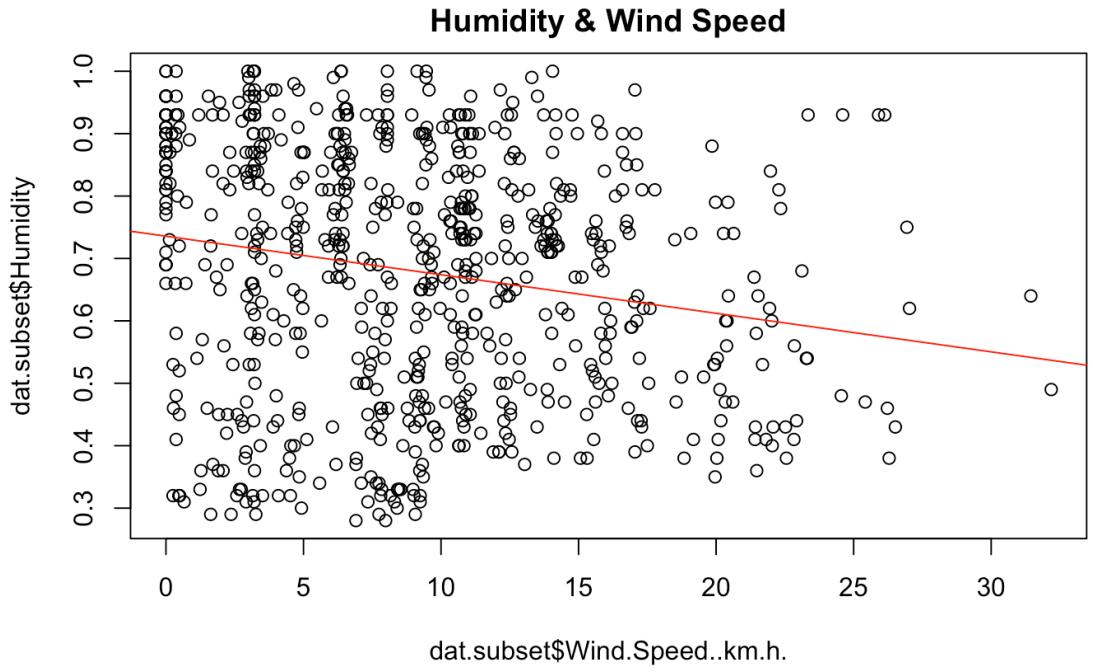
Plot 1.8



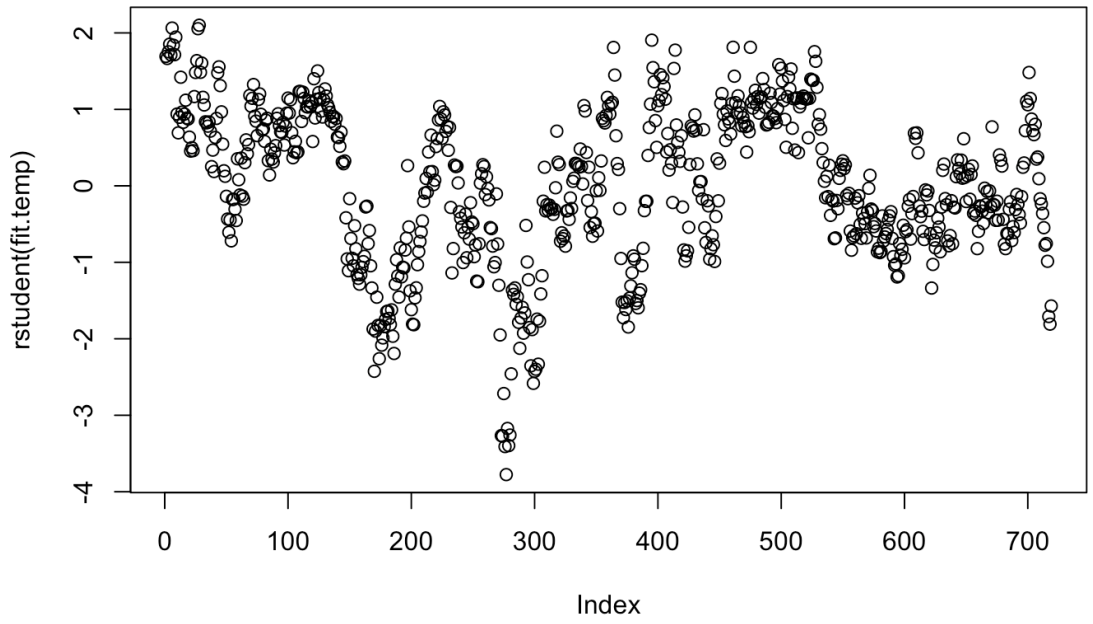
Plot 1.9



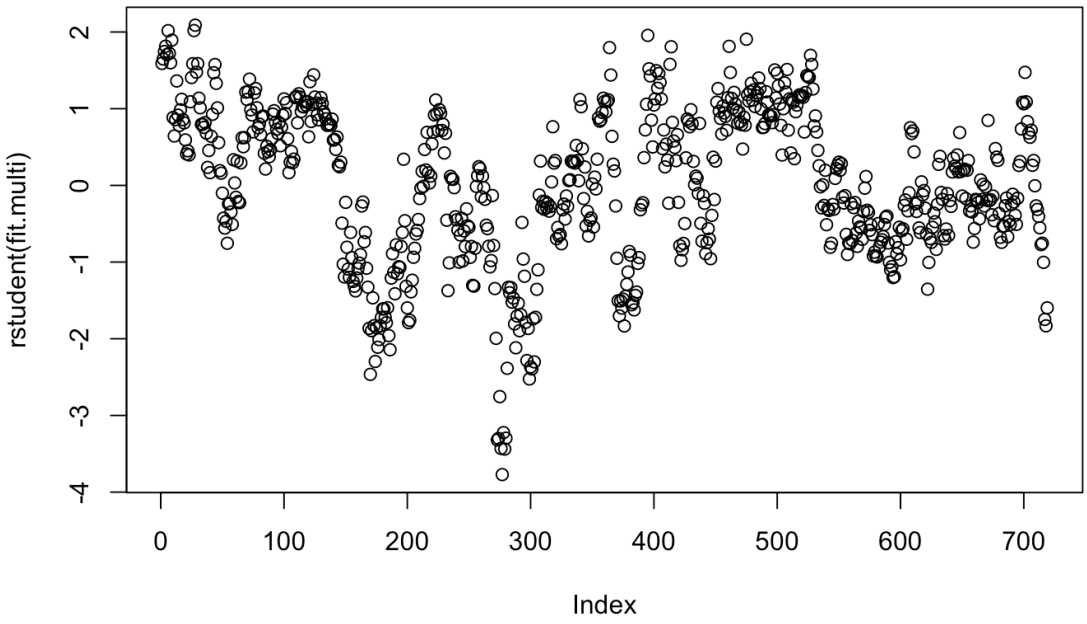
Plot 2.1



Plot 2.2



Plot 2.3



Plot 3.1

```
Call:
lm(formula = dat.subset$Humidity ~ dat.subset$Temperature..C.)

Residuals:
     Min       1Q   Median       3Q      Max
-0.32253 -0.05610  0.00483  0.07141  0.18057

Coefficients:
                             Estimate Std. Error t value Pr(>|t|)
(Intercept)                 1.4292855  0.0137976  103.59   <2e-16 ***
dat.subset$Temperature..C. -0.0349542  0.0006258  -55.85   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.08626 on 717 degrees of freedom
Multiple R-squared:  0.8131,    Adjusted R-squared:  0.8129
F-statistic:  3120 on 1 and 717 DF,  p-value: < 2.2e-16
```

Plot 3.2

```
Call:
lm(formula = dat.subset$Humidity ~ dat.subset$Temperature..C. +
    dat.subset$Wind.Speed..km.h.)

Residuals:
     Min       1Q   Median       3Q      Max
-0.32181 -0.05524  0.00394  0.07045  0.17935

Coefficients:
                              Estimate Std. Error t value Pr(>|t|)
(Intercept)                  1.4269926  0.0138635 102.932   <2e-16 ***
dat.subset$Temperature..C.  -0.0351949  0.0006443 -54.629   <2e-16 ***
dat.subset$Wind.Speed..km.h.  0.0008231  0.0005315   1.549    0.122
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.08618 on 716 degrees of freedom
Multiple R-squared:  0.8137,    Adjusted R-squared:  0.8132
F-statistic:  1564 on 2 and 716 DF,  p-value: < 2.2e-16
```

Plot 3.3

```
Call:
lm(formula = dat.subset$Humidity ~ poly(dat.subset$Temperature..C.,
    degree = 3) + poly(dat.subset$Wind.Speed..km.h., degree = 2))

Residuals:
     Min       1Q   Median       3Q      Max
-0.32331 -0.05084  0.00533  0.06992  0.17757

Coefficients:
                                            Estimate Std. Error t value Pr(>|t|)
(Intercept)                                 0.679889   0.003095 219.671  < 2e-16 ***
poly(dat.subset$Temperature..C., degree = 3)1  -4.847601   0.085613 -56.622  < 2e-16 ***
poly(dat.subset$Temperature..C., degree = 3)2  -0.340298   0.084281  -4.038 5.98e-05 ***
poly(dat.subset$Temperature..C., degree = 3)3   0.533649   0.083312   6.405 2.72e-10 ***
poly(dat.subset$Wind.Speed..km.h., degree = 2)1  0.130584   0.086761   1.505    0.133
poly(dat.subset$Wind.Speed..km.h., degree = 2)2  0.096205   0.083420   1.153    0.249
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.08299 on 713 degrees of freedom
Multiple R-squared:  0.828,     Adjusted R-squared:  0.8268
F-statistic: 686.4 on 5 and 713 DF,  p-value: < 2.2e-16
```

Plot 3.4

```
Call:
lm(formula = dat.subset$Humidity ~ poly(dat.subset$Temperature..C.,
    degree = 3))

Residuals:
     Min       1Q   Median       3Q      Max
-0.32698 -0.05161  0.00645  0.06897  0.18020

Coefficients:
                                            Estimate Std. Error t value Pr(>|t|)
(Intercept)                                 0.679889   0.003099 219.415  < 2e-16 ***
poly(dat.subset$Temperature..C., degree = 3)1 -4.817926   0.083087 -57.986  < 2e-16 ***
poly(dat.subset$Temperature..C., degree = 3)2 -0.349889   0.083087  -4.211 2.87e-05 ***
poly(dat.subset$Temperature..C., degree = 3)3  0.526063   0.083087   6.331 4.29e-10 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.08309 on 715 degrees of freedom
Multiple R-squared:  0.8271,    Adjusted R-squared:  0.8264
F-statistic:  1140 on 3 and 715 DF,  p-value: < 2.2e-16
```

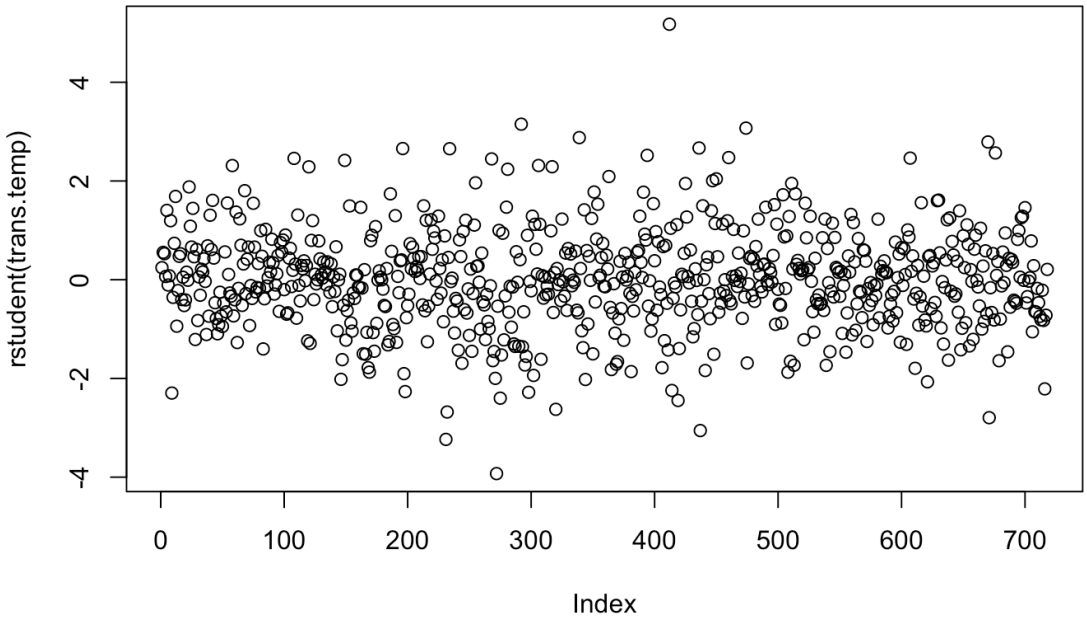
Plot 4.1

```
        Durbin-Watson test

data:  fit.temp
DW = 0.13645, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0
```

Plot 4.2

```
Call:
lm(formula = y.temp ~ x.temp)

Residuals:
     Min       1Q   Median       3Q      Max
-0.12066 -0.01798 -0.00032  0.01674  0.15744

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.1021176  0.0016646   61.35   <2e-16 ***
x.temp      -0.0378432  0.0008116  -46.63   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.03106 on 716 degrees of freedom
Multiple R-squared:  0.7523,    Adjusted R-squared:  0.7519
F-statistic:  2174 on 1 and 716 DF,  p-value: < 2.2e-16
```

Plot 4.3



Plot 4.4

```
        Durbin-Watson test

data:  trans.temp
DW = 2.119, p-value = 0.942
alternative hypothesis: true autocorrelation is greater than 0
```

Plot 4.5

```
        Durbin-Watson test

data:  fit.multi
DW = 0.13998, p-value < 2.2e-16
alternative hypothesis: true autocorrelation is greater than 0
```

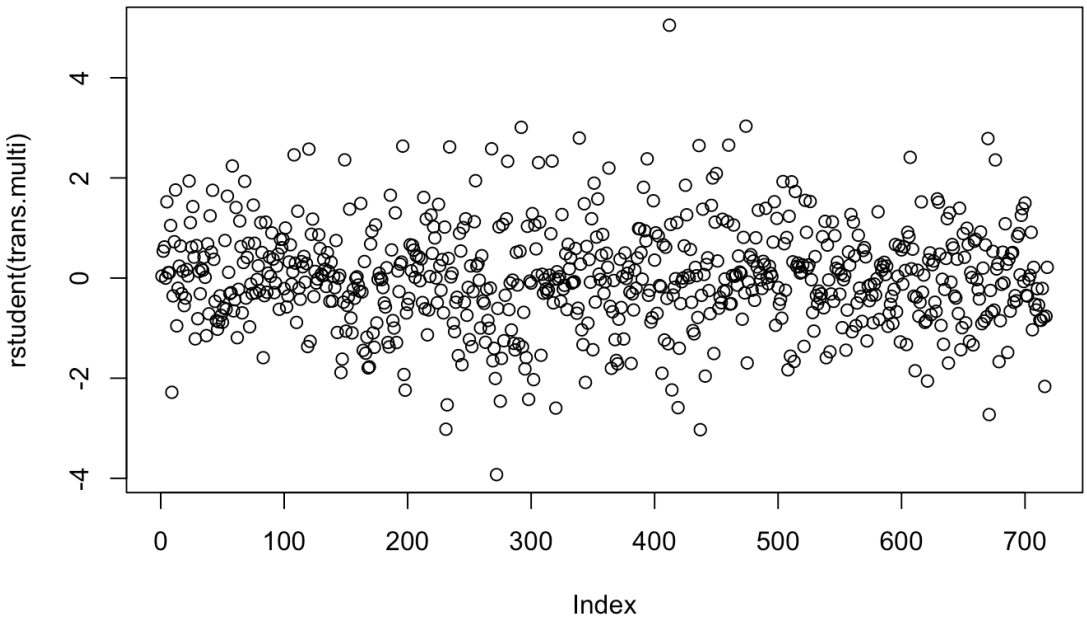
Plot 4.6

```
Call:
lm(formula = y.multi ~ x.multi + z.multi)

Residuals:
      Min        1Q    Median        3Q       Max
-0.120251 -0.017728 -0.000327  0.016950  0.153022

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.1044699  0.0016796  62.198   <2e-16 ***
x.multi     -0.0376190  0.0008147 -46.174   <2e-16 ***
z.multi     -0.0007729  0.0003483  -2.219   0.0268 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.03097 on 715 degrees of freedom
Multiple R-squared:  0.7541,    Adjusted R-squared:  0.7534
F-statistic:  1096 on 2 and 715 DF,  p-value: < 2.2e-16
```

Plot 4.7

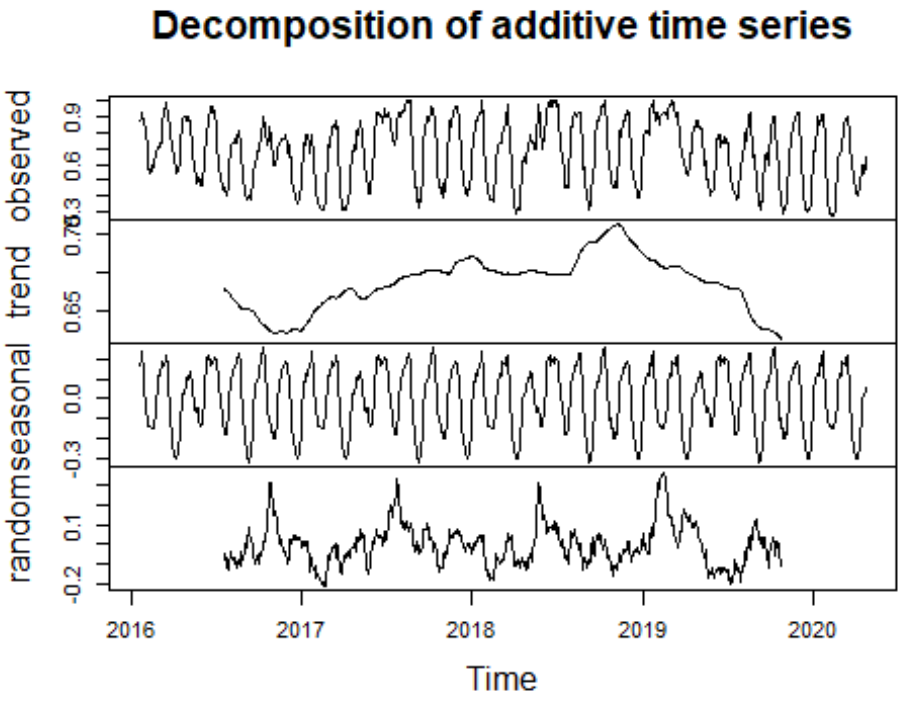
```
        Durbin-Watson test

data:  trans.multi
DW = 2.1182, p-value = 0.9417
alternative hypothesis: true autocorrelation is greater than 0
```

Plot 4.8



Plot 5.1

Plot 5.2



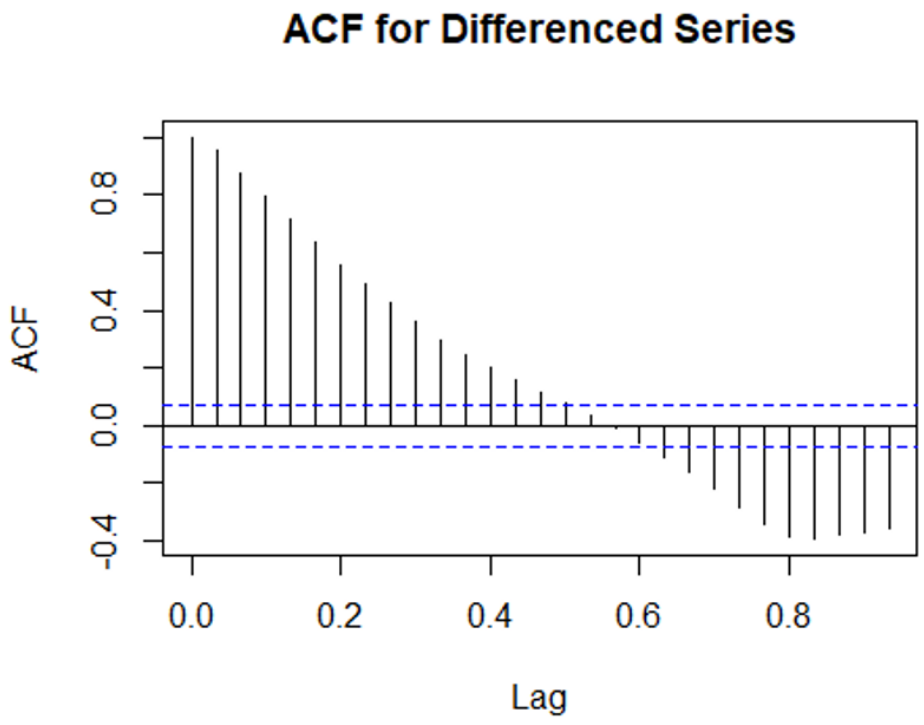
Plot 5.4

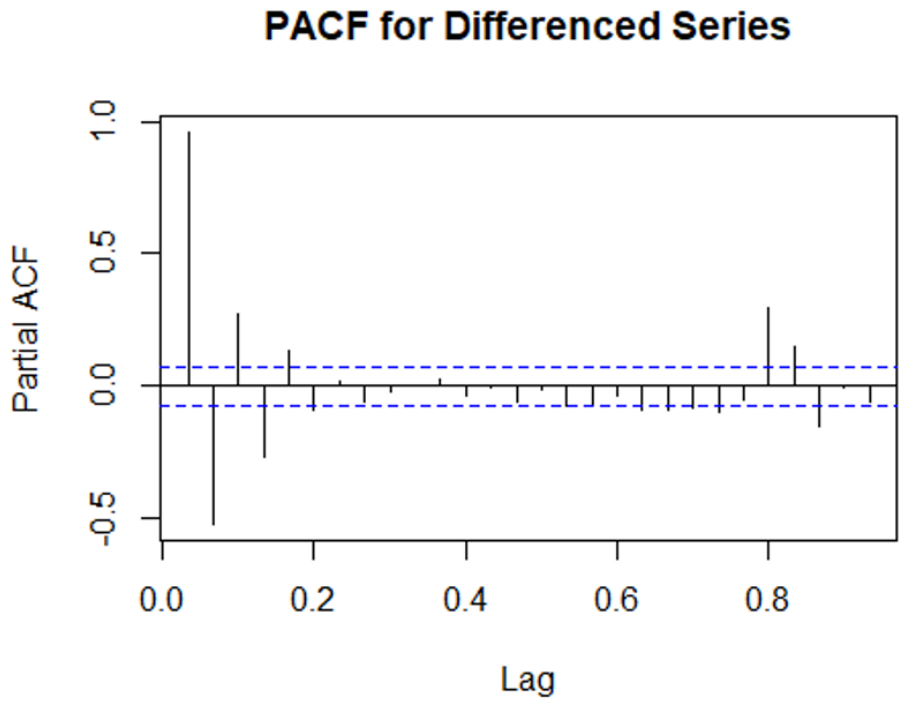
```
adf.test(count_humid_ma,alternative = "stationary")

##
##  Augmented Dickey-Fuller Test
##
## data:  count_humid_ma
## Dickey-Fuller = -3.658, Lag order = 8, p-value = 0.02711
## alternative hypothesis: stationary
```

Plot 5.5

```
adf.test(count_d1, alternative = "stationary")

## Warning in adf.test(count_d1, alternative = "stationary"): p-value smaller
## than printed p-value

##
##  Augmented Dickey-Fuller Test
##
## data:  count_d1
## Dickey-Fuller = -5.7047, Lag order = 8, p-value = 0.01
## alternative hypothesis: stationary
```

Plot 5.6

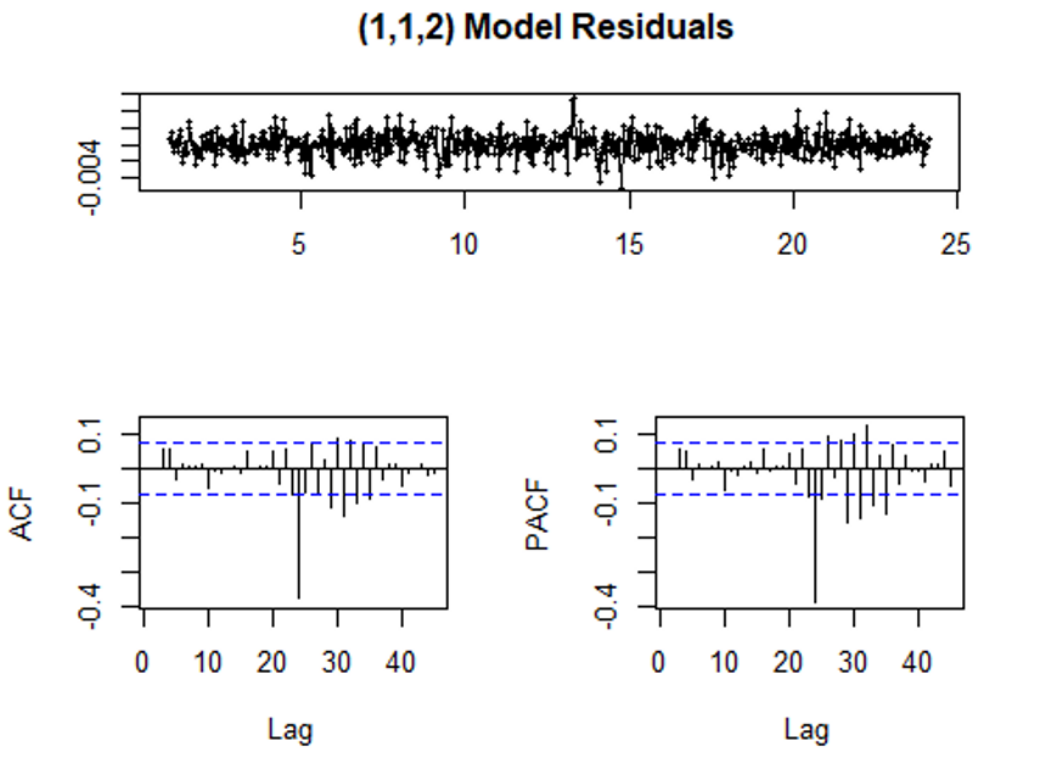

ACF for Differenced Series
ACF
0.8
0.4
0.0
-0.4
0.0
0.2
0.4
0.6
0.8
Lag


PACF for Differenced Series
Partial ACF
1.0
0.5
0.0
-0.5
0.0
0.2
0.4
0.6
0.8
Lag

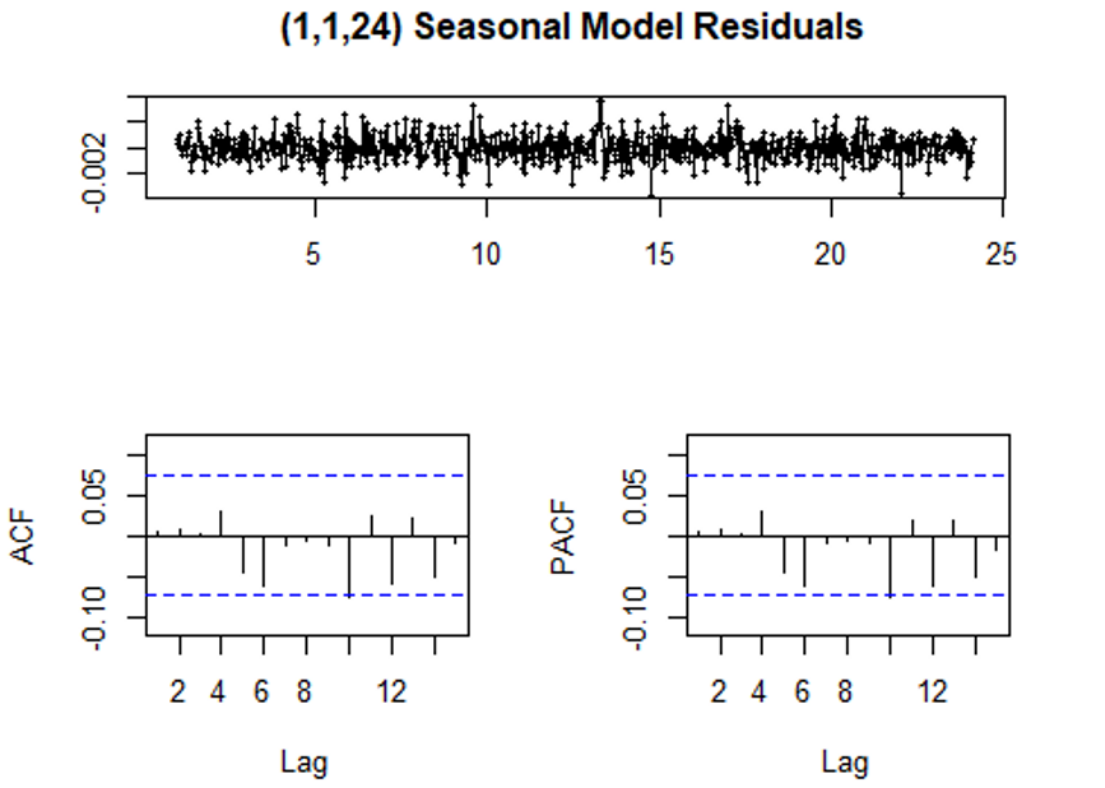
Plot 5.7

```
auto.arima(deseasonal_humid,seasonal = FALSE)

## Series: deseasonal_humid
## ARIMA(1,1,2)
##
## Coefficients:
##          ar1     ma1     ma2
##       0.9102  0.8232  0.0940
## s.e.  0.0170  0.0416  0.0412
##
## sigma^2 estimated as 1.836e-06:  log likelihood=3598.06
## AIC=-7188.12   AICc=-7188.06   BIC=-7169.95
```

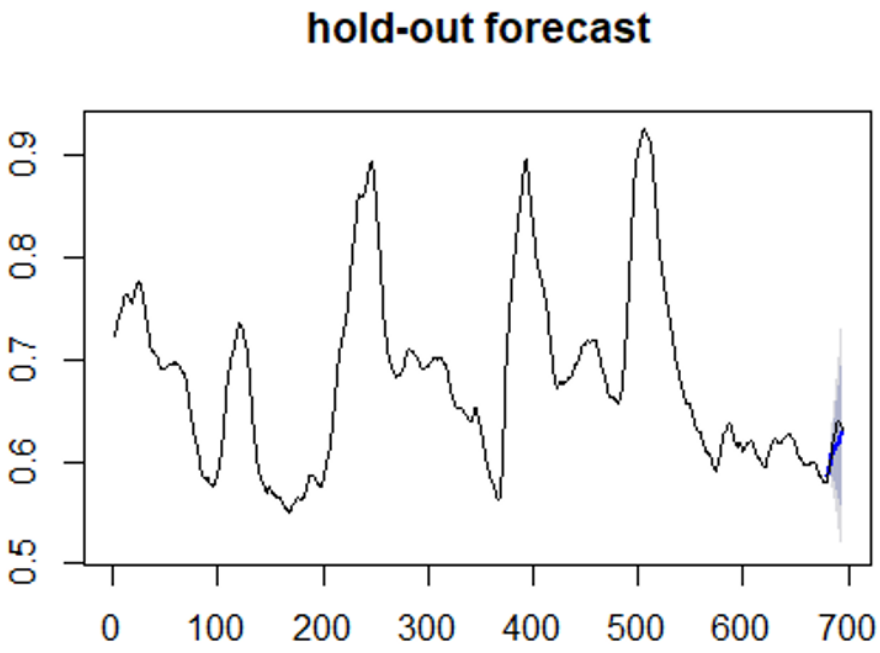
Plot 5.8



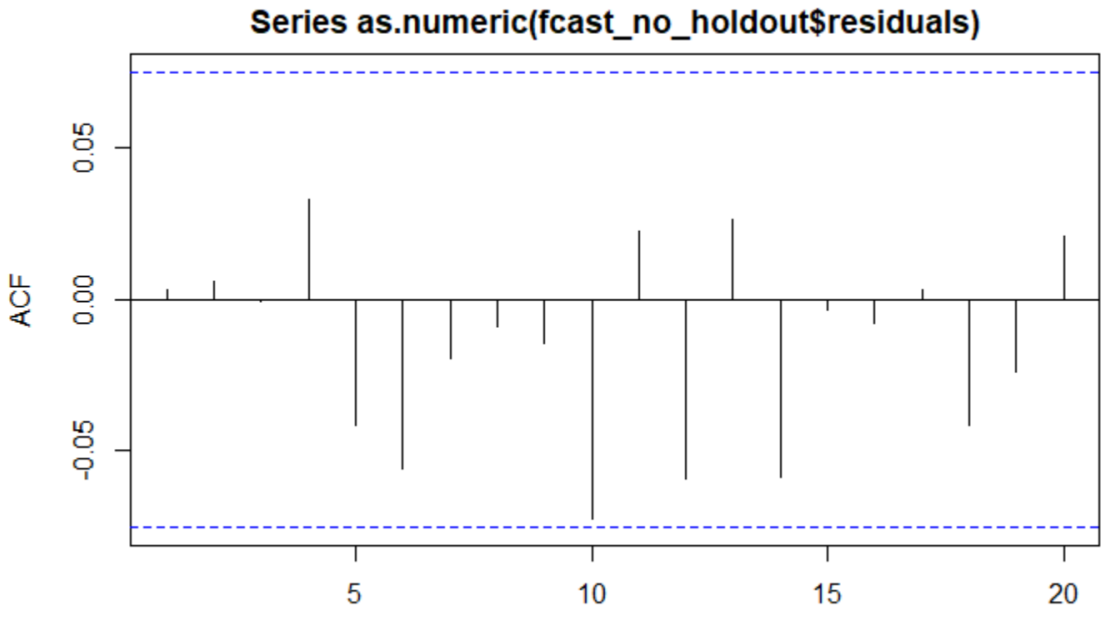
Plot 5.9


(1,1,24) Seasonal Model Residuals
-0.002
5
10
15
20
25
ACF
0.05
-0.10
2
4
6
8
12
Lag
PACF
0.05
-0.10
2
4
6
8
12
Lag

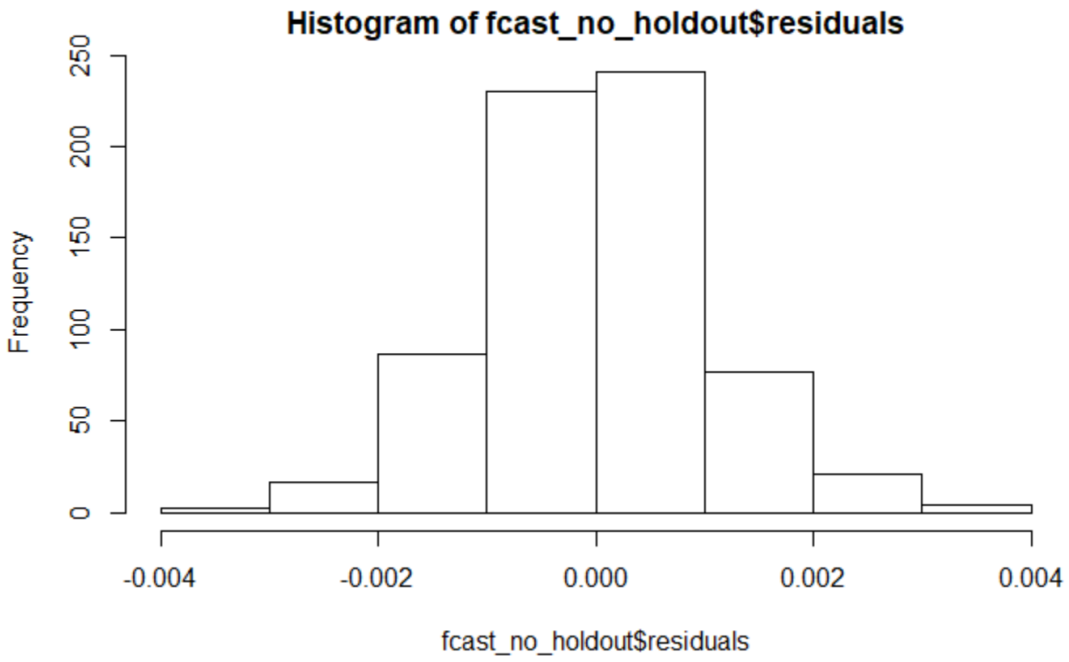
Plot 6.0


hold-out forecast
0.5
0.6
0.7
0.8
0.9
0
100
200
300
400
500
600
700

Plot 6.1


Series as.numeric(fcast_no_holdout$residuals)
ACF
-0.05
0.00
0.05
5
10
15
20

```r
# ARIMA
Box.test(fcast_no_holdout$residuals,lag=20,type = "Ljung-Box")

##
##  Box-Ljung test
##
## data:  fcast_no_holdout$residuals
## X-squared = 15.917, df = 20, p-value = 0.7218
```

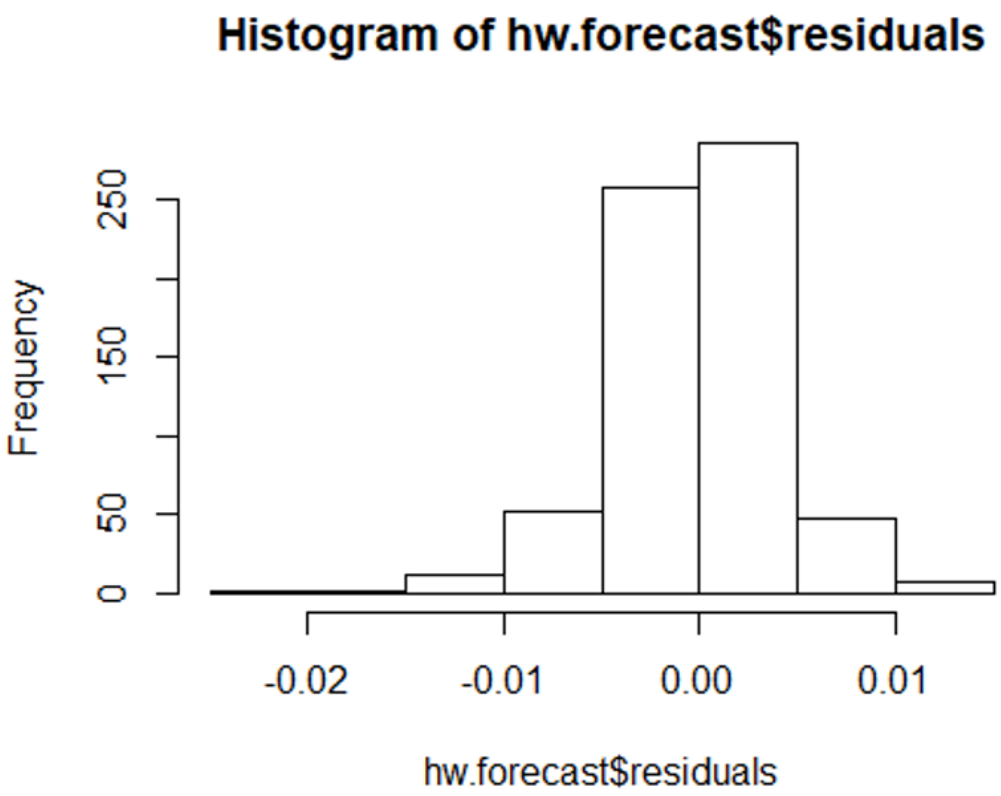


Plot 6.2

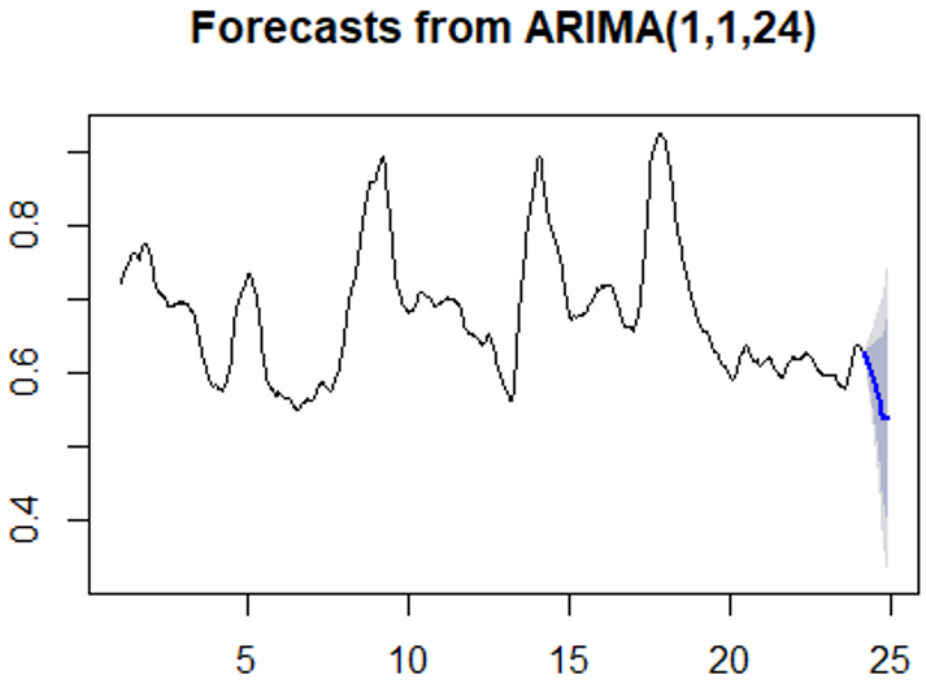
```
Holt-Winters exponential smoothing with trend and additive seasonal component.

Call:
HoltWinters(x = deseasonal_humid)

Smoothing parameters:
 alpha: 0.931571
 beta : 0.658385
 gamma: 1
```

Plot 6.3

```r
# Holtwinters
Box.test(hw.forecast$residuals,lag=20,type = "Ljung-Box")

##
##  Box-Ljung test
##
## data:  hw.forecast$residuals
## X-squared = 203.18, df = 20, p-value < 2.2e-16
```



Plot 6.4


Forecasts from ARIMA(1,1,24)
0.4
0.6
0.8
5
10
15
20
25