ACADGILD ASSIGNMENT - 10.1

1. Import dataset from the following link:
https://archive.ics.uci.edu/ml/machine-learning-databases/00360/
Perform the below written operations:

a. Read the file in Zip format and get it into R

b. Create Univariate for all the columns.

c. Check for missing values in all columns.

d. Impute the missing values using appropriate methods

e. Create bi-variate analysis for all relationships s

f. Test relevant hypothesis for valid relations

g. Create cross tabulations with derived variables

h. check for trends and patterns in time series

i. Find out the most polluted time of the day and the name of the chemical compound.

ANSWER:

```
> library(readxl)
> AirQualityUCI <- read_excel("C:/Users/Veena/Desktop/AirQualityUCI.xlsx")
> View(AirQualityUCI)
```

Read the file in Zip format and get it into R

```
> library(readxl)
> AirQualityUCI <- read_excel("C:/Users/Veena/Desktop/AirQualityUCI.xlsx")
> View(AirQualityUCI)
```

```
View(AirQualityUCI)
str(AirQualityUCI)
```

Output from R-console

```
> View(AirQualityUCI)
> str(AirQualityUCI)
Classes ‘tbl_df’, ‘tbl’ and 'data.frame': 9357 obs. of 15 variables:
$ Date : POSIXct, format: "2004-03-10" "2004-03-10" "2004-03-10" ...
$ Time : POSIXct, format: "1899-12-31 18:00:00" "1899-12-31 19:00:00" "1899-12-31
20:00:00" ...
$ CO(GT) : num 2.6 2 2.2 2.2 1.6 1.2 1.2 1 0.9 0.6 ...
$ PT08.S1(CO) : num 1360 1292 1402 1376 1272 ...
```

$ NMHC(GT) : num 150 112 88 80 51 38 31 31 24 19 ...
$ C6H6(GT) : num 11.88 9.4 9 9.23 6.52 ...
$ PT08.S2(NMHC): num 1046 955 939 948 836 ...
$ NOx(GT) : num 166 103 131 172 131 89 62 62 45 -200 ...
$ PT08.S3(NOx) : num 1056 1174 1140 1092 1205 ...
$ NO2(GT) : num 113 92 114 122 116 96 77 76 60 -200 ...
$ PT08.S4(NO2) : num 1692 1559 1554 1584 1490 ...
$ PT08.S5(O3) : num 1268 972 1074 1203 1110 ...
$ T : num 13.6 13.3 11.9 11 11.2 ...
$ RH : num 48.9 47.7 54 60 59.6 ...
$ AH : num 0.758 0.725 0.75 0.787 0.789 ...

Create Univariate for all the columns.

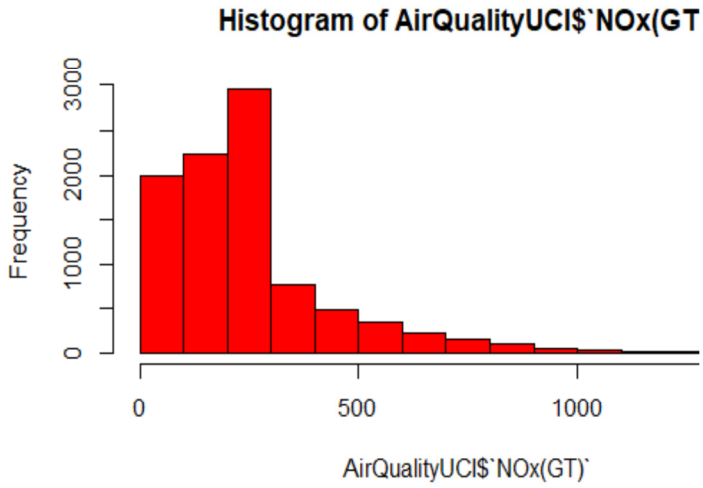
```
> library(readxl)
> AirQualityUCI <- read_excel("C:/Users/Veena/Desktop/AirQualityUCI.xlsx")
> View(AirQualityUCI)
```

```
View(AirQualityUCI)
dim(AirQualityUCI)
summary(AirQualityUCI)
AirQualityUCI[AirQualityUCI==-200.0]<-NA
for(i in 1:ncol(AirQualityUCI)){AirQualityUCI[is.na(AirQualityUCI[,i]),i] <-
mean(AirQualityUCI[,i], na.rm = TRUE)}
summary(AirQualityUCI)
AirQualityUCI[7:14,]
hist(AirQualityUCI$`NOx(GT)`,col="red")
```

Output from R-console > dim(AirQualityUCI)
[1] 9357 15
> summary(AirQualityUCI)
Date
Min. :2004-03-10 00:00:00
1st Qu.:2004-06-16 00:00:00
Median :2004-09-21 00:00:00
Mean :2004-09-21 04:30:05
3rd Qu.:2004-12-28 00:00:00
Max. :2005-04-04 00:00:00
Time
Min. :1899-12-31 00:00:00
1st Qu.:1899-12-31 05:00:00
Median :1899-12-31 11:00:00
Mean :1899-12-31 11:29:55
3rd Qu.:1899-12-31 18:00:00
Max. :1899-12-31 23:00:00
CO(GT) PT08.S1(CO)

Min. :-200.00 Min. :-200
1st Qu.: 0.60 1st Qu.: 921
Median : 1.50 Median :1052
Mean : -34.21 Mean :1049
3rd Qu.: 2.60 3rd Qu.:1221
Max. : 11.90 Max. :2040
NMHC(GT) C6H6(GT)
Min. :-200.0 Min. :-200.000
1st Qu.:-200.0 1st Qu.: 4.005
Median :-200.0 Median : 7.887
Mean :-159.1 Mean : 1.866
3rd Qu.:-200.0 3rd Qu.: 13.636
Max. :1189.0 Max. : 63.741
PT08.S2(NMHC) NOx(GT)
Min. :-200.0 Min. :-200.0
1st Qu.: 711.0 1st Qu.: 50.0
Median : 894.5 Median : 141.0
Mean : 894.5 Mean : 168.6
3rd Qu.:1104.8 3rd Qu.: 284.2
Max. :2214.0 Max. :1479.0
PT08.S3(NOx) NO2(GT)
Min. :-200.0 Min. :-200.00
1st Qu.: 637.0 1st Qu.: 53.00
Median : 794.2 Median : 96.00
Mean : 794.9 Mean : 58.14
3rd Qu.: 960.2 3rd Qu.: 133.00
Max. :2682.8 Max. : 339.70
PT08.S4(NO2) PT08.S5(O3)
Min. :-200 Min. :-200.0
1st Qu.:1185 1st Qu.: 699.8
Median :1446 Median : 942.0
Mean :1391 Mean : 975.0
3rd Qu.:1662 3rd Qu.:1255.2
Max. :2775 Max. :2522.8
T RH
Min. :-200.000 Min. :-200.00
1st Qu.: 10.950 1st Qu.: 34.05
Median : 17.200 Median : 48.55
Mean : 9.777 Mean : 39.48
3rd Qu.: 24.075 3rd Qu.: 61.88
Max. : 44.600 Max. : 88.72
AH
Min. :-200.0000
1st Qu.: 0.6923
Median : 0.9768
Mean : -6.8376
3rd Qu.: 1.2962

```
Max. : 2.2310 > AirQualityUCI[7:14,]
Date Time CO(GT) PT08.S1(CO) NMHC(GT)
C6H6(GT) PT08.S2(NMHC) NOx(GT)
7 2004-03-11 1899-12-31 00:00:00 1.20000
1185.00 31 3.624399 689.50 62.0000
8 2004-03-11 1899-12-31 01:00:00 1.00000
1136.25 31 3.326677 672.00 62.0000
9 2004-03-11 1899-12-31 02:00:00 0.90000
1094.00 24 2.339416 608.50 45.0000
10 2004-03-11 1899-12-31 03:00:00 0.60000
1009.75 19 1.696658 560.75 246.8813
11 2004-03-11 1899-12-31 04:00:00 2.15275
1011.00 14 1.293620 526.75 21.0000
12 2004-03-11 1899-12-31 05:00:00 0.70000
1066.00 8 1.133431 512.00 16.0000
13 2004-03-11 1899-12-31 06:00:00 0.70000
1051.75 16 1.603768 553.25 34.0000
14 2004-03-11 1899-12-31 07:00:00 1.10000
1144.00 29 3.243618 667.00 98.0000
PT08.S3(NOx) NO2(GT) PT08.S4(NO2) PT08.S5(O3)
T RH AH
7 1461.75 77.0000 1332.75 732.50 11.325 56.775
0.7603119
8 1453.25 76.0000 1332.75 729.50 10.675 60.000
0.7702385
9 1579.00 60.0000 1276.00 619.50 10.650 59.675
0.7648187
10 1705.00 113.0755 1234.75 501.25 10.250
60.200 0.7516572
11 1817.50 34.0000 1196.75 445.25 10.075 60.475
0.7464945
12 1918.00 28.0000 1182.00 421.75 11.000 56.175
0.7365596
13 1738.25 48.0000 1221.25 471.50 10.450 58.125
0.7352951
14 1489.75 82.0000 1339.00 729.75 10.200 59.600
0.7417362
> hist(AirQualityUCI$`NOx(GT)`,col="red")
```



Check for missing values in all columns.

Answer:
col1<- mapply(anyNA,AirQualityUCI)
col1
summary(AirQualityUCI)
is.na(AirQualityUCI)
Output from R-console
> colSums(is.na(AirQualityUCI))
Date Time CO(GT) PT08.S1(CO) NMHC(GT) C6H6(GT)
0 0 1683 366 8443 366
PT08.S2(NMHC) NOx(GT) PT08.S3(NOx) NO2(GT) PT08.S4(NO2) PT08.S5(O3)
366 1639 366 1642 366 366
T RH AH
366 366 366
col1<- mapply(anyNA,AirQualityUCI)
> col1

Date Time CO(GT) PT08.S1(CO) NMHC(GT) C6H6(GT)
FALSE FALSE TRUE TRUE TRUE TRUE
PT08.S2(NMHC) NOx(GT) PT08.S3(NOx) NO2(GT) PT08.S4(NO2) PT08.S5(O3)
TRUE TRUE TRUE TRUE TRUE TRUE
T RH AH
TRUE TRUE TRUE is.na(AirQualityUCI)
Date Time CO(GT) PT08.S1(CO) NMHC(GT) C6H6(GT) PT08.S2(NMHC) NOx(GT)
[1,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[2,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[3,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[4,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[5,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[6,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[7,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[8,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[9,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[10,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[11,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[12,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[13,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[14,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[15,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[16,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[17,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[18,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[19,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[20,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[21,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[22,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[23,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[24,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[25,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[26,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[27,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[28,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[29,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[30,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[31,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[32,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[33,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[34,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[35,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[36,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[37,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[38,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[39,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[40,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE

[41,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[42,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[43,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[44,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[45,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[46,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[47,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[48,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[49,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[50,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[51,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[52,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[53,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[54,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[55,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[56,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[57,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[58,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[59,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[60,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[61,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[62,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[63,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[64,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[65,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[66,] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
[reached getOption("max.print") -- omitted 9291 rows]
>

Impute the missing values using appropriate methods

Answer:

```
colSums(is.na(AirQualityUCI))
library(plyr)
AirQualityUCI[AirQualityUCI==-200.0]<-NA
for(i in 1:ncol(AirQualityUCI)){
AirQualityUCI[is.na(AirQualityUCI[,i]),i] <- mean(AirQualityUCI[,i], na.rm = TRUE)}
summary(AirQualityUCI)
```

Output from R-console

```
> AirQualityUCI[AirQualityUCI==-200.0]<-NA
> for(i in 1:ncol(AirQualityUCI)){
+ AirQualityUCI[is.na(AirQualityUCI[,i]),i] <- mean(AirQualityUCI[,i], na.rm = TRUE)}
> summary(AirQualityUCI)
 Date Time CO(GT)
 Min. :2004-03-10 00:00:00 Min. :1899-12-31 00:00:00 Min. : 0.100
 1st Qu.:2004-06-16 00:00:00 1st Qu.:1899-12-31 05:00:00 1st Qu.: 1.200
```

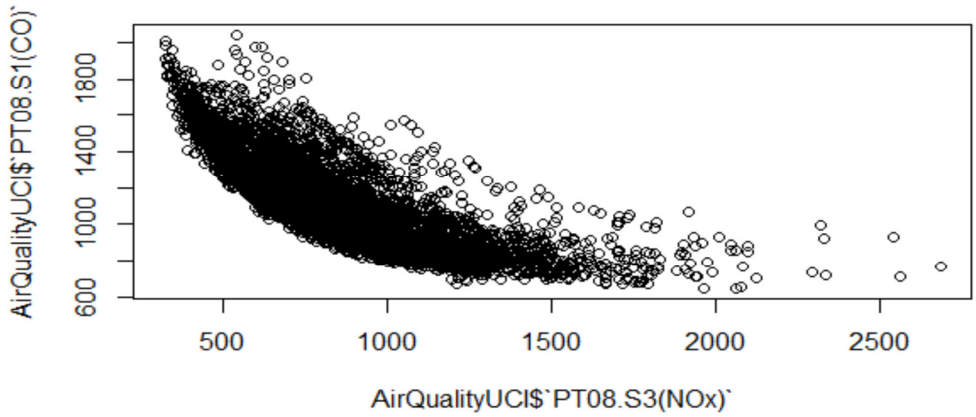
Median :2004-09-21 00:00:00 Median :1899-12-31 11:00:00 Median : 2.153
Mean :2004-09-21 04:30:05 Mean :1899-12-31 11:29:55 Mean : 2.153
3rd Qu.:2004-12-28 00:00:00 3rd Qu.:1899-12-31 18:00:00 3rd Qu.: 2.600
Max. :2005-04-04 00:00:00 Max. :1899-12-31 23:00:00 Max. :11.900
PT08.S1(CO) NMHC(GT) C6H6(GT) PT08.S2(NMHC)
Min. : 647.2 Min. : 7.0 Min. : 0.149 Min. : 383.2
1st Qu.: 941.2 1st Qu.: 218.8 1st Qu.: 4.591 1st Qu.: 742.5
Median :1074.5 Median : 218.8 Median : 8.593 Median : 923.2
Mean :1099.7 Mean : 218.8 Mean :10.083 Mean : 939.0
3rd Qu.:1221.2 3rd Qu.: 218.8 3rd Qu.:13.636 3rd Qu.:1104.8
Max. :2039.8 Max. :1189.0 Max. :63.741 Max. :2214.0
NOx(GT) PT08.S3(NOx) NO2(GT) PT08.S4(NO2) PT08.S5(O3)
Min. : 2.0 Min. : 322.0 Min. : 2.0 Min. : 551 Min. : 221.0
1st Qu.: 112.0 1st Qu.: 665.5 1st Qu.: 85.9 1st Qu.:1242 1st Qu.: 741.8
Median : 229.0 Median : 817.5 Median :113.1 Median :1456 Median : 982.5
Mean : 246.9 Mean : 835.4 Mean :113.1 Mean :1456 Mean :1022.8
3rd Qu.: 284.2 3rd Qu.: 960.2 3rd Qu.:133.0 3rd Qu.:1662 3rd Qu.:1255.2
Max. :1479.0 Max. :2682.8 Max. :339.7 Max. :2775 Max. :2522.8
T RH AH
Min. :-1.90 Min. : 9.175 Min. :0.1847
1st Qu.:12.03 1st Qu.:36.550 1st Qu.:0.7461
Median :18.27 Median :49.232 Median :1.0154
Mean :18.32 Mean :49.232 Mean :1.0255
3rd Qu.:24.07 3rd Qu.:61.875 3rd Qu.:1.2962
Max. :44.60 Max. :88.725 Max. :2.2310

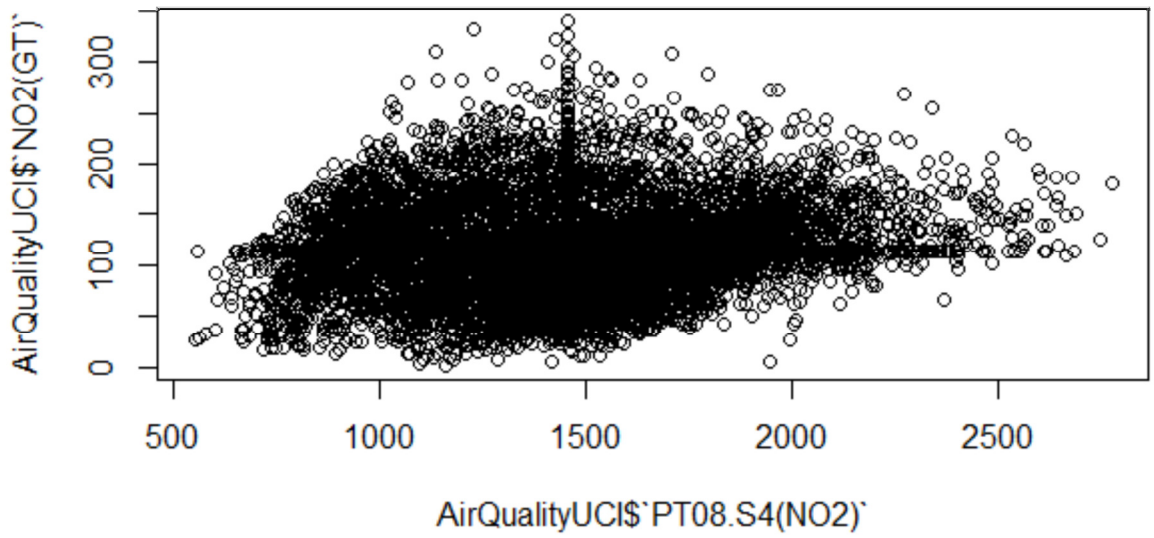
Create bi-variate analysis for all relationships

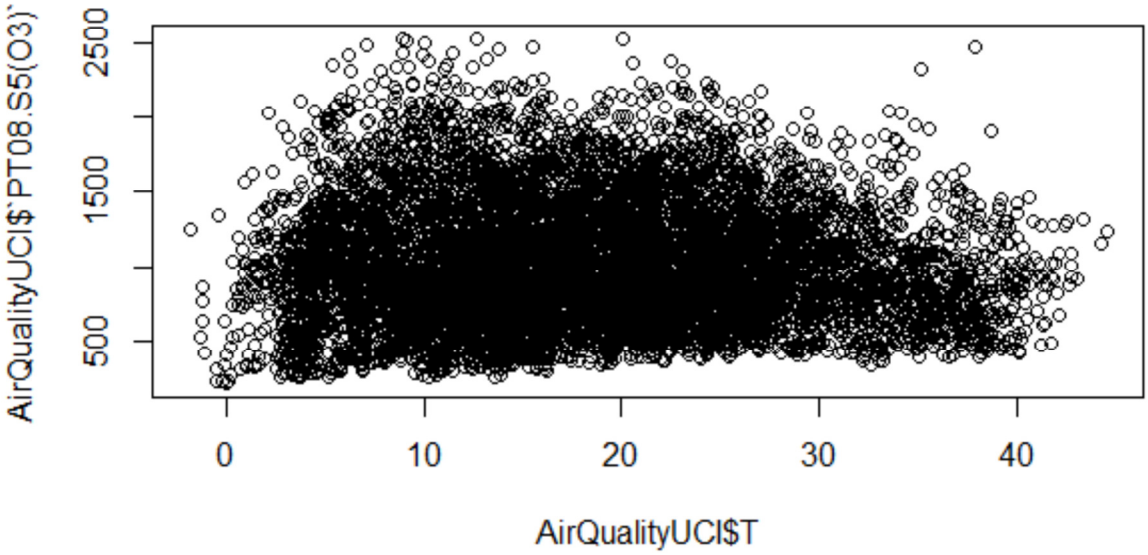
Answer:

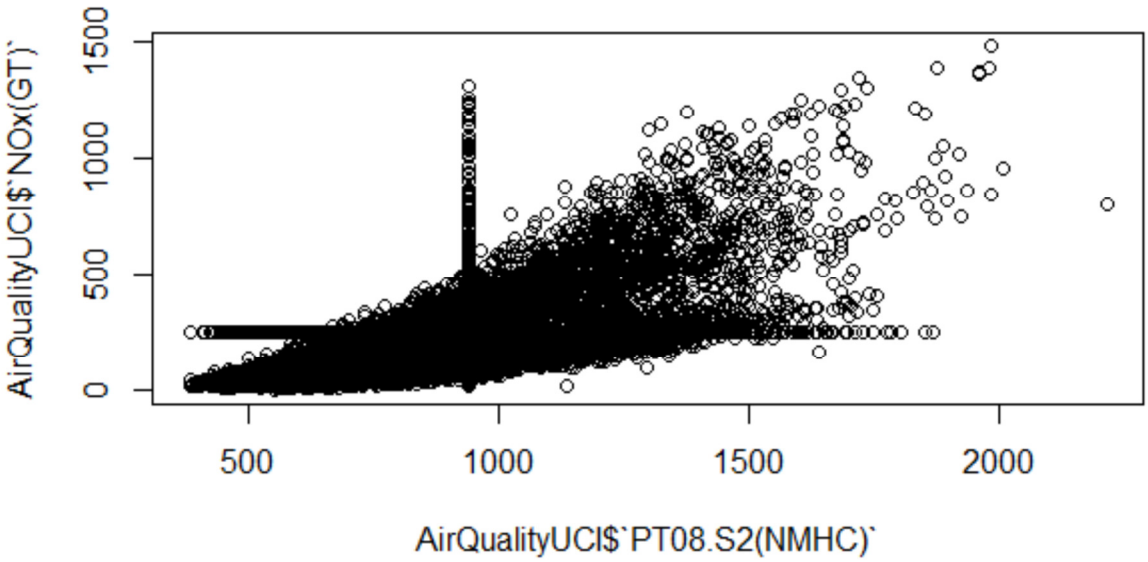
```
summary(AirQualityUCI)
plot(AirQualityUCI$`NOx(GT)`~AirQualityUCI$`PT08.S2(NMHC)`)
plot(AirQualityUCI$`PT08.S1(CO)`~AirQualityUCI$`PT08.S3(NOx)`)
plot(AirQualityUCI$`NO2(GT)`~AirQualityUCI$`PT08.S4(NO2)`)
plot(AirQualityUCI$`PT08.S5(O3)`~AirQualityUCI$T)
```

Output from Rconsole


AirQualityUCI$`PT08.S1(CO)`
600
1000
1400
1800
500
1000
1500
2000
2500
AirQualityUCI$`PT08.S3(NOx)`


AirQualityUCI$`NO2(GT)`
0
100
200
300
500
1000
1500
2000
2500
AirQualityUCI$`PT08.S4(NO2)`





Test relevant hypothesis for valid relations

```
plot(AirQualityUCI$`PT08.S1(CO)`,AirQualityUCI$T)
lm(formula=AirQualityUCI$`PT08.S3(NOx)`~AirQualityUCI$`NOx(GT)`)
lm(formula = AirQualityUCI$`PT08.S1(CO)`~AirQualityUCI$T)
```

```
lm(formula = AirQualityUCI$`NMHC(GT)`~AirQualityUCI$`PT08.S2(NMHC)`)
plot(AirQualityUCI$`PT08.S5(O3)`,AirQualityUCI$`NOx(GT)`)
lm(formula =AirQualityUCI$`PT08.S5(O3)`~AirQualityUCI$`NOx(GT)` )
pnorm(1.49)
pnorm(1.097)
qnorm(0.9318879)
qnorm(0.8636793)
library(car)
mod=lm(AirQualityUCI$`PT08.S5(O3)` ~ AirQualityUCI$`NOx(GT)`)
summary(mod)
predict(mod)
```

Output from R console

```
> plot(AirQualityUCI$`PT08.S1(CO)`,AirQualityUCI$T)
> lm(formula=AirQualityUCI$`PT08.S3(NOx)`~AirQualityUCI$`NOx(GT)`)
Call:
lm(formula = AirQualityUCI$`PT08.S3(NOx)` ~ AirQualityUCI$`NOx(GT)`)
Coefficients:
(Intercept) AirQualityUCI$`NOx(GT)`
1016.3598 -0.7331
> lm(formula = AirQualityUCI$`PT08.S1(CO)`~AirQualityUCI$T)
Call:
lm(formula = AirQualityUCI$`PT08.S1(CO)` ~ AirQualityUCI$T)
Coefficients:
(Intercept) AirQualityUCI$T
1077.818 1.195
> lm(formula = AirQualityUCI$`NMHC(GT)`~AirQualityUCI$`PT08.S2(NMHC)`)
Call:
lm(formula = AirQualityUCI$`NMHC(GT)` ~ AirQualityUCI$`PT08.S2(NMHC)`)
Coefficients:
(Intercept) AirQualityUCI$`PT08.S2(NMHC)`
154.66404 0.06831
> plot(AirQualityUCI$`PT08.S5(O3)`,AirQualityUCI$`NOx(GT)`)
> lm(formula =AirQualityUCI$`PT08.S5(O3)`~AirQualityUCI$`NOx(GT)` )
Call:
lm(formula = AirQualityUCI$`PT08.S5(O3)` ~ AirQualityUCI$`NOx(GT)`)
Coefficients:
(Intercept) AirQualityUCI$`NOx(GT)`
679.65 1.39
> pnorm(1.49)
[1] 0.9318879
> pnorm(1.097)
[1] 0.8636793
> qnorm(0.9318879)
[1] 1.49
> qnorm(0.8636793)
[1] 1.097 > library(car)
Loading required package: carData
Warning messages:
1: package ‘car’ was built under R version 3.5.2
2: package ‘carData’ was built under R version 3.5.2
> mod=lm(AirQualityUCI$`PT08.S5(O3)` ~ AirQualityUCI$`NOx(GT)`)
> summary(mod)
Call:
lm(formula = AirQualityUCI$`PT08.S5(O3)` ~ AirQualityUCI$`NOx(GT)`)
Residuals:
Min 1Q Median 3Q Max
-1477.57 -182.85 -10.98 168.81 1369.83
Coefficients:
```

Estimate Std. Error t value Pr(>|t|)
(Intercept) 679.65470 4.75079 143.06 <2e-16 ***
AirQualityUCI$`NOx(GT)` 1.38984 0.01515 91.75 <2e-16 ***

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
Residual standard error: 283.4 on 9355 degrees of freedom
Multiple R-squared: 0.4736, Adjusted R-squared: 0.4736
F-statistic: 8418 on 1 and 9355 DF, p-value: < 2.2e-16
> predict(mod)
1 2 3 4 5 6 7 8
910.3685 822.8085 861.7241 918.7076 861.7241 803.3507 765.8249 765.8249
9 10 11 12 13 14 15 16
742.1976 1022.7807 708.8414 701.8922 726.9093 815.8593 921.4873 858.9444
17 18 19 20 21 22 23 24
835.3170 811.6897 824.1983 882.5717 967.3521 935.3857 947.8943 1017.3864
25 26 27 28 29 30 31 32
1070.2004 1211.9643 1167.4894 1013.2169 810.2999 744.9773 849.2155 864.5037
33 34 35 36 37 38 39 40
793.6218 1022.7807 708.8414 721.3500 757.4859 831.1475 1106.3363 1022.7807
41 42 43 44 45 46 47 48
939.5552 979.8607 878.4022 902.0295 906.1990 943.7248 927.0466 888.1311
49 50 51 52 53 54 55 56
965.9622 960.4029 1152.2011 1060.4715 1031.2848 1096.6074 947.8943 872.8428
57 58 59 60 61 62 63 64
795.0116 1022.7807 831.1475 765.8249 753.3163 872.8428 1035.4543 1089.6582
65 66 67 68 69 70 71 72
1027.1153 1091.0480 1011.8270 892.3006 843.6561 845.0459 871.4529 885.3514
73 74 75 76 77 78 79 80
995.1489 1064.6410 1067.4207 1072.9801 977.0810 918.7076 943.7248 921.4873
81 82 83 84 85 86 87 88
857.5545 1022.7807 776.9437 753.3163 740.8078 782.5030 820.0288 843.6561
89 90 91 92 93 94 95 96
879.7920 924.2670 903.4193 836.7069 822.8085 835.3170 915.9279 929.8263
97 98 99 100 101 102 103 104
902.0295 1042.4036 1131.3535 981.2505 882.5717 890.9107 824.1983 826.9780
105 106 107 108 109 110 111 112
829.7577 1022.7807 771.3843 801.9608 871.4529 996.5388 1179.9980 1343.9994
113 114 115 116 117 118 119 120
1227.2526 1123.0144 959.0130 917.3177 900.6396 892.3006 878.4022 896.4701
121 122 123 124 125 126 127 128
1116.0652 1241.1510 1124.4043 1035.4543 947.8943 803.3507 856.1647 789.4522
129 130 131 132 133 134 135 136
739.4179 1022.7807 761.6554 732.4687 793.6218 817.2491 1045.1832 997.9286
137 138 139 140 141 142 143 144
1230.0323 1116.0652 981.2505 1029.8950 1045.1832 929.8263 935.3857 943.7248
145 146 147 148 149 150 151 152
935.3857 931.2162 910.3685 1120.2347 935.3857 860.3342 863.1139 811.6897

153 154 155 156 157 158 159 160
776.9437 1022.7807 754.7062 718.5703 743.5874 902.0295 1124.4043 1203.6253
161 162 163 164 165 166 167 168
1068.8106 986.8099 971.5216 963.1825 903.4193 867.2834 938.1654 883.9615
169 170 171 172 173 174 175 176
1095.2176 1250.8799 1161.9300 1146.6417 960.4029 927.0466 893.6904 807.5202
177 178 179 180 181 182 183 184
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[reached getOption("max.print") -- omitted 8357 entries]
>

Create cross tabulations with derived variables

Answer:

```
mydata<-AirQualityUCI
View(mydata) # 2-Way Frequency Table
attach(mydata)
mytable <- table(A,B) # A will be rows, B will be columns
mytable # print table
margin.table(mytable, 1) # A frequencies (summed over B)
margin.table(mytable, 2) # B frequencies (summed over A)
prop.table(mytable) # cell percentages
prop.table(mytable, 1) # row percentages
prop.table(mytable, 2) # column percentages
```

```
data: mytable
X-squared = 2450, df = 2401, p-value = 0.2382
```

Check for trends and patterns in time series

ts (AirQualityUCI, frequency = 4, start = c(1959, 2)) # frequency 4 => Quarterly Data
ts (1:10, frequency = 12, start = 1990) # freq 12 => Monthly data.
ts (AirQualityUCI, start=c(2009), end=c(2014), frequency=1) # Yearly Data
ts (1:1000, frequency = 365, start = 1990)# freq 365 => daily data.
tsAirqualityUCI <- EuStockMarkets[, 1] # ts data
copied some time series data as below
#plot time series
tsAirqualityUCI <- EuStockMarkets[, 1] # ts data
decomposedRes <- decompose(tsAirqualityUCI, type="mult") # use type = "additive" for additive components
plot (decomposedRes) # see plot below
Output from Rconsole
> ts (AirQualityUCI, frequency = 4, start = c(1959, 2))# frequency 4 => Quarterly Data
Date Time CO(GT) PT08.S1(CO) NMHC(GT) C6H6(GT)
1959 Q2 1078876800 -2209010400 2.60000 1360.0000 150.0000 11.8817235
1959 Q3 1078876800 -2209006800 2.00000 1292.2500 112.0000 9.3971649
1959 Q4 1078876800 -2209003200 2.20000 1402.0000 88.0000 8.9978169
1960 Q1 1078876800 -2208999600 2.20000 1375.5000 80.0000 9.2287964
1960 Q2 1078876800 -2208996000 1.60000 1272.2500 51.0000 6.5182237
1960 Q3 1078876800 -2208992400 1.20000 1197.0000 38.0000 4.7410124
1960 Q4 1078963200 -2209075200 1.20000 1185.0000 31.0000 3.6243992
1961 Q1 1078963200 -2209071600 1.00000 1136.2500 31.0000 3.3266770
1961 Q2 1078963200 -2209068000 0.90000 1094.0000 24.0000 2.3394162
1961 Q3 1078963200 -2209064400 0.60000 1009.7500 19.0000 1.6966583
1961 Q4 1078963200 -2209060800 2.15275 1011.0000 14.0000 1.2936198
1962 Q1 1078963200 -2209057200 0.70000 1066.0000 8.0000 1.1334306
1962 Q2 1078963200 -2209053600 0.70000 1051.7500 16.0000 1.6037679
1962 Q3 1078963200 -2209050000 1.10000 1144.0000 29.0000 3.2436181
1962 Q4 1078963200 -2209046400 2.00000 1333.2500 64.0000 8.0137730
1963 Q1 1078963200 -2209042800 2.20000 1351.0000 87.0000 9.5406429
1963 Q2 1078963200 -2209039200 1.70000 1233.2500 77.0000 6.3357824
1963 Q3 1078963200 -2209035600 1.50000 1178.7500 43.0000 4.9715838
1963 Q4 1078963200 -2209032000 1.60000 1236.0000 61.0000 5.2169190
1964 Q1 1078963200 -2209028400 1.90000 1285.5000 63.0000 7.2699334
1964 Q2 1078963200 -2209024800 2.90000 1371.0000 164.0000 11.5390072
1964 Q3 1078963200 -2209021200 2.20000 1310.0000 79.0000 8.8262227
1964 Q4 1078963200 -2209017600 2.20000 1291.7500 95.0000 8.3014134
1965 Q1 1078963200 -2209014000 2.90000 1383.0000 150.0000 11.1515812
1965 Q2 1078963200 -2209010400 4.80000 1580.7500 307.0000 20.7992169
1965 Q3 1078963200 -2209006800 6.90000 1775.5000 461.0000 27.3598075
1965 Q4 1078963200 -2209003200 6.10000 1640.0000 401.0000 24.0177569
1966 Q1 1078963200 -2208999600 3.90000 1312.7500 197.0000 12.7793682
1966 Q2 1078963200 -2208996000 1.50000 964.5000 61.0000 4.7070719
1966 Q3 1078963200 -2208992400 1.00000 912.7500 26.0000 2.6457215
1966 Q4 1079049600 -2209075200 1.70000 1080.2500 55.0000 5.8548015
1967 Q1 1079049600 -2209071600 1.90000 1043.7500 53.0000 6.3742975
1967 Q2 1079049600 -2209068000 1.40000 987.7500 40.0000 4.1323418

1967 Q3 1079049600 -2209064400 0.80000 888.7500 21.0000 1.8694446
1967 Q4 1079049600 -2209060800 2.15275 831.0000 10.0000 1.0682926
1968 Q1 1079049600 -2209057200 0.60000 847.2500 7.0000 1.0224146
1968 Q2 1079049600 -2209053600 0.80000 927.0000 17.0000 1.8304312
1968 Q3 1079049600 -2209050000 1.40000 1090.5000 33.0000 4.3593410
1968 Q4 1079049600 -2209046400 4.40000 1587.0000 202.0000 17.8655867
1969 Q1 1079049600 -2209042800 2.15275 1544.5000 218.8118 22.0741621
1969 Q2 1079049600 -2209039200 3.10000 1350.2500 208.0000 14.0270114
1969 Q3 1079049600 -2209035600 2.70000 1262.7500 166.0000 11.6456466
1969 Q4 1079049600 -2209032000 2.10000 1206.2500 114.0000 10.2246621
1970 Q1 1079049600 -2209028400 2.50000 1251.5000 140.0000 11.0399360
1970 Q2 1079049600 -2209024800 2.70000 1287.0000 169.0000 12.8164462
1970 Q3 1079049600 -2209021200 2.90000 1352.7500 185.0000 14.1738512
1970 Q4 1079049600 -2209017600 2.80000 1309.0000 165.0000 12.6905681
1971 Q1 1079049600 -2209014000 2.40000 1274.0000 133.0000 11.7384054
1971 Q2 1079049600 -2209010400 3.90000 1509.5000 233.0000 19.2909749
1971 Q3 1079049600 -2209006800 3.70000 1525.2500 242.0000 18.2261783
1971 Q4 1079049600 -2209003200 6.60000 1843.0000 488.0000 32.5562783
1972 Q1 1079049600 -2208999600 4.40000 1597.7500 333.0000 20.0929436
1972 Q2 1079049600 -2208996000 3.50000 1483.5000 215.0000 14.3213424
1972 Q3 1079049600 -2208992400 5.40000 1677.2500 367.0000 21.8128651
1972 Q4 1079136000 -2209075200 2.70000 1279.5000 122.0000 9.6389998
1973 Q1 1079136000 -2209071600 1.90000 1196.2500 67.0000 7.3751395
1973 Q2 1079136000 -2209068000 1.60000 1183.7500 43.0000 5.3696042
1973 Q3 1079136000 -2209064400 1.70000 1171.7500 46.0000 5.3901039
1973 Q4 1079136000 -2209060800 2.15275 1147.0000 56.0000 6.1990420
1974 Q1 1079136000 -2209057200 1.00000 978.2500 30.0000 2.5779322
1974 Q2 1079136000 -2209053600 1.20000 1099.5000 27.0000 2.9085480
1974 Q3 1079136000 -2209050000 1.50000 1112.2500 47.0000 5.1362558
1974 Q4 1079136000 -2209046400 2.70000 1335.5000 132.0000 11.8171386
1975 Q1 1079136000 -2209042800 3.70000 1408.3333 239.0000 15.1401612
1975 Q2 1079136000 -2209039200 3.20000 1447.0000 160.0000 12.9130631
1975 Q3 1079136000 -2209035600 4.10000 1541.5000 283.0000 16.1335088
PT08.S2(NMHC) NOx(GT) PT08.S3(NOx) NO2(GT) PT08.S4(NO2) PT08.S5(O3)
1959 Q2 1045.5000 166.0000 1056.2500 113.0000 1692.0000 1267.5000
1959 Q3 954.7500 103.0000 1173.7500 92.0000 1558.7500 972.2500
1959 Q4 939.2500 131.0000 1140.0000 114.0000 1554.5000 1074.0000
1960 Q1 948.2500 172.0000 1092.0000 122.0000 1583.7500 1203.2500
1960 Q2 835.5000 131.0000 1205.0000 116.0000 1490.0000 1110.0000
1960 Q3 750.2500 89.0000 1336.5000 96.0000 1393.0000 949.2500
1960 Q4 689.5000 62.0000 1461.7500 77.0000 1332.7500 732.5000
1961 Q1 672.0000 62.0000 1453.2500 76.0000 1332.7500 729.5000
1961 Q2 608.5000 45.0000 1579.0000 60.0000 1276.0000 619.5000
1961 Q3 560.7500 246.8813 1705.0000 113.0755 1234.7500 501.2500
1961 Q4 526.7500 21.0000 1817.5000 34.0000 1196.7500 445.2500
1962 Q1 512.0000 16.0000 1918.0000 28.0000 1182.0000 421.7500
1962 Q2 553.2500 34.0000 1738.2500 48.0000 1221.2500 471.5000

1962 Q3 667.0000 98.0000 1489.7500 82.0000 1339.0000 729.7500
1962 Q4 899.7500 174.0000 1136.0000 112.0000 1517.0000 1101.5000
1963 Q1 960.2500 129.0000 1079.0000 101.0000 1582.7500 1027.7500
1963 Q2 827.2500 112.0000 1218.0000 98.0000 1445.7500 859.7500
1963 Q3 762.0000 95.0000 1327.5000 92.0000 1361.7500 670.5000
1963 Q4 774.2500 104.0000 1301.2500 95.0000 1401.2500 664.0000
1964 Q1 868.5000 146.0000 1162.2500 112.0000 1536.7500 799.0000
1964 Q2 1033.5000 207.0000 983.2500 128.0000 1730.2500 1036.5000
1964 Q3 932.5000 184.0000 1081.7500 126.0000 1646.5000 946.2500
1964 Q4 911.5000 193.0000 1102.5000 131.0000 1590.7500 956.7500
1965 Q1 1019.7500 243.0000 1008.0000 135.0000 1718.7500 1104.0000
1965 Q2 1318.5000 281.0000 798.5000 151.0000 2083.0000 1408.5000
1965 Q3 1487.7500 383.0000 702.2500 172.0000 2332.5000 1704.0000
1965 Q4 1404.0000 351.0000 742.7500 165.0000 2191.2500 1653.7500
1966 Q1 1076.2500 240.0000 957.2500 136.0000 1706.5000 1284.7500
1966 Q2 748.5000 94.0000 1325.2500 85.0000 1332.5000 821.0000
1966 Q3 629.2500 47.0000 1564.5000 53.0000 1252.2500 551.7500
1966 Q4 805.0000 122.0000 1253.5000 97.0000 1375.0000 815.5000
1967 Q1 829.0000 133.0000 1247.2500 110.0000 1378.2500 831.5000
1967 Q2 718.0000 82.0000 1395.5000 91.0000 1303.5000 691.5000
1967 Q3 574.2500 246.8813 1680.2500 113.0755 1187.0000 512.0000
1967 Q4 505.7500 21.0000 1892.7500 32.0000 1133.7500 384.0000
1968 Q1 501.2500 30.0000 1894.5000 44.0000 1154.7500 394.0000
1968 Q2 571.2500 56.0000 1684.7500 71.0000 1222.7500 486.5000
1968 Q3 730.2500 109.0000 1387.0000 104.0000 1360.7500 748.2500
1968 Q4 1235.5000 307.0000 896.5000 141.0000 1900.2500 1400.2500
1969 Q1 1353.0000 246.8813 767.2500 113.0755 2058.0000 1587.7500
1969 Q2 1117.5000 187.0000 912.0000 122.0000 1711.7500 1237.0000
1969 Q3 1037.2500 216.0000 969.0000 143.0000 1598.2500 1166.5000
1969 Q4 986.0000 143.0000 1034.5000 113.0000 1537.0000 959.0000
1970 Q1 1015.7500 160.0000 1007.5000 116.0000 1592.7500 983.0000
1970 Q2 1077.5000 163.0000 948.7500 123.0000 1660.2500 1060.7500
1970 Q3 1122.2500 190.0000 921.7500 126.0000 1740.0000 1139.2500
1970 Q4 1073.2500 178.0000 954.0000 120.0000 1657.2500 1112.2500
1971 Q1 1040.5000 150.0000 1005.7500 119.0000 1609.7500 993.7500
1971 Q2 1276.5000 206.0000 812.2500 149.0000 1909.7500 1409.5000
1971 Q3 1246.0000 202.0000 821.0000 145.0000 1846.7500 1447.7500
1971 Q4 1609.7500 340.0000 624.0000 170.0000 2390.2500 1886.5000
1972 Q1 1299.0000 274.0000 752.0000 149.0000 1940.5000 1626.7500
1972 Q2 1127.0000 253.0000 839.0000 139.0000 1723.0000 1491.0000
1972 Q3 1346.0000 300.0000 740.5000 134.0000 2062.0000 1657.0000
1972 Q4 964.0000 193.0000 962.5000 113.0000 1543.5000 1285.2500
1973 Q1 873.0000 139.0000 1071.2500 97.0000 1463.2500 1144.2500
1973 Q2 781.7500 83.0000 1176.2500 82.0000 1364.5000 1042.7500
1973 Q3 782.7500 246.8813 1178.5000 113.0755 1379.7500 995.5000
1973 Q4 821.0000 109.0000 1132.2500 83.0000 1411.7500 991.5000
1974 Q1 624.7500 62.0000 1420.2500 65.0000 1274.2500 819.2500

1974 Q2 646.2500 53.0000 1406.2500 60.0000 1267.5000 835.0000
1974 Q3 770.2500 139.0000 1228.0000 77.0000 1408.5000 939.7500
1974 Q4 1043.2500 256.0000 935.2500 96.0000 1678.0000 1191.7500
1975 Q1 1153.0000 295.0000 830.3333 119.0000 1776.6667 1411.0000
1975 Q2 1080.7500 250.0000 868.5000 126.0000 1666.7500 1465.0000
1975 Q3 1183.7500 296.0000 808.2500 158.0000 1779.7500 1582.5000
T RH AH
1959 Q2 13.600000 48.87500 0.7577538
1959 Q3 13.300000 47.70000 0.7254874
1959 Q4 11.900000 53.97500 0.7502391
1960 Q1 11.000000 60.00000 0.7867125
1960 Q2 11.150000 59.57500 0.7887942
1960 Q3 11.175000 59.17500 0.7847717
1960 Q4 11.325000 56.77500 0.7603119
1961 Q1 10.675000 60.00000 0.7702385
1961 Q2 10.650000 59.67500 0.7648187
1961 Q3 10.250000 60.20000 0.7516572
1961 Q4 10.075000 60.47500 0.7464945
1962 Q1 11.000000 56.17500 0.7365596
1962 Q2 10.450000 58.12500 0.7352951
1962 Q3 10.200000 59.60000 0.7417362
1962 Q4 10.750000 57.42500 0.7407946
1963 Q1 10.500000 60.60000 0.7691108
1963 Q2 10.800000 58.35000 0.7551831
1963 Q3 10.500000 57.92500 0.7351608
1963 Q4 9.525000 66.77500 0.7950538
1964 Q1 8.300000 76.42500 0.8392681
1964 Q2 8.000000 81.15000 0.8735885
1964 Q3 8.325000 79.80000 0.8777844
1964 Q4 9.700000 71.15000 0.8569381
1965 Q1 9.775000 67.62500 0.8185012
1965 Q2 10.350000 64.17500 0.8065436
1965 Q3 9.650000 69.30000 0.8319211
1965 Q4 9.650000 67.75000 0.8133139
1966 Q1 9.125000 63.97500 0.7419242
1966 Q2 8.175000 63.40000 0.6904844
1966 Q3 8.250000 60.82500 0.6657444
1966 Q4 8.325000 58.52500 0.6437636
1967 Q1 7.725000 59.67500 0.6307661
1967 Q2 7.125000 61.80000 0.6275974
1967 Q3 6.975000 62.27500 0.6261075
1967 Q4 6.100000 65.90000 0.6247536
1968 Q1 6.275000 64.97500 0.6232823
1968 Q2 6.750000 62.95000 0.6234275
1968 Q3 6.450000 65.07500 0.6316281
1968 Q4 7.325000 63.15000 0.6499331
1969 Q1 9.225000 56.20000 0.6560651

1969 Q2 13.225000 41.75000 0.6319501
1969 Q3 14.325000 38.45000 0.6243043
1969 Q4 15.025000 36.50000 0.6195323
1970 Q1 16.100000 34.47500 0.6261647
1970 Q2 16.275001 35.72500 0.6560306
1970 Q3 15.825000 37.02500 0.6609611
1970 Q4 15.875000 37.17500 0.6657285
1971 Q1 16.875000 34.35000 0.6549085
1971 Q2 15.150000 39.55000 0.6766265
1971 Q3 14.400000 43.42500 0.7084498
1971 Q4 12.875000 50.52500 0.7478032
1972 Q1 12.150000 53.35000 0.7536202
1972 Q2 10.975000 59.12500 0.7739800
1972 Q3 9.675000 64.62500 0.7770739
1972 Q4 9.450000 64.12500 0.7597465
1973 Q1 9.150000 63.90000 0.7422764
1973 Q2 8.800000 63.92500 0.7256154
1973 Q3 7.800000 67.52500 0.7173121
1973 Q4 7.000000 71.07500 0.7157785
1974 Q1 8.300000 63.57500 0.6981546
1974 Q2 7.200000 67.47500 0.6886721
1974 Q3 6.350000 71.90000 0.6931986
1974 Q4 6.450000 71.55000 0.6944755
1975 Q1 9.566667 59.66667 0.7123666
1975 Q2 12.375000 51.17500 0.7334584
1975 Q3 15.650000 42.20000 0.7450938
[reached getOption("max.print") -- omitted 9291 rows]
> ts (1:10, frequency = 12, start = 1990) # freq 12 => Monthly data.
Jan Feb Mar Apr May Jun Jul Aug Sep Oct
1990 1 2 3 4 5 6 7 8 9 10
> ts (AirQualityUCI, start=c(2009), end=c(2014), frequency=1) # Yearly Data
Time Series:
Start = 2009
End = 2014
Frequency = 1
Date Time CO(GT) PT08.S1(CO) NMHC(GT) C6H6(GT) PT08.S2(NMHC)
2009 1078876800 -2209010400 2.6 1360.00 150 11.881723 1045.50
2010 1078876800 -2209006800 2.0 1292.25 112 9.397165 954.75
2011 1078876800 -2209003200 2.2 1402.00 88 8.997817 939.25
2012 1078876800 -2208999600 2.2 1375.50 80 9.228796 948.25
2013 1078876800 -2208996000 1.6 1272.25 51 6.518224 835.50
2014 1078876800 -2208992400 1.2 1197.00 38 4.741012 750.25
NOx(GT) PT08.S3(NOx) NO2(GT) PT08.S4(NO2) PT08.S5(O3) T RH AH
2009 166 1056.25 113 1692.00 1267.50 13.600 48.875 0.7577538
2010 103 1173.75 92 1558.75 972.25 13.300 47.700 0.7254874
2011 131 1140.00 114 1554.50 1074.00 11.900 53.975 0.7502391
2012 172 1092.00 122 1583.75 1203.25 11.000 60.000 0.7867125

2013 131 1205.00 116 1490.00 1110.00 11.150 59.575 0.7887942
2014 89 1336.50 96 1393.00 949.25 11.175 59.175 0.7847717
> ts (1:1000, frequency = 365, start = 1990) # freq 365 => daily data.
Time Series:
Start = c(1990, 1)
End = c(1992, 270)
Frequency = 365
[1] 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
[16] 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
[31] 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45
[46] 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
[61] 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75
[76] 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90
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[106] 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120
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[286] 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300
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[586] 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600
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[616] 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630
[631] 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645
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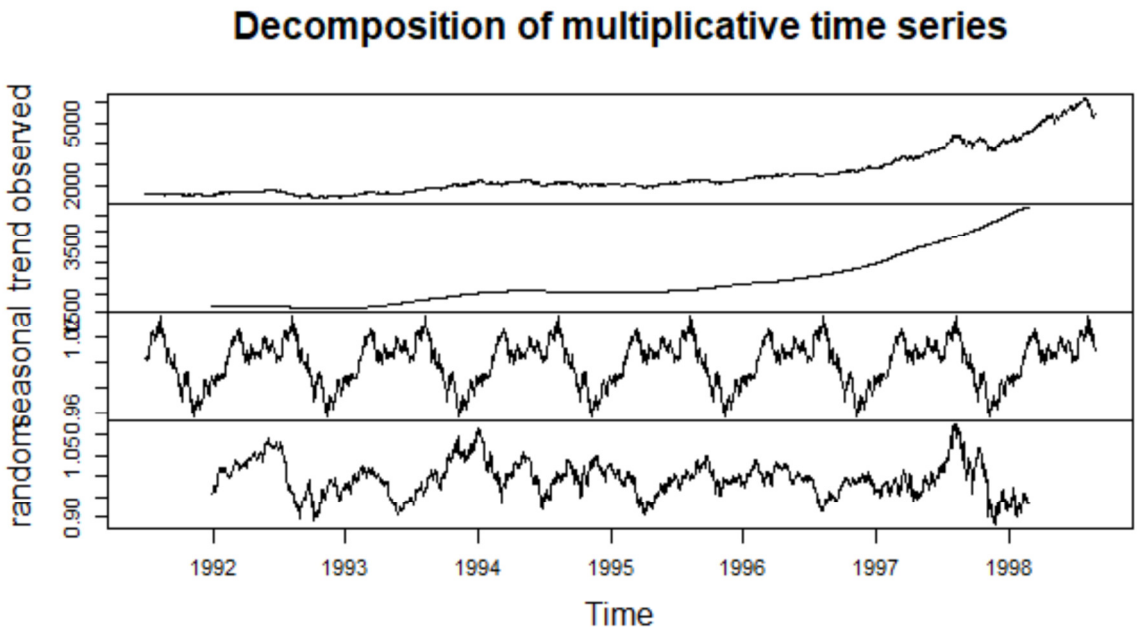
[661] 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675
[676] 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690
[691] 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705
[706] 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720
[721] 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735
[736] 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750
[751] 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765
[766] 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780
[781] 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795
[796] 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810
[811] 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825
[826] 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840

[841] 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855
[856] 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870
[871] 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885
[886] 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900
[901] 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915
[916] 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930
[931] 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945
[946] 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960
[961] 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975
[976] 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990
[991] 991 992 993 994 995 996 997 998 999 1000
> tsAirqualityUCI <- EuStockMarkets[, 1]



Find out the most polluted time of the day and the name of the chemical compound.

Answer
#plot time series
tsAirqualityUCI <- EuStockMarkets[, 1] # ts data
decomposedRes <- decompose(tsAirqualityUCI, type="mult") # use type = "additive" for additive components
plot (decomposedRes) # see plot below
stlRes <- stl(tsAirqualityUCI, s.window = "periodic")
plot(AirQualityUCI$T, type = "l")
Output from Rconsole
O

PT08.S4(NO2) is the	Time	NOx(GT)	PT08.S3(NOx)	NO2(GT)	PT08.S4(NO2)	PT08.S5(O3)

highest pollution at 18.00 hr Date							
6/8/2004	8:00:00	376	525	125	2746	1708
6/9/2004	8:00:00	357	507	151	2691	2147
10/26/2004	18:00:00	952	325	180	2775	2372
max	1479.0	2682.8	339.7	2775.0	2522.8	

```
decomposedRes <- decompose(tsAirqualityUCI, type="mult") # use type = "additive" for
additive components
plot (decomposedRes) # see plot below
stlRes <- stl(tsAirqualityUCI, s.window = "periodic")
plot(AirQualityUCI$T, type = "l")
```

Output from Rconsole

O						
PT08.S4(NO2) is the highest pollution at 18.00 hr	Time	NOx(GT)	PT08.S3(NOx)	NO2(GT)	PT08.S4(NO2)	PT08.S5(O3)
Date						
6/8/2004	8:00:00	376	525	125	2746	1708
6/9/2004	8:00:00	357	507	151	2691	2147
10/26/2004	18:00:00	952	325	180	2775	2372
max	1479.0	2682.8	339.7	2775.0	2522.8	