N11_beyond_frames

February 25, 2021

1 N11_beyond_frames

A data frame is a great way to look at data. It appears as a simple spread sheet, and the rows and columns can be easily accessed. There are other models for refering to data frames. One of these, the time sequence, will be presented, but used later.

First, a little help dealing with data frames:

One problem many students have is knowing what they have. Use the class function to find out what it is.

[1]:
```
class(mtcars)
class(UKgas)
```

'data.frame'

'ts'

The mtcars is a data.frame, and we can use all we have learned on it. The UKgas is a 'ts' (time sequence). It is not the same as a data frame. You cannot use most data frame elements on it.

[2]:
```
UKgas
```

```
      Qtr1  Qtr2  Qtr3  Qtr4
1960 160.1 129.7  84.8 120.1
1961 160.1 124.9  84.8 116.9
1962 169.7 140.9  89.7 123.3
1963 187.3 144.1  92.9 120.1
1964 176.1 147.3  89.7 123.3
1965 185.7 155.3  99.3 131.3
1966 200.1 161.7 102.5 136.1
1967 204.9 176.1 112.1 140.9
1968 227.3 195.3 115.3 142.5
1969 244.9 214.5 118.5 153.7
1970 244.9 216.1 188.9 142.5
1971 301.0 196.9 136.1 267.3
1972 317.0 230.5 152.1 336.2
1973 371.4 240.1 158.5 355.4
1974 449.9 286.6 179.3 403.4
1975 491.5 321.8 177.7 409.8
1976 593.9 329.8 176.1 483.5
```

```
1977  584.3  395.4  187.3  485.1
1978  669.2  421.0  216.1  509.1
1979  827.7  467.5  209.7  542.7
1980  840.5  414.6  217.7  670.8
1981  848.5  437.0  209.7  701.2
1982  925.3  443.4  214.5  683.6
1983  917.3  515.5  224.1  694.8
1984  989.4  477.1  233.7  730.0
1985 1087.0  534.7  281.8  787.6
1986 1163.9  613.1  347.4  782.8
```

You can see that it has columns representing quarters, and rows representing years.

[5]:
```
UKgas[22]
```

155.3

It acts more like a list. There is one value per entry (typically), and they can be accessed in a linear fashion

[8]:
```
summary(UKgas)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
   84.8   153.3   220.9   337.6   469.9  1163.9 
```

Many functions treat it like a simple series of data. The summary function understood what to do with the data. If looking for a seasonal trend, then You will find the seasonal nature of the data makes it hard to get reasonable results from combining all the quarters.

[11]:
```
UKgas$Qtr1
```

```
    Error in UKgas$Qtr1: $ operator is invalid for atomic vectors
Traceback:
```

[19]:
```
"That didn't work"
UKgas[seq(1,length(UKgas),4)]
window(UKgas,c(1960,1),c(1986,1),1)
```

'That didn\'t work'

1. 160.1 2. 160.1 3. 169.7 4. 187.3 5. 176.1 6. 185.7 7. 200.1 8. 204.9 9. 227.3 10. 244.9 11. 244.9 12. 301 13. 317 14. 371.4 15. 449.9 16. 491.5 17. 593.9 18. 584.3 19. 669.2 20. 827.7 21. 840.5 22. 848.5 23. 925.3 24. 917.3 25. 989.4 26. 1087 27. 1163.9

```
Time Series:
Start = 1960
```

```
End = 1986
Frequency = 1
 [1]  160.1  160.1  169.7  187.3  176.1  185.7  200.1  204.9  227.3  244.9
[11]  244.9  301.0  317.0  371.4  449.9  491.5  593.9  584.3  669.2  827.7
[21]  840.5  848.5  925.3  917.3  989.4 1087.0 1163.9
```

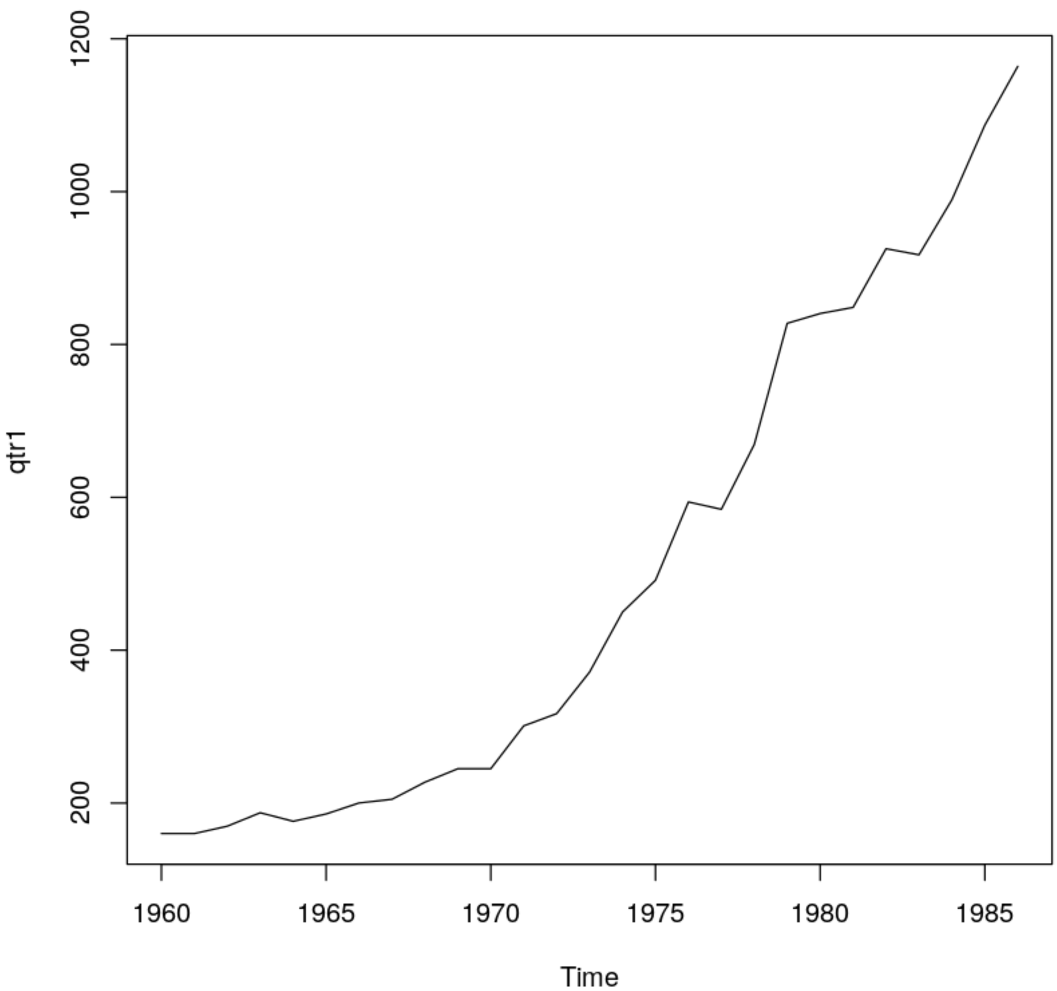
Here, the seq function was used to get items starting at quarter 1, and then each year by skipping ahead 4 quarters. This allows easy access to a column of time sequence data.

The window function does something simular, but returns a time series from the starting and ending dates. The 3rd parameter tells it how many to extract for each year (1= annual, 12=monthly, 4=quarterly, 2=every 6 months.

A summary of this shows how things look in the winter (Quarter 1)

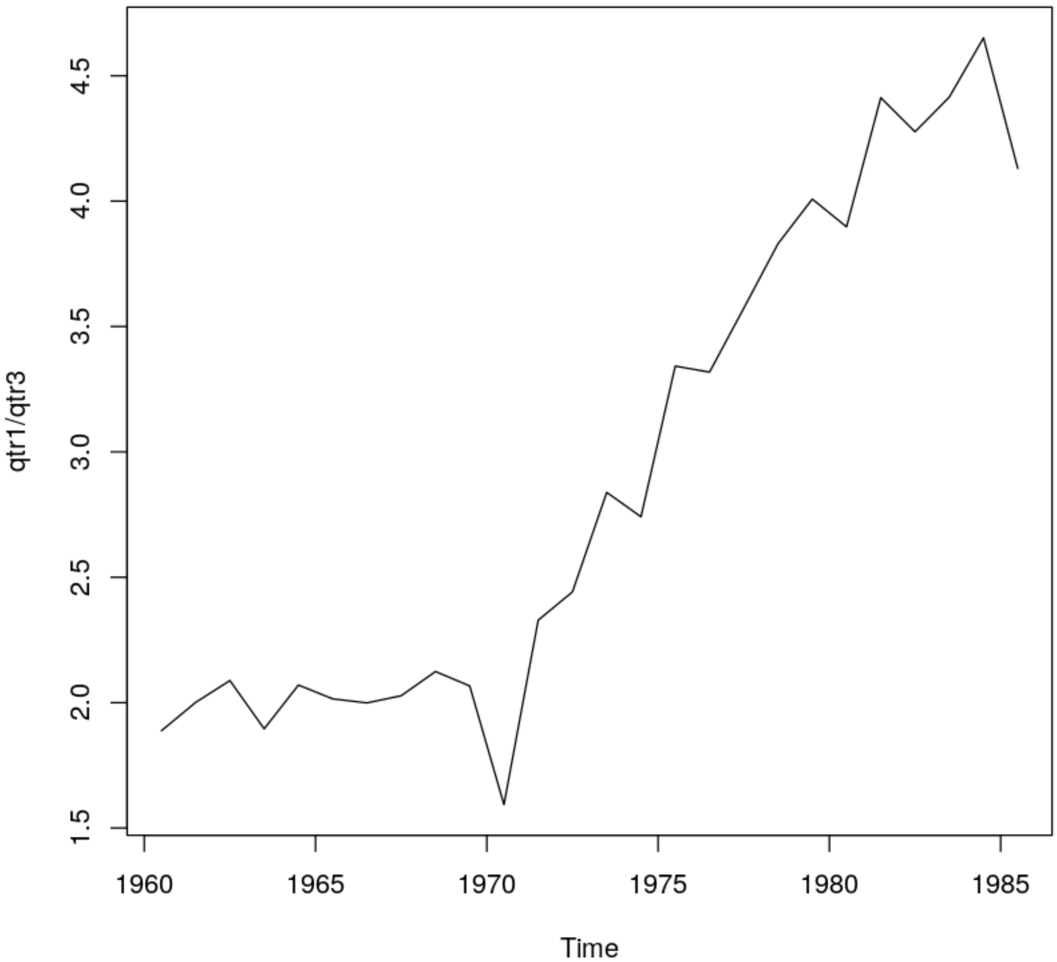
[20]:
```
qtr1 <- window(UKgas,c(1960,1),c(1986,1),1)

summary(qtr1)
plot(qtr1)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
  160.1   202.5   371.4   501.4   834.1  1163.9 
```



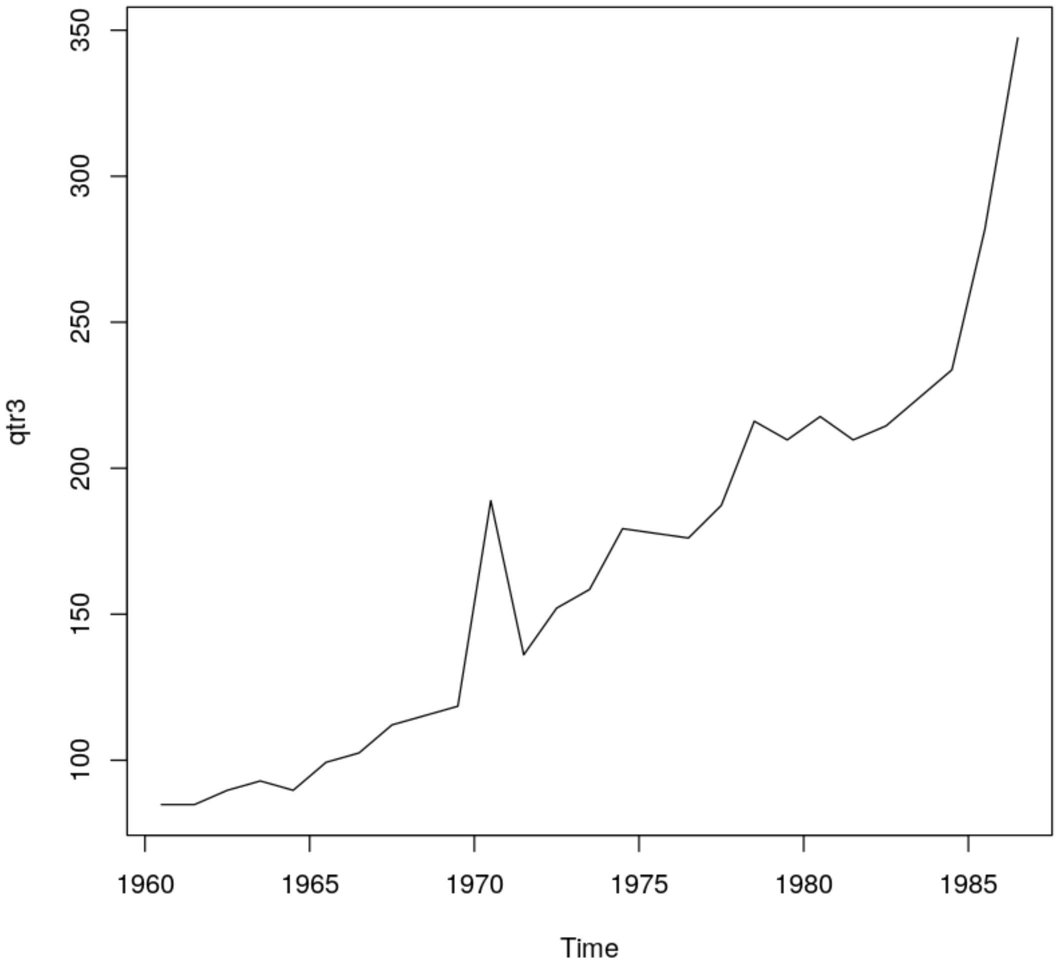
Note the rapid rise in gas consumption in the winter over the last 10 sample years. Compare this to the consumption in Q3 (assumed to be during the summer) Plot the ratio of winter usage to summer usage to see if general usage has gone up, or just summer usage

[33]:
```
qtr3<- window(UKgas,c(1960,3),c(1986,3),1)
plot(qtr1/qtr3)
```



Plot just the summer usage

[34]:
```
plot(qtr3)
```



Summer is also going up.

1.1 data.frame hints

Many time, you download a csv, and the data ends up as a factor. To convert it to a number, use as.character to make it a string, and then as.numeric to make the string a number. This often happens in csv that don't have correct headers, or ones that have some typos in the data.

Assume john is a data fram in factor format and the calorie column is a mess. Try a conversion…

john$calorie <- as.numeric(as.character(john$calorie))

[30]:
```
john <- data.frame(calorie = c("22","13","19") )
class(john)
```

```
john
class(john$calorie)
```

'data.frame'

A data.frame: 3 × 1

calorie
<chr>
22
13
19

'character'

[31]:
```
john$calorie <- as.numeric(as.character(john$calorie))
class(john$calorie)
```

'numeric'

It has now been converted to numeric values, and can be used for statistics

1.2 where is bad data ?

Often, you download a piece of data, and it has something bad in it. This prevents converting the data to numeric. The location of the bad data can be found using which.min (Somewhat indirectly)

First an example of which.min (There is also a which.max)

[2]:
```
jill <- c(2,4,6,8,3,2,1)
min(jill)
which.min(jill)
```

1

7

[3]:
```
jill <- list(2,3,4,"8",3,2,1)
sd(jill)
```

```
        Error in var(if (is.vector(x) || is.factor(x)) x else as.double(x), na.
↪rm = na.rm): is.atomic(x) is not TRUE
    Traceback:


        1. sd(jill)

        2. var(if (is.vector(x) || is.factor(x)) x else as.double(x), na.rm = na.
↪rm)

        3. stopifnot(is.atomic(x))
```

[6]:
```
# That didn't work, so where is the problem
is.numeric(jill)
sapply(jill,is.numeric)
which.min(sapply(jill,is.numeric))
```

FALSE

1. TRUE 2. TRUE 3. TRUE 4. FALSE 5. TRUE 6. TRUE 7. TRUE

4

In the box below, explain how this worked, and how you could use this on a downloaded data set (hint, false is less than true)

Put your comments here # The "is.numeric" asks the funtion if it is a numerical # sapply creates a new vector/matrix by combining "jill" and "is.numeric" thereby creating a new vector of "jill" that is a numeric. # which.min which brings back whatever lowest variable. This case is the fourth in the vector. # This is useful in downloaded data sets are strings and need to visualized in a graph. This allows those to strings to be converted to numberics for data visualization.

Print the screen, download pdf, or what you can do, and submit the results on Canvas.