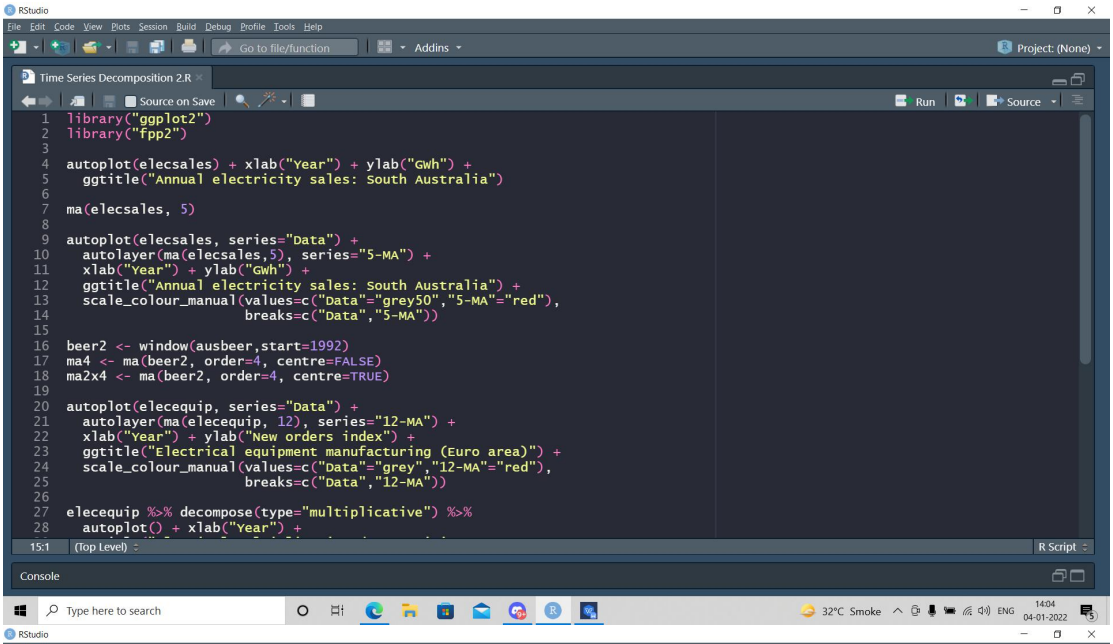
Time Serise Decomposition

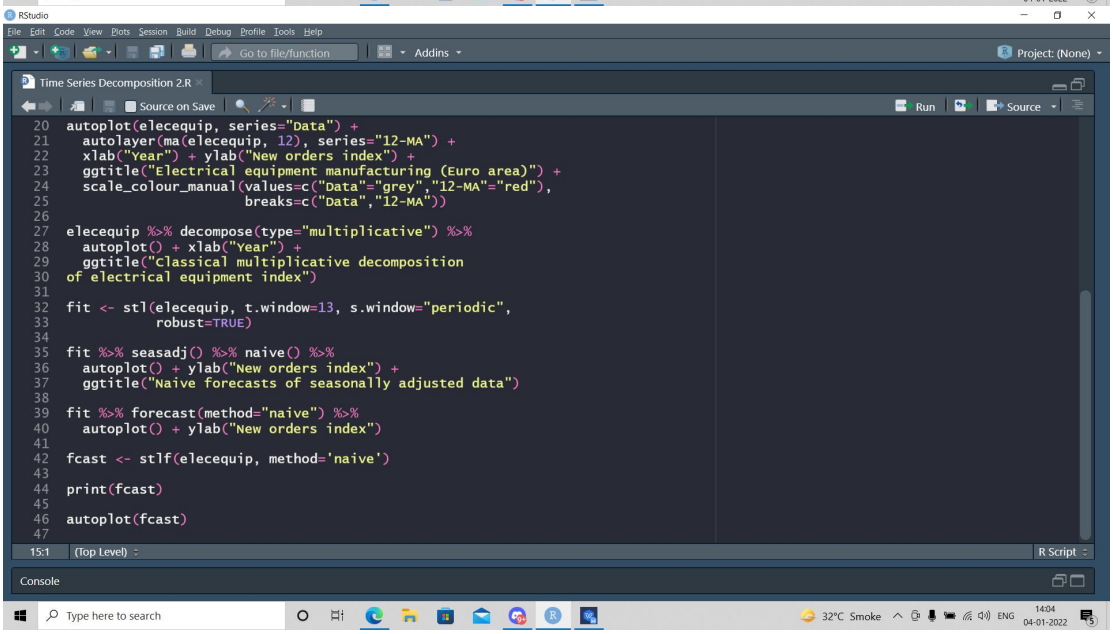
Code:

```
library("ggplot2")
library("fpp2")

autoplot(elecsales) + xlab("Year") + ylab("GWh") +
  ggtitle("Annual electricity sales: South Australia")

ma(elecsales, 5)

autoplot(elecsales, series="Data") +
  autolayer(ma(elecsales,5), series="5-MA") +
  xlab("Year") + ylab("GWh") +
  ggtitle("Annual electricity sales: South Australia") +
  scale_colour_manual(values=c("Data"="grey50","5-MA"="red"),
                      breaks=c("Data","5-MA"))

beer2 <- window(ausbeer,start=1992)
ma4 <- ma(beer2, order=4, centre=FALSE)
ma2x4 <- ma(beer2, order=4, centre=TRUE)

autoplot(elecequip, series="Data") +
  autolayer(ma(elecequip, 12), series="12-MA") +
  xlab("Year") + ylab("New orders index") +
  ggtitle("Electrical equipment manufacturing (Euro area)") +
  scale_colour_manual(values=c("Data"="grey","12-MA"="red"),
                      breaks=c("Data","12-MA"))

elecequip %>% decompose(type="multiplicative") %>%
  autoplot() + xlab("Year") +
  ggtitle("Classical multiplicative decomposition
of electrical equipment index")
```

```
fit <- stl(elecequip, t.window=13, s.window="periodic",
          robust=TRUE)

fit %>% seasadj() %>% naive() %>%
  autoplot() + ylab("New orders index") +
  ggtitle("Naive forecasts of seasonally adjusted data")

fit %>% forecast(method="naive") %>%
  autoplot() + ylab("New orders index")

fcast <- stlf(elecequip, method='naive')

print(fcast)

autoplot(fcast)
```

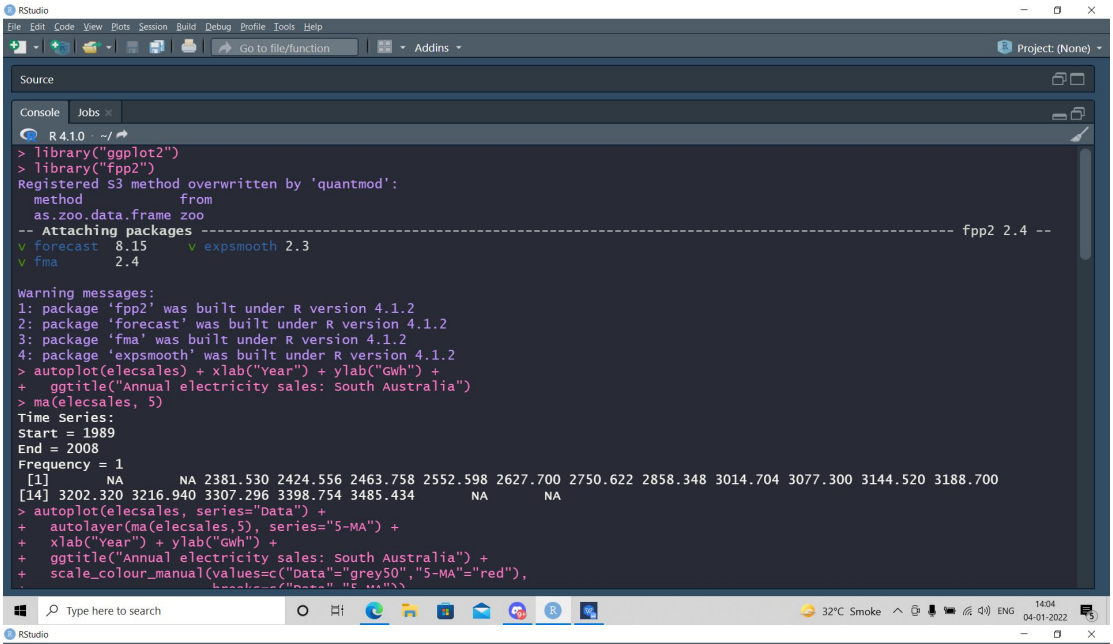


```
library("ggplot2")
library("fpp2")

autoplot(elecsales) + xlab("Year") + ylab("GWh") +
  ggtitle("Annual electricity sales: South Australia")

ma(elecsales, 5)

autoplot(elecsales, series="Data") +
  autolayer(ma(elecsales,5), series="5-MA") +
  xlab("Year") + ylab("GWh") +
  ggtitle("Annual electricity sales: South Australia") +
  scale_colour_manual(values=c("Data"="grey50","5-MA"="red"),
                      breaks=c("Data","5-MA"))

beer2 <- window(ausbeer,start=1992)
ma4 <- ma(beer2, order=4, centre=FALSE)
ma2x4 <- ma(beer2, order=4, centre=TRUE)

autoplot(elecequip, series="Data") +
  autolayer(ma(elecequip, 12), series="12-MA") +
  xlab("Year") + ylab("New orders index") +
  ggtitle("Electrical equipment manufacturing (Euro area)") +
  scale_colour_manual(values=c("Data"="grey","12-MA"="red"),
                      breaks=c("Data","12-MA"))

elecequip %>% decompose(type="multiplicative") %>%
  autoplot() + xlab("Year") +
```

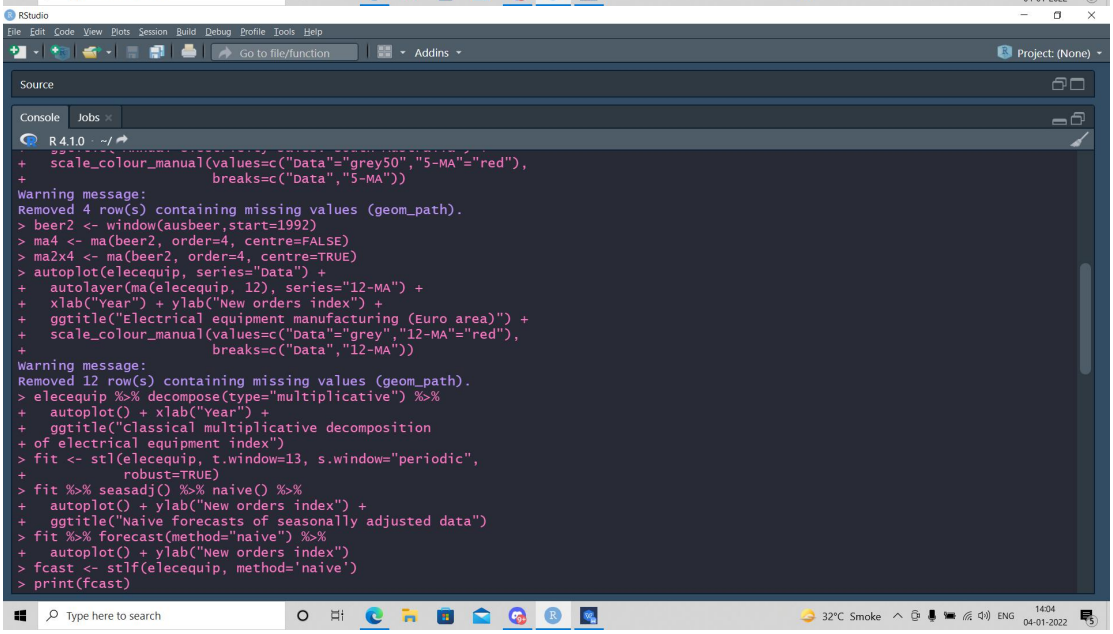


```
autoplot(elecequip, series="Data") +
  autolayer(ma(elecequip, 12), series="12-MA") +
  xlab("Year") + ylab("New orders index") +
  ggtitle("Electrical equipment manufacturing (Euro area)") +
  scale_colour_manual(values=c("Data"="grey","12-MA"="red"),
                      breaks=c("Data","12-MA"))

elecequip %>% decompose(type="multiplicative") %>%
  autoplot() + xlab("Year") +
  ggtitle("Classical multiplicative decomposition
of electrical equipment index")

fit <- stl(elecequip, t.window=13, s.window="periodic",
           robust=TRUE)

fit %>% seasadj() %>% naive() %>%
  autoplot() + ylab("New orders index") +
  ggtitle("Naive forecasts of seasonally adjusted data")

fit %>% forecast(method="naive") %>%
  autoplot() + ylab("New orders index")

fcast <- stlf(elecequip, method='naive')

print(fcast)

autoplot(fcast)
```

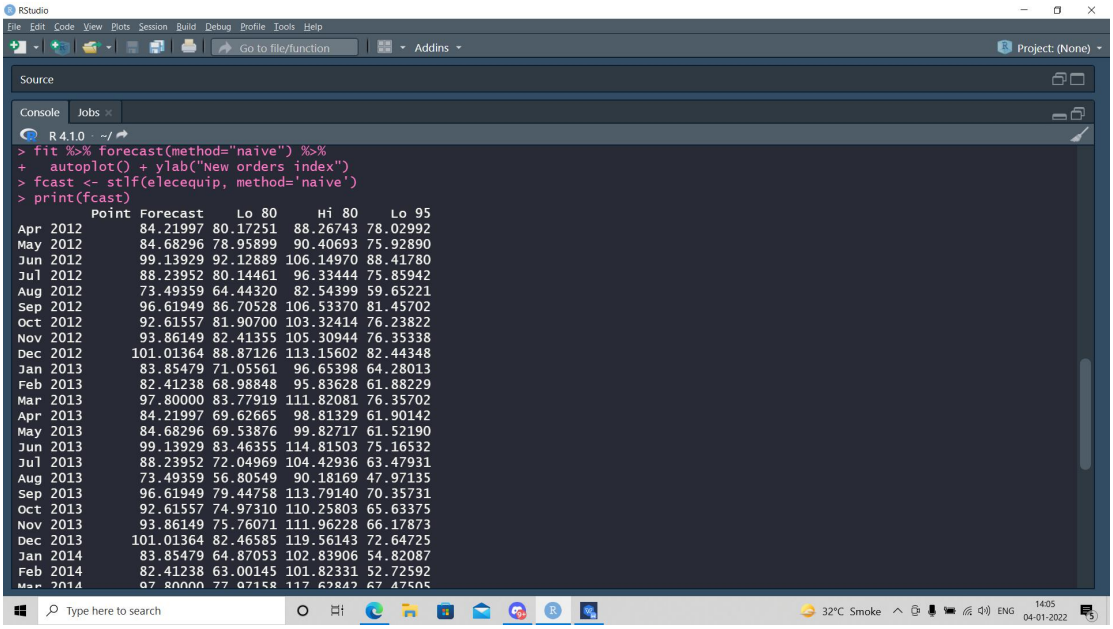
Output:

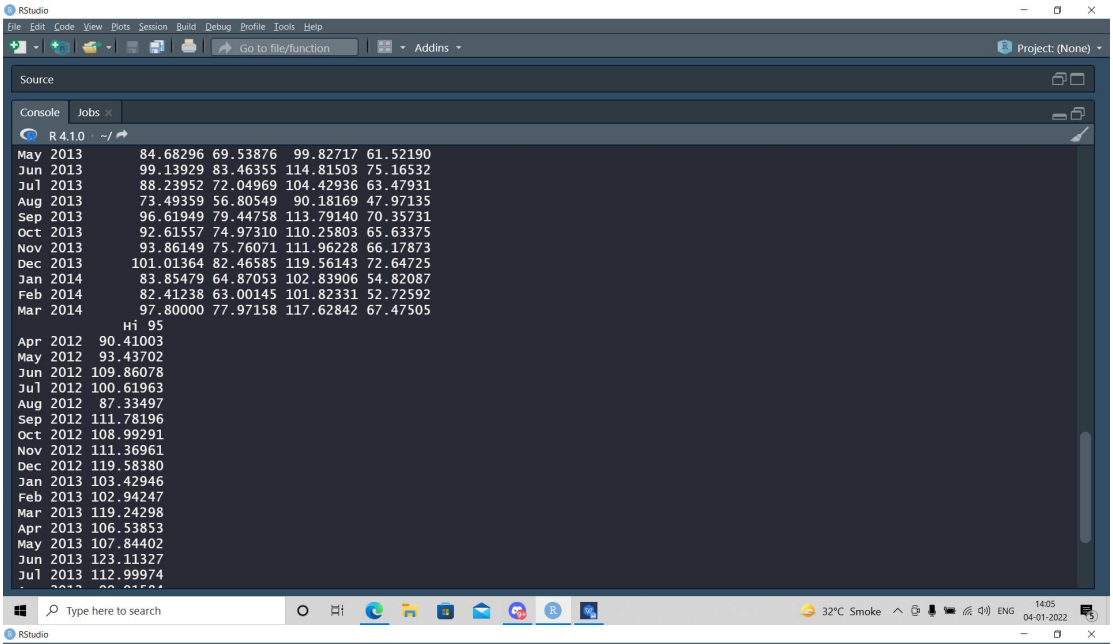


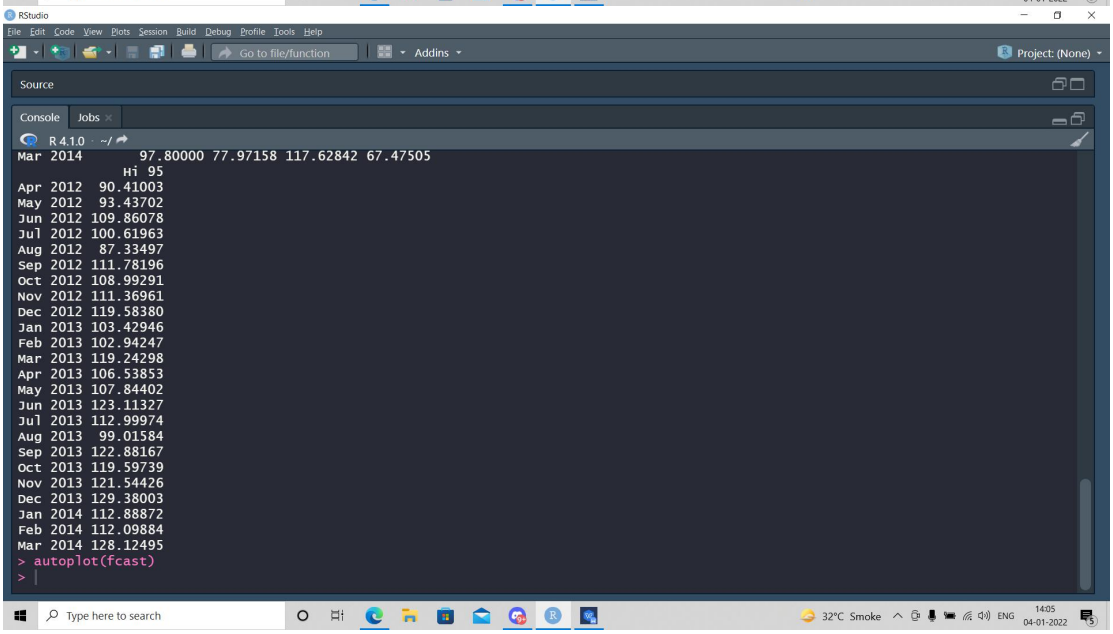
```
> library("ggplot2")
> library("fpp2")
Registered S3 method overwritten by 'quantmod':
  method            from
  as.zoo.data.frame zoo
-- Attaching packages --------------------------------------------------------------------------------------- fpp2 2.4 --
v forecast  8.15     v expsmooth 2.3
v fma       2.4

Warning messages:
1: package 'fpp2' was built under R version 4.1.2
2: package 'forecast' was built under R version 4.1.2
3: package 'fma' was built under R version 4.1.2
4: package 'expsmooth' was built under R version 4.1.2
> autoplot(elecsales) + xlab("Year") + ylab("GWh") +
+   ggtitle("Annual electricity sales: South Australia")
> ma(elecsales, 5)
Time Series:
Start = 1989
End = 2008
Frequency = 1
 [1]       NA       NA 2381.530 2424.556 2463.758 2552.598 2627.700 2750.622 2858.348 3014.704 3077.300 3144.520 3188.700
[14] 3202.320 3216.940 3307.296 3398.754 3485.434       NA       NA
> autoplot(elecsales, series="Data") +
+   autolayer(ma(elecsales,5), series="5-MA") +
+   xlab("Year") + ylab("GWh") +
+   ggtitle("Annual electricity sales: South Australia") +
+   scale_colour_manual(values=c("Data"="grey50","5-MA"="red"),
```



```
+   scale_colour_manual(values=c("Data"="grey50","5-MA"="red"),
+                       breaks=c("Data","5-MA"))
Warning message:
Removed 4 row(s) containing missing values (geom_path).
> beer2 <- window(ausbeer,start=1992)
> ma4 <- ma(beer2, order=4, centre=FALSE)
> ma2x4 <- ma(beer2, order=4, centre=TRUE)
> autoplot(elecequip, series="Data") +
+   autolayer(ma(elecequip, 12), series="12-MA") +
+   xlab("Year") + ylab("New orders index") +
+   ggtitle("Electrical equipment manufacturing (Euro area)") +
+   scale_colour_manual(values=c("Data"="grey","12-MA"="red"),
+                       breaks=c("Data","12-MA"))
Warning message:
Removed 12 row(s) containing missing values (geom_path).
> elecequip %>% decompose(type="multiplicative") %>%
+   autoplot() + xlab("Year") +
+   ggtitle("Classical multiplicative decomposition
+ of electrical equipment index")
> fit <- stl(elecequip, t.window=13, s.window="periodic",
+            robust=TRUE)
> fit %>% seasadj() %>% naive() %>%
+   autoplot() + ylab("New orders index") +
+   ggtitle("Naive forecasts of seasonally adjusted data")
> fit %>% forecast(method="naive") %>%
+   autoplot() + ylab("New orders index")
> fcast <- stlf(elecequip, method='naive')
> print(fcast)
```


RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
Project: (None)
Source
Console
Jobs
R 4.1.0 · ~/
> fit %>% forecast(method="naive") %>%
+   autoplot() + ylab("New orders index")
> fcast <- stlf(elecequip, method='naive')
> print(fcast)
Point Forecast Lo 80 Hi 80 Lo 95
Apr 2012 84.21997 80.17251 88.26743 78.02992
May 2012 84.68296 78.95899 90.40693 75.92890
Jun 2012 99.13929 92.12889 106.14970 88.41780
Jul 2012 88.23952 80.14461 96.33444 75.85942
Aug 2012 73.49359 64.44320 82.54399 59.65221
Sep 2012 96.61949 86.70528 106.53370 81.45702
Oct 2012 92.61557 81.90700 103.32414 76.23822
Nov 2012 93.86149 82.41355 105.30944 76.35338
Dec 2012 101.01364 88.87126 113.15602 82.44348
Jan 2013 83.85479 71.05561 96.65398 64.28013
Feb 2013 82.41238 68.98848 95.83628 61.88229
Mar 2013 97.80000 83.77919 111.82081 76.35702
Apr 2013 84.21997 69.62665 98.81329 61.90142
May 2013 84.68296 69.53876 99.82717 61.52190
Jun 2013 99.13929 83.46355 114.81503 75.16532
Jul 2013 88.23952 72.04969 104.42936 63.47931
Aug 2013 73.49359 56.80549 90.18169 47.97135
Sep 2013 96.61949 79.44758 113.79140 70.35731
Oct 2013 92.61557 74.97310 110.25803 65.63375
Nov 2013 93.86149 75.76071 111.96228 66.17873
Dec 2013 101.01364 82.46585 119.56143 72.64725
Jan 2014 83.85479 64.87053 102.83906 54.82087
Feb 2014 82.41238 63.00145 101.82331 52.72592
Type here to search
32°C Smoke
ENG
14:05
04-01-2022


RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
Project: (None)
Source
Console
Jobs
R 4.1.0 · ~/
May 2013 84.68296 69.53876 99.82717 61.52190
Jun 2013 99.13929 83.46355 114.81503 75.16532
Jul 2013 88.23952 72.04969 104.42936 63.47931
Aug 2013 73.49359 56.80549 90.18169 47.97135
Sep 2013 96.61949 79.44758 113.79140 70.35731
Oct 2013 92.61557 74.97310 110.25803 65.63375
Nov 2013 93.86149 75.76071 111.96228 66.17873
Dec 2013 101.01364 82.46585 119.56143 72.64725
Jan 2014 83.85479 64.87053 102.83906 54.82087
Feb 2014 82.41238 63.00145 101.82331 52.72592
Mar 2014 97.80000 77.97158 117.62842 67.47505
Hi 95
Apr 2012 90.41003
May 2012 93.43702
Jun 2012 109.86078
Jul 2012 100.61963
Aug 2012 87.33497
Sep 2012 111.78196
Oct 2012 108.99291
Nov 2012 111.36961
Dec 2012 119.58380
Jan 2013 103.42946
Feb 2013 102.94247
Mar 2013 119.24298
Apr 2013 106.53853
May 2013 107.84402
Jun 2013 123.11327
Jul 2013 112.99974
Type here to search
32°C Smoke
ENG
14:05
04-01-2022


RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
Project: (None)
Source
Console
Jobs
R 4.1.0 · ~/
Mar 2014 97.80000 77.97158 117.62842 67.47505
Hi 95
Apr 2012 90.41003
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Jul 2012 100.61963
Aug 2012 87.33497
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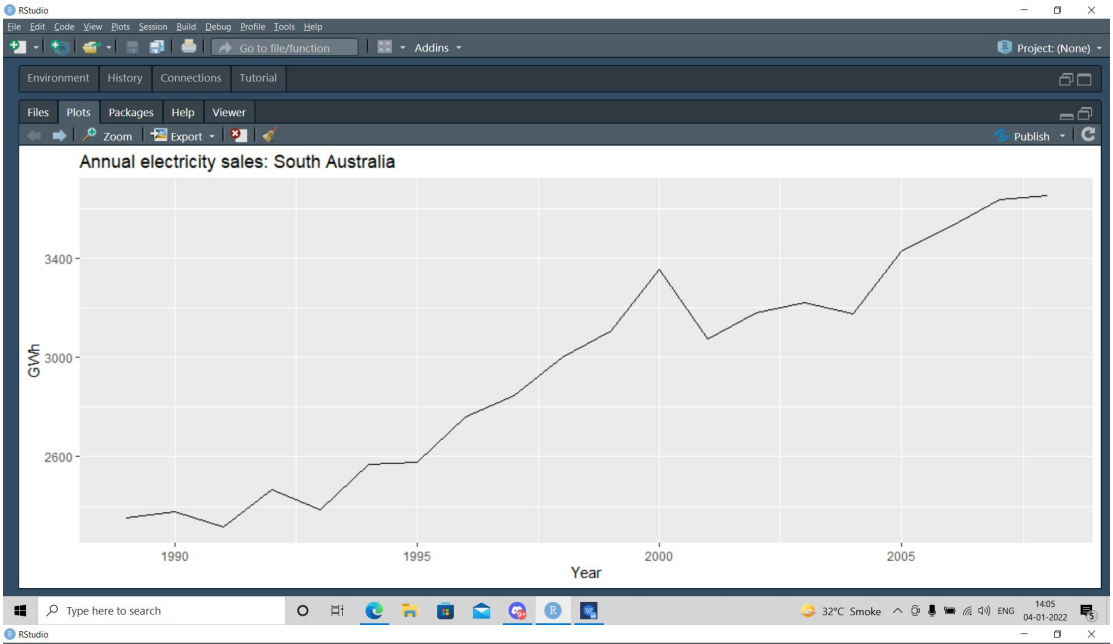
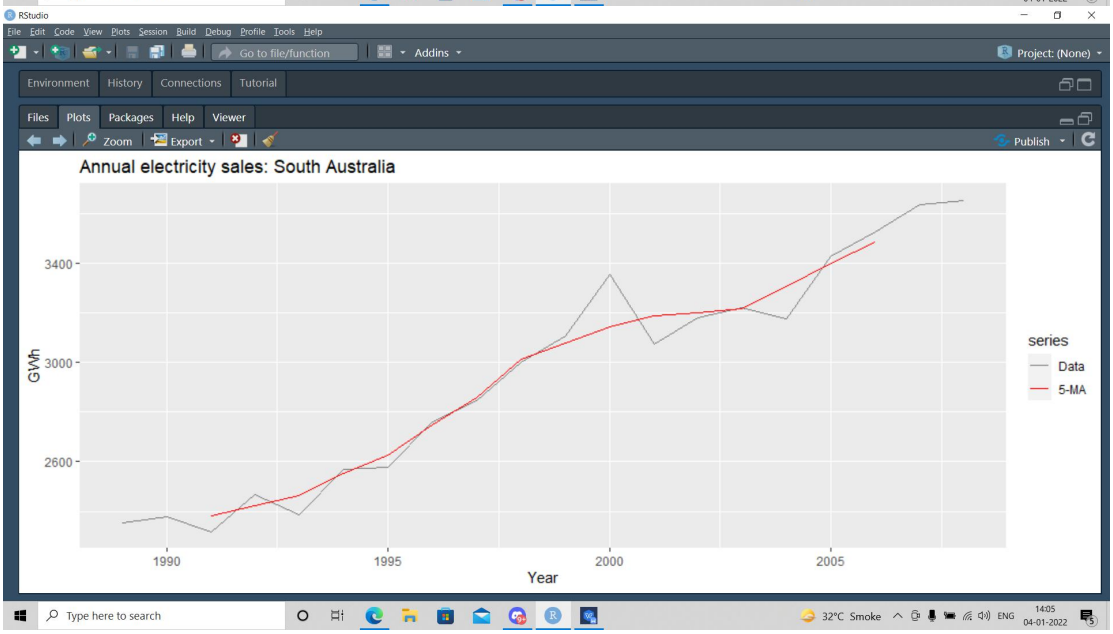
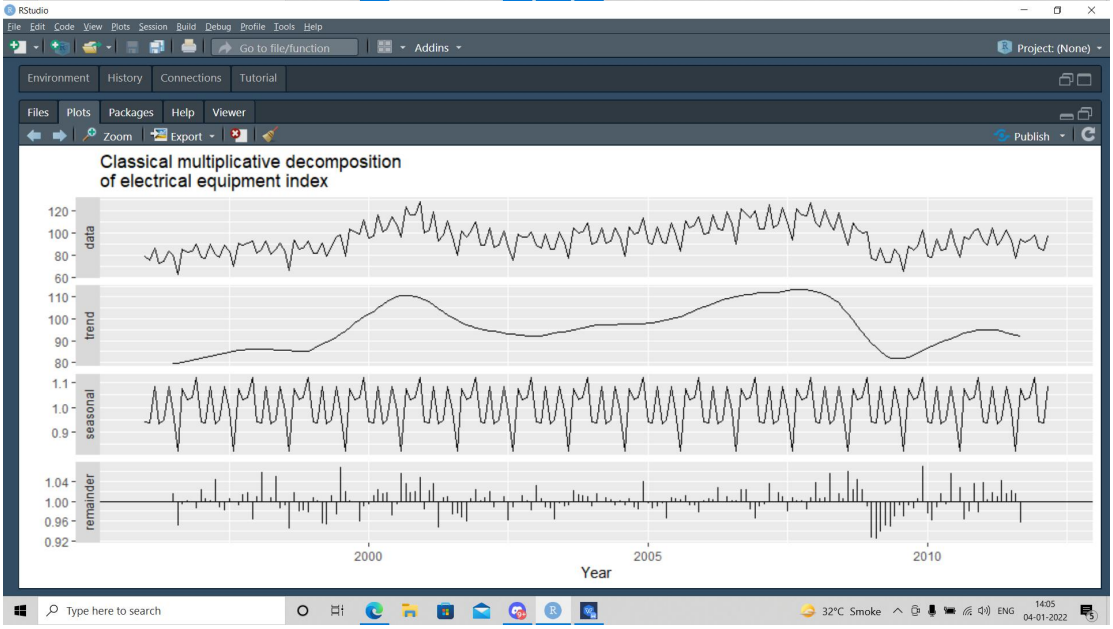
Oct 2012 108.99291
Nov 2012 111.36961
Dec 2012 119.58380
Jan 2013 103.42946
Feb 2013 102.94247
Mar 2013 119.24298
Apr 2013 106.53853
May 2013 107.84402
Jun 2013 123.11327
Jul 2013 112.99974
Aug 2013 99.01584
Sep 2013 122.88167
Oct 2013 119.59739
Nov 2013 121.54426
Dec 2013 129.38003
Jan 2014 112.88872
Feb 2014 112.09884
Mar 2014 128.12495
> autoplot(fcast)
Type here to search
32°C Smoke
ENG
14:05
04-01-2022

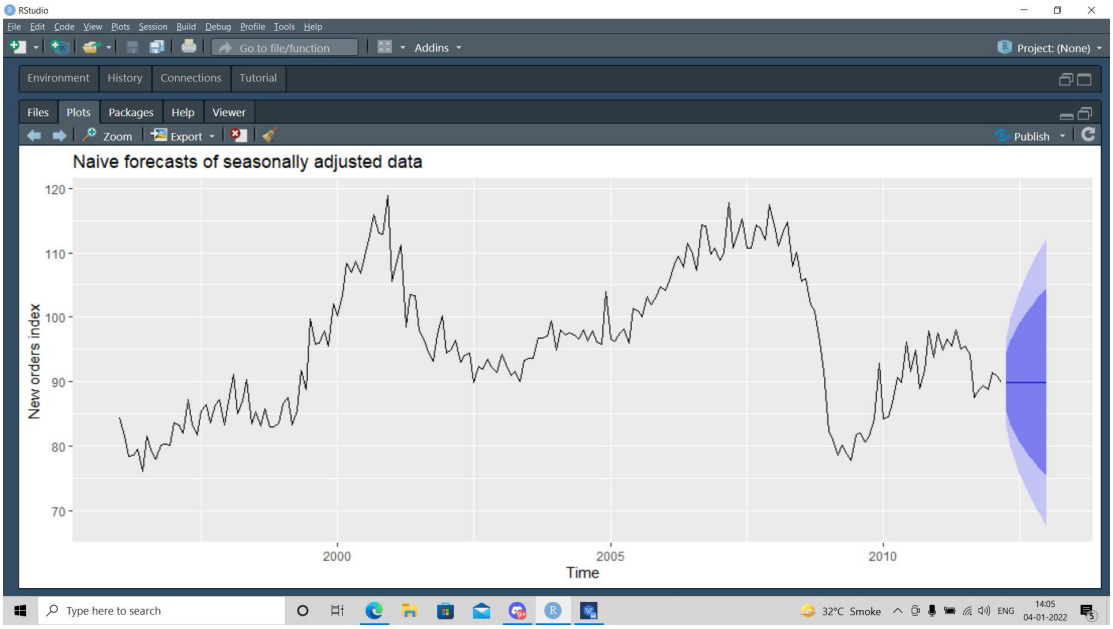
Graphs:

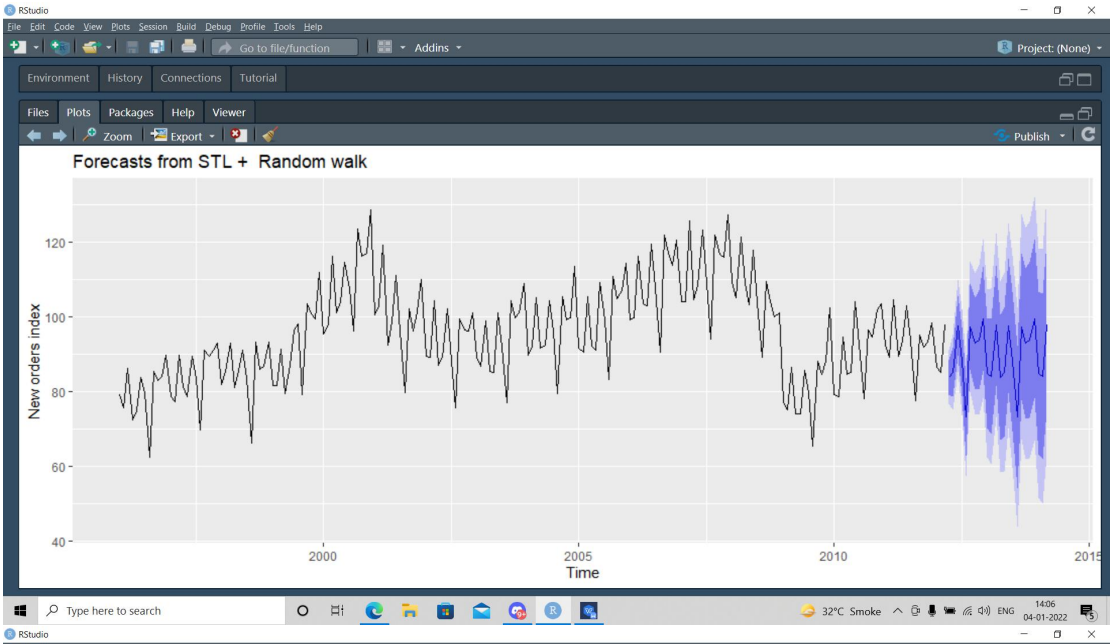

RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
Project: (None)
Environment History Connections Tutorial
Files Plots Packages Help Viewer
Zoom Export
Publish
Annual electricity sales: South Australia
GWh
3400
3000
2600
1990
1995
2000
2005
Year
Type here to search
32°C Smoke
ENG
14:05
04-01-2022

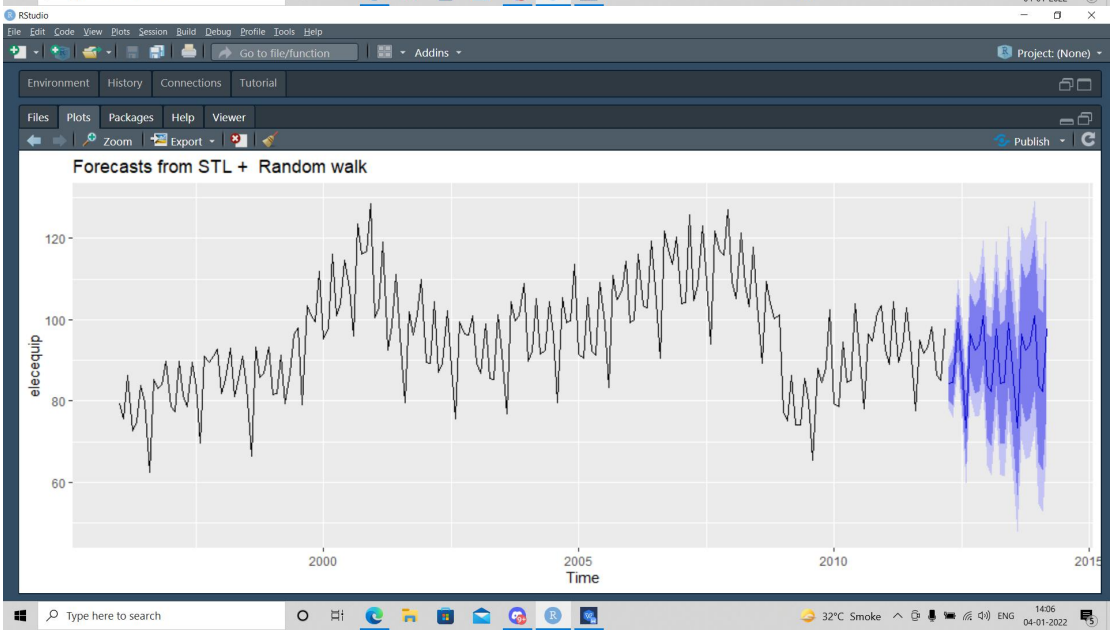

RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
Project: (None)
Environment History Connections Tutorial
Files Plots Packages Help Viewer
Zoom Export
Publish
Annual electricity sales: South Australia
GWh
3400
3000
2600
1990
1995
2000
2005
Year
series
Data
5-MA
Type here to search
32°C Smoke
ENG
14:05
04-01-2022


RStudio
Electrical equipment manufacturing (Euro area)
New orders index
120
100
80
60
2000
2005
2010
Year
series
Data
12-MA


RStudio
Classical multiplicative decomposition
of electrical equipment index
data
trend
seasonal
remainder
2000
2005
2010
Year


RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function
Addins
Project: (None)
Environment
History
Connections
Tutorial
Files
Plots
Packages
Help
Viewer
Zoom
Export
Publish
Naive forecasts of seasonally adjusted data
New orders index
120
110
100
90
80
70
2000
2005
2010
Time
Type here to search
32°C Smoke
ENG
14:05
04-01-2022


RStudio
Forecasts from STL + Random walk
New orders index
Time
120
100
80
60
40
2000
2005
2010
Environment
History
Connections
Tutorial
Files
Plots
Packages
Help
Viewer
Zoom
Export
Publish
Project: (None)
Addins
Go to file/function
Type here to search
32°C Smoke
ENG
14:06
04-01-2022


RStudio
Forecasts from STL + Random walk
elecequip
Time
120
100
80
60
2000
2005
2010
Environment
History
Connections
Tutorial
Files
Plots
Packages
Help
Viewer
Zoom
Export
Publish
Project: (None)
Addins
Go to file/function
Type here to search
32°C Smoke
ENG
14:06
04-01-2022