VERSION 17.2

Featuring a new interface to R.

What is R?

- **R** is a language and environment for statistical computing and graphics.
- It is widely used by statisticians to develop new statistical methods.
- There are hundreds of libraries available for R which perform many types of analyses.
- R is free.

Why Interface to R?

- Gives users access to new techniques not yet included in Statgraphics.

- Lets statisticians code their own routines and access them from Statgraphics.

- Provides an interactive environment similar to the “execute” window in Statgraphics for DOS.

Features of Statgraphics/R Interface

1. Exchange data easily between Statgraphics and the R console.

2. Run R commands on data stored in the Statgraphics Databook.

3. Retrieve output from R and save it in the StatLog.

4. Save R scripts in StatFolios for reuse.

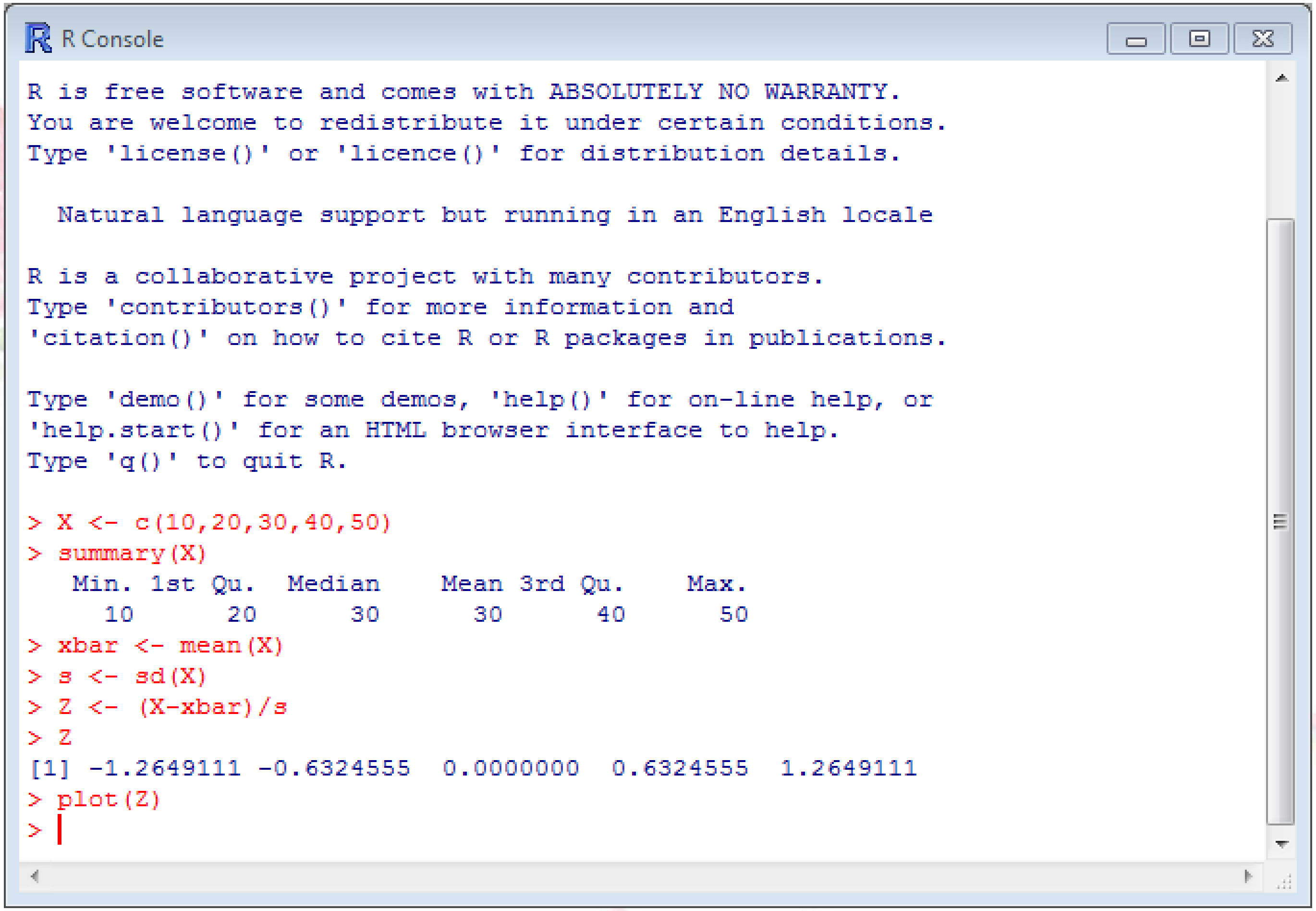
Installing R

- To install R, go to https://www.r-project.org and click on “Download R”.

- Follow the instructions, which places an icon similar to on your desktop.

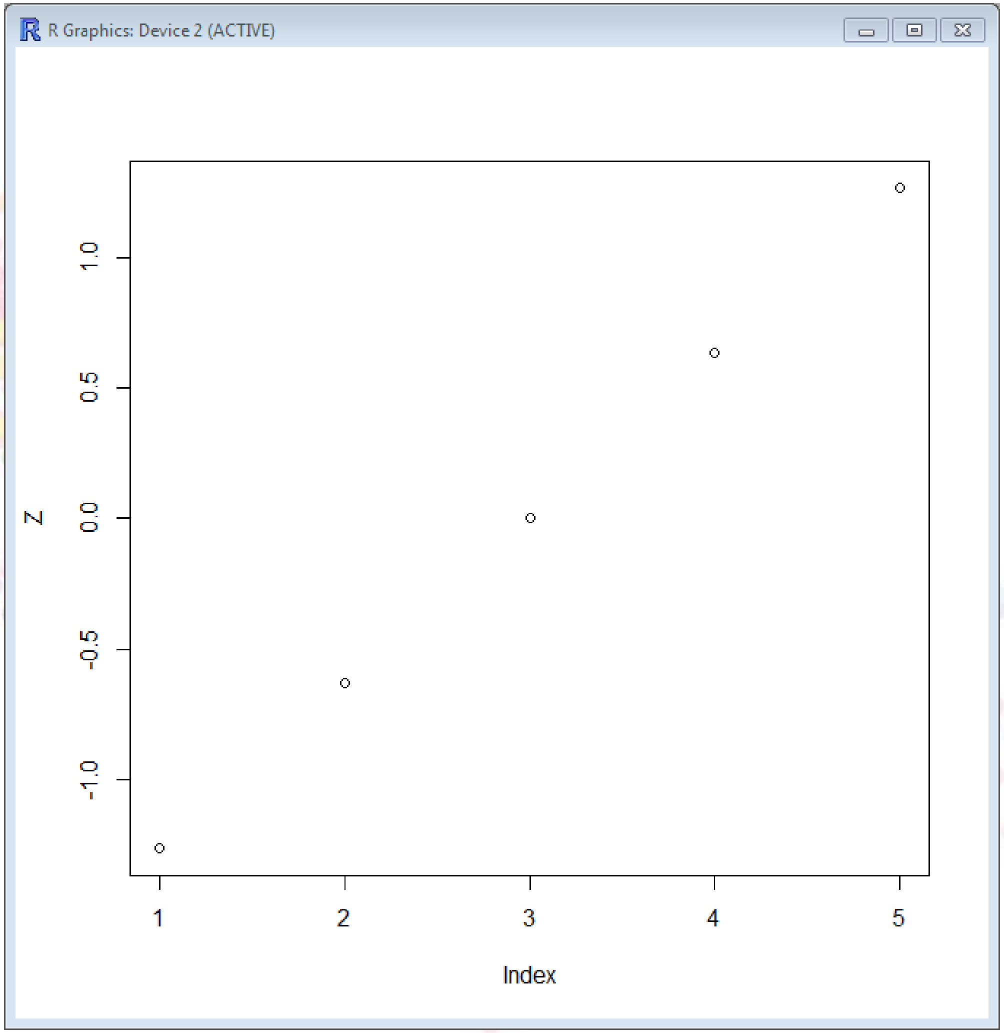
- Right-click on the icon and select “Run as administrator” to load the R console.

Some Simple R Commands



```
R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

  Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> X <- c(10,20,30,40,50)
> summary(X)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
     10      20      30      30      40      50 
> xbar <- mean(X)
> s <- sd(X)
> Z <- (X-xbar)/s
> Z
[1] -1.2649111 -0.6324555  0.0000000  0.6324555  1.2649111
> plot(Z)
> 
```

Sample Output



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Load Required Libraries

```
> install.packages(“installr”)
> require(installr)
> install.pandoc()
> install.packages(“seasonal”)
```

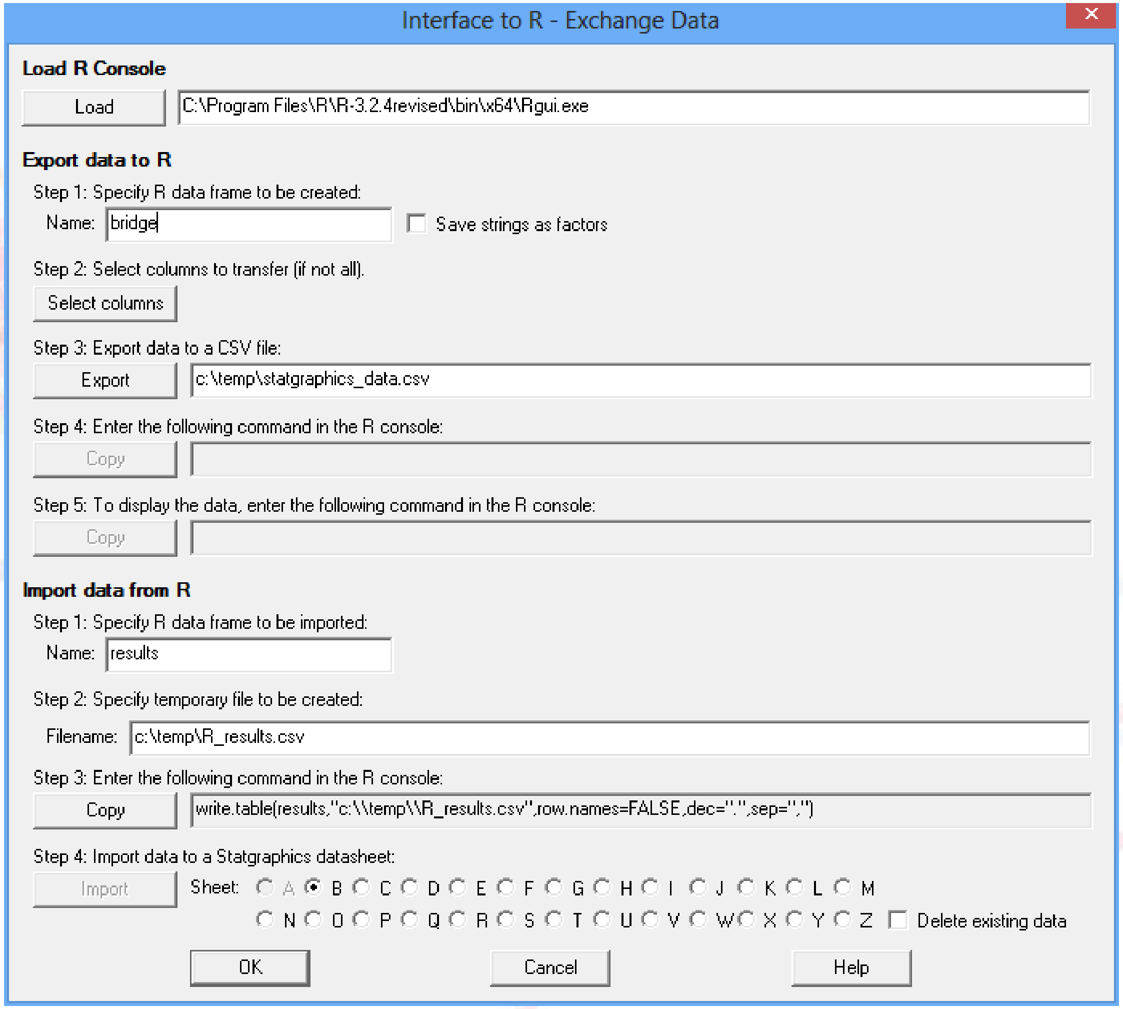
Example: Using X-13ARIMA-SEATS

- X-13ARIMA-SEATS is the current method for seasonally adjusting time series used by the U.S. Census Bureau.

- It has more options than the seasonal adjustment procedure currently in Statgraphics Centurion.

- We will use the R interface to load data into Statgraphics, pass it to R, seasonally adjust it, and retrieve the seasonally adjusted data.

Statgraphics: Exchange Data with R



Interface to R - Exchange Data

Load R Console

Load | C:\Program Files\R\R-3.2.4revised\bin\x64\Rgui.exe

Export data to R

Step 1: Specify R data frame to be created:

Name: bridge | □ Save strings as factors

Step 2: Select columns to transfer (if not all).

Select columns

Step 3: Export data to a CSV file:

Export | c:\temp\statgraphics_data.csv

Step 4: Enter the following command in the R console:

Copy

Step 5: To display the data, enter the following command in the R console:

Copy

Import data from R

Step 1: Specify R data frame to be imported:

Name: results

Step 2: Specify temporary file to be created:

Filename: c:\temp\R_results.csv

Step 3: Enter the following command in the R console:

Copy

```
write.table(results,"c:\\temp\\R_results.csv",row.names=FALSE,dec=".",sep=",")
```

Step 4: Import data to a Statgraphics datasheet:

Import | Sheet: ○ A ● B ○ C ○ D ○ E ○ F ○ G ○ H ○ I ○ J ○ K ○ L ○ M
○ N ○ O ○ P ○ Q ○ R ○ S ○ T ○ U ○ V ○ W ○ X ○ Y ○ Z □ Delete existing data

OK | Cancel | Help

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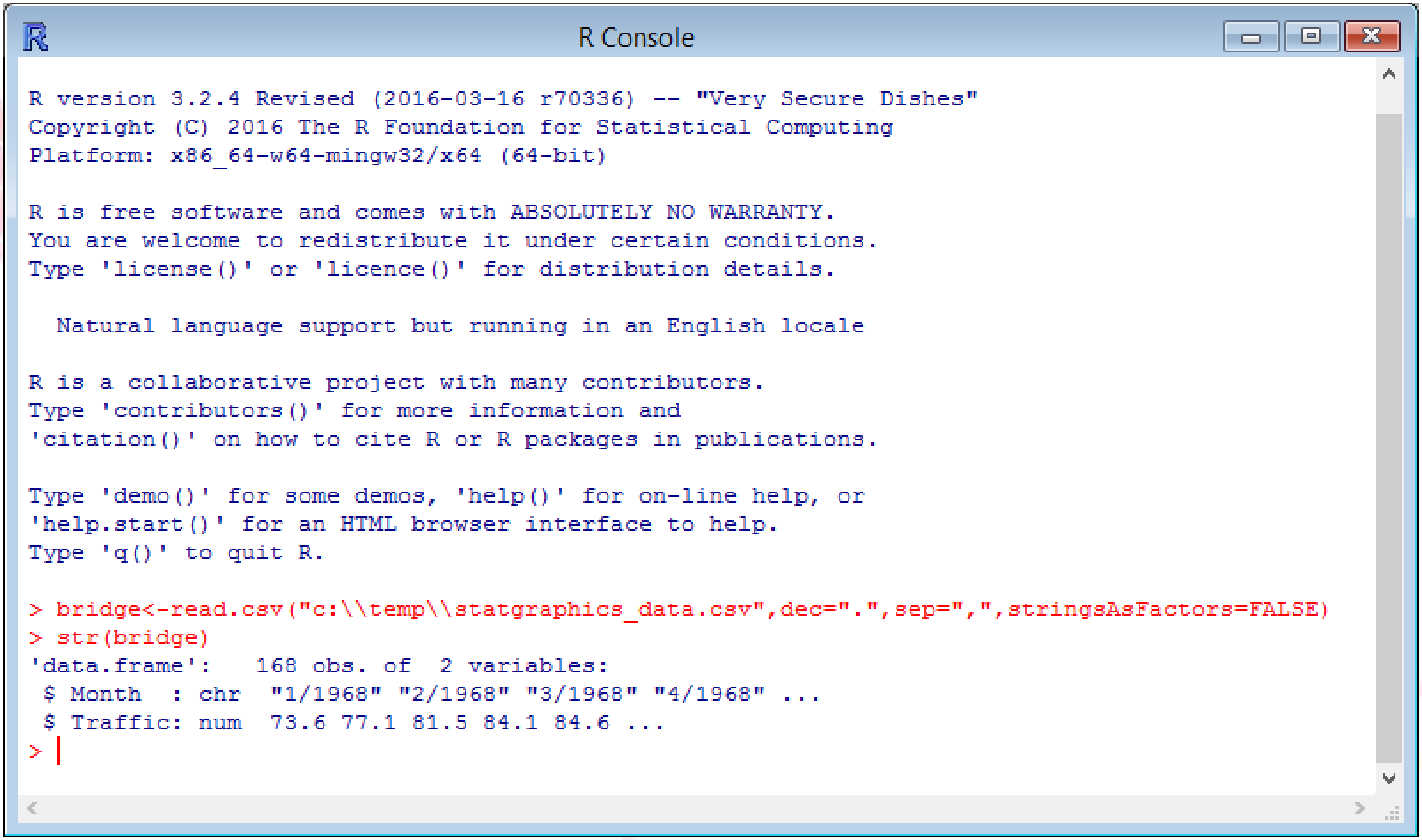
Exchange Data



```
R version 3.2.4 Revised (2016-03-16 r70336) -- "Very Secure Dishes"
Copyright (C) 2016 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)

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R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> bridge<-read.csv("c:\\temp\\statgraphics_data.csv",dec=".",sep=",",stringsAsFactors=FALSE)
> str(bridge)
'data.frame':   168 obs. of  2 variables:
 $ Month  : chr  "1/1968" "2/1968" "3/1968" "4/1968" ...
 $ Traffic: num  73.6 77.1 81.5 84.1 84.6 ...
> 
```
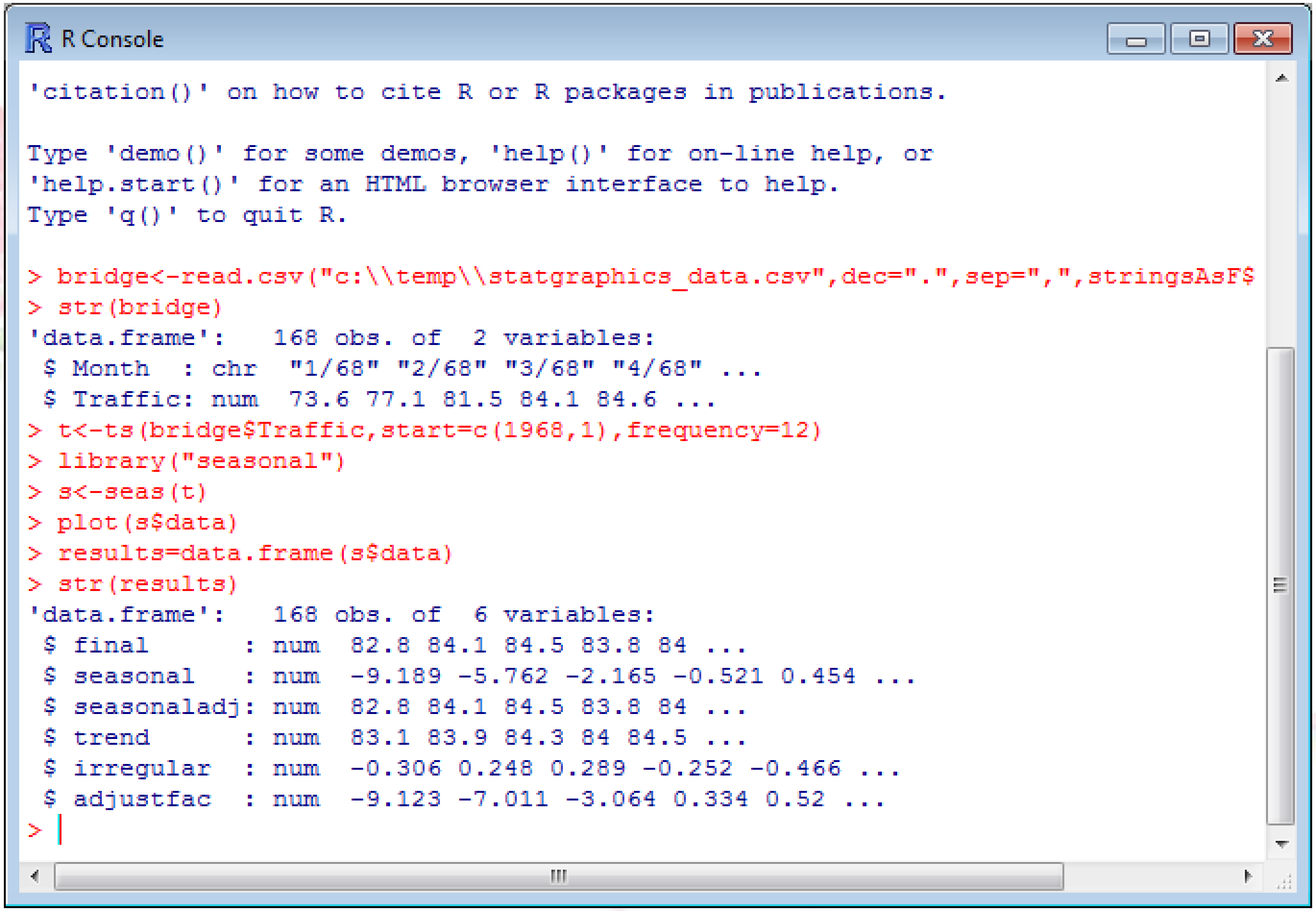
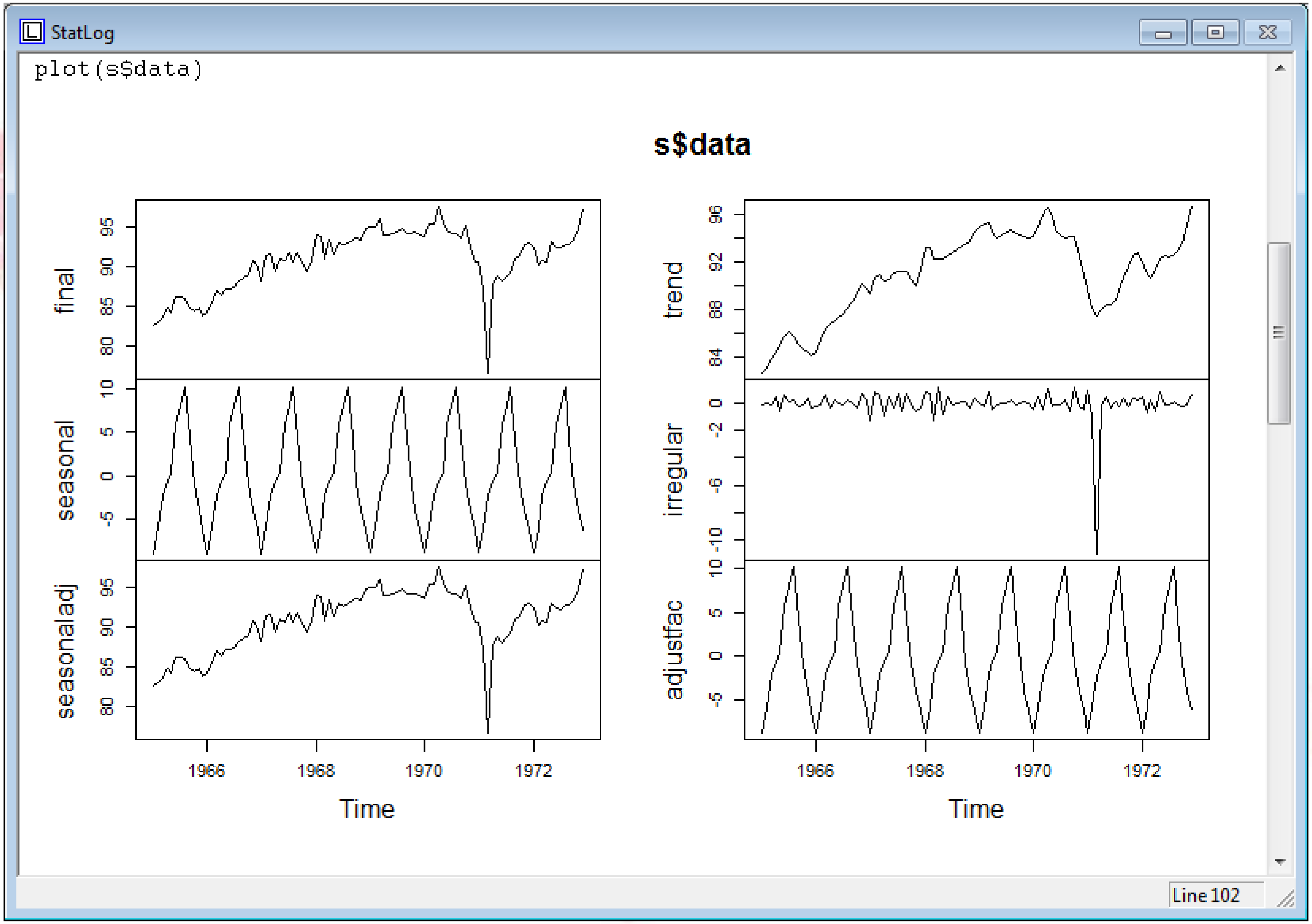

Run R Commands



```
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> bridge<-read.csv("c:\\temp\\statgraphics_data.csv",dec=".",sep=",",stringsAsF$
> str(bridge)
'data.frame':   168 obs. of  2 variables:
 $ Month  : chr  "1/68" "2/68" "3/68" "4/68" ...
 $ Traffic: num  73.6 77.1 81.5 84.1 84.6 ...
> t<-ts(bridge$Traffic,start=c(1968,1),frequency=12)
> library("seasonal")
> s<-seas(t)
> plot(s$data)
> results=data.frame(s$data)
> str(results)
'data.frame':   168 obs. of  6 variables:
 $ final      : num  82.8 84.1 84.5 83.8 84 ...
 $ seasonal   : num  -9.189 -5.762 -2.165 -0.521 0.454 ...
 $ seasonaladj: num  82.8 84.1 84.5 83.8 84 ...
 $ trend      : num  83.1 83.9 84.3 84 84.5 ...
 $ irregular  : num  -0.306 0.248 0.289 -0.252 -0.466 ...
 $ adjustfac  : num  -9.123 -7.011 -3.064 0.334 0.52 ...
> 
```

Graphics Output in R



```
plot(s$data)
```

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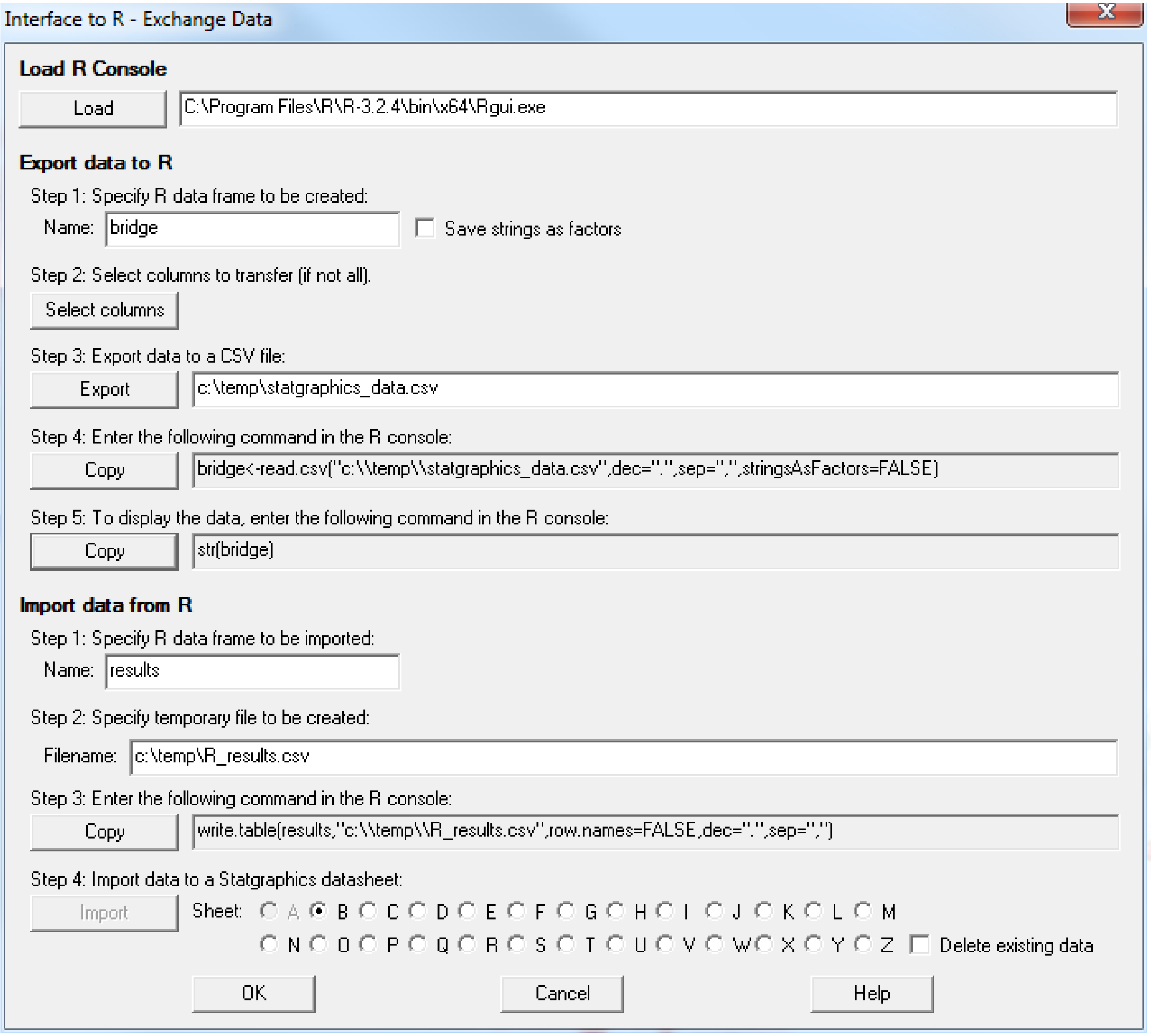
Retrieve Results



Interface to R - Exchange Data

Load R Console

C:\Program Files\R\R-3.2.4\bin\x64\Rgui.exe

Export data to R

Step 1: Specify R data frame to be created:

Name: bridge

□ Save strings as factors

Step 2: Select columns to transfer (if not all).

Step 3: Export data to a CSV file:

c:\temp\statgraphics_data.csv

Step 4: Enter the following command in the R console:

```
bridge<-read.csv("c:\\temp\\statgraphics_data.csv",dec=".",sep=",",stringsAsFactors=FALSE)
```

Step 5: To display the data, enter the following command in the R console:

```
str(bridge)
```

Import data from R

Step 1: Specify R data frame to be imported:

Name: results

Step 2: Specify temporary file to be created:

Filename: c:\temp\R_results.csv

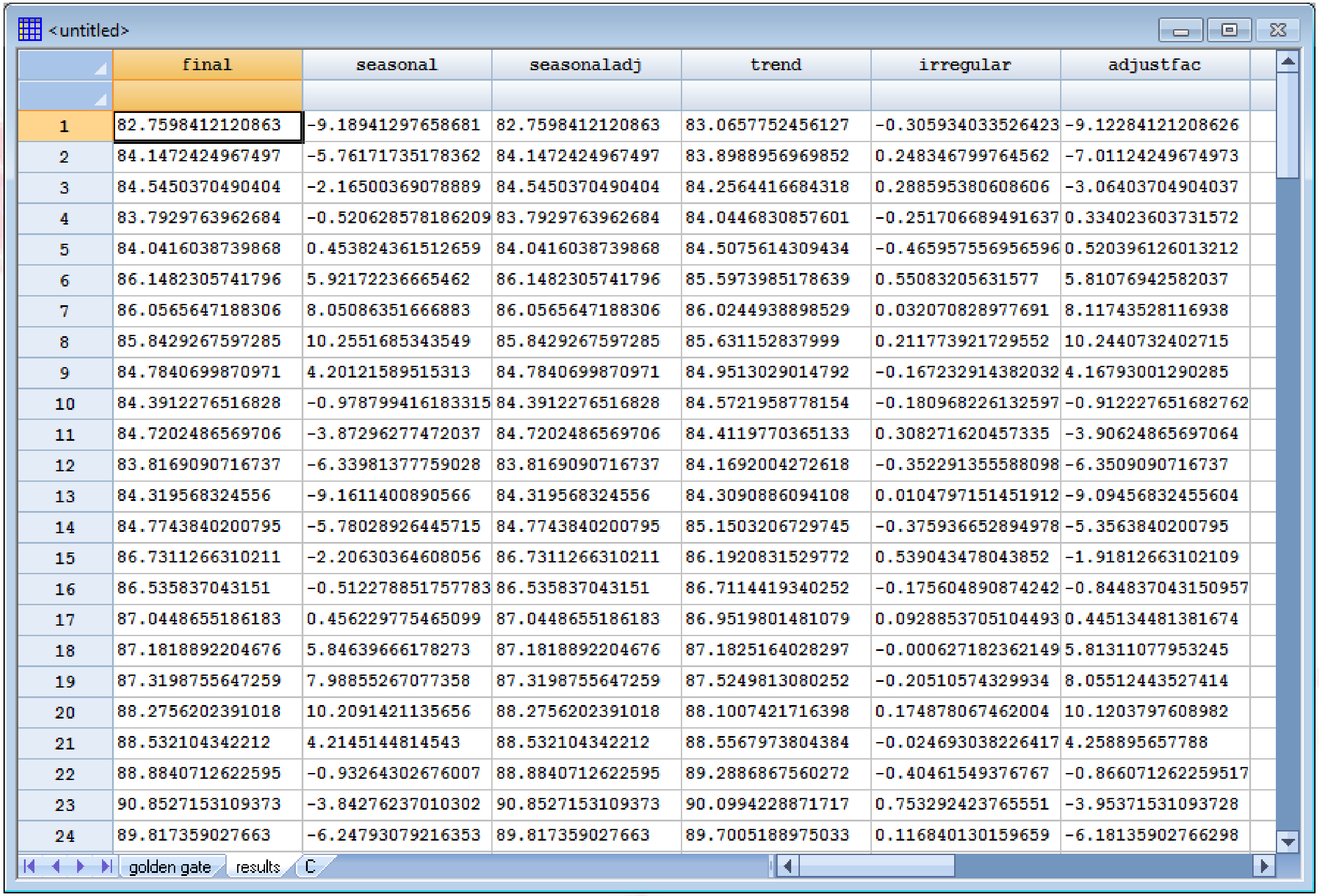
Step 3: Enter the following command in the R console:

```
write.table(results,"c:\\temp\\R_results.csv",row.names=FALSE,dec=".",sep=",")
```

Step 4: Import data to a Statgraphics datasheet:

Sheet: ○ A ● B ○ C ○ D ○ E ○ F ○ G ○ H ○ I ○ J ○ K ○ L ○ M
○ N ○ O ○ P ○ Q ○ R ○ S ○ T ○ U ○ V ○ W ○ X ○ Y ○ Z □ Delete existing data

Saved in Datasheet B



	final	seasonal	seasonaladj	trend	irregular	adjustfac
1	82.7598412120863	-9.18941297658681	82.7598412120863	83.0657752456127	-0.305934033526423	-9.12284121208626
2	84.1472424967497	-5.76171735178362	84.1472424967497	83.8988956969852	0.248346799764562	-7.01124249674973
3	84.5450370490404	-2.16500369078889	84.5450370490404	84.2564416684318	0.288595380608606	-3.06403704904037
4	83.7929763962684	-0.520628578186209	83.7929763962684	84.0446830857601	-0.251706689491637	0.334023603731572
5	84.0416038739868	0.453824361512659	84.0416038739868	84.5075614309434	-0.465957556956596	0.520396126013212
6	86.1482305741796	5.92172236665462	86.1482305741796	85.5973985178639	0.55083205631577	5.81076942582037
7	86.0565647188306	8.05086351666883	86.0565647188306	86.0244938898529	0.032070828977691	8.11743528116938
8	85.8429267597285	10.2551685343549	85.8429267597285	85.631152837999	0.211773921729552	10.2440732402715
9	84.7840699870971	4.20121589515313	84.7840699870971	84.9513029014792	-0.167232914382032	4.16793001290285
10	84.3912276516828	-0.978799416183315	84.3912276516828	84.5721958778154	-0.180968226132597	-0.912227651682762
11	84.7202486569706	-3.87296277472037	84.7202486569706	84.4119770365133	0.308271620457335	-3.90624865697064
12	83.8169090716737	-6.33981377759028	83.8169090716737	84.1692004272618	-0.352291355588098	-6.3509090716737
13	84.319568324556	-9.1611400890566	84.319568324556	84.3090886094108	0.0104797151451912	-9.09456832455604
14	84.7743840200795	-5.78028926445715	84.7743840200795	85.1503206729745	-0.375936652894978	-5.3563840200795
15	86.7311266310211	-2.20630364608056	86.7311266310211	86.1920831529772	0.539043478043852	-1.91812663102109
16	86.535837043151	-0.512278851757783	86.535837043151	86.7114419340252	-0.175604890874242	-0.844837043150957
17	87.0448655186183	0.456229775465099	87.0448655186183	86.9519801481079	0.0928853705104493	0.445134481381674
18	87.1818892204676	5.84639666178273	87.1818892204676	87.1825164028297	-0.000627182362149	5.81311077953245
19	87.3198755647259	7.98855267077358	87.3198755647259	87.5249813080252	-0.20510574329934	8.05512443527414
20	88.2756202391018	10.2091421135656	88.2756202391018	88.1007421716398	0.174878067462004	10.1203797608982
21	88.532104342212	4.2145144814543	88.532104342212	88.5567973804384	-0.024693038226417	4.258895657788
22	88.8840712622595	-0.93264302676007	88.8840712622595	89.2886867560272	-0.40461549376767	-0.866071262259517
23	90.8527153109373	-3.84276237010302	90.8527153109373	90.0994228871717	0.753292423765551	-3.95371531093728
24	89.817359027663	-6.24793079216353	89.817359027663	89.7005188975033	0.116840130159659	-6.18135902766298

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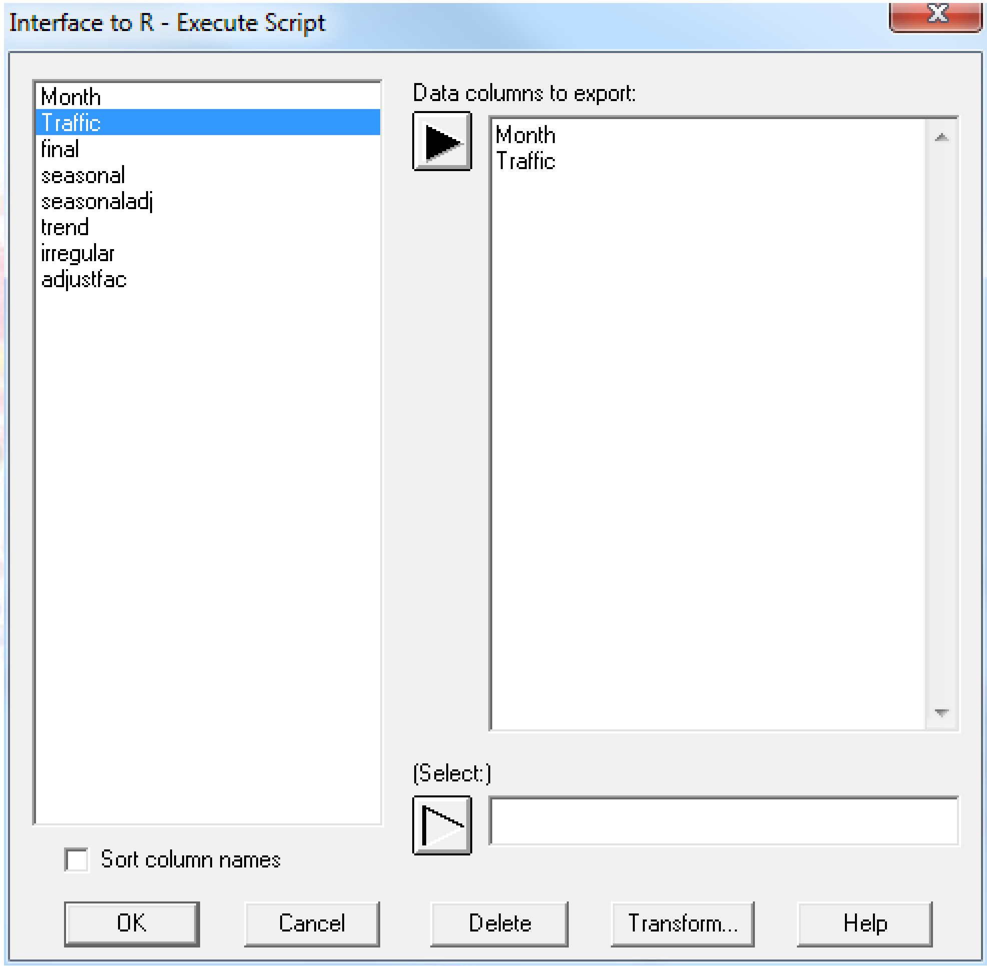
Automating the Analysis

- “Exchange Data” makes it easy to pass data back and forth between Statgraphics and R.
- Useful for applying R in an interactive manner.
- But what if you wish to save a set of R commands for later use?
- “Execute Script” lets you store R commands in a StatFolio so that you can rerun them.

Saving the Analysis into the StatFolio



Interface to R - Execute Script

Month
Traffic
final
seasonal
seasonaladj
trend
irregular
adjustfac

Data columns to export:

Month
Traffic

(Select:)

☐ Sort column names

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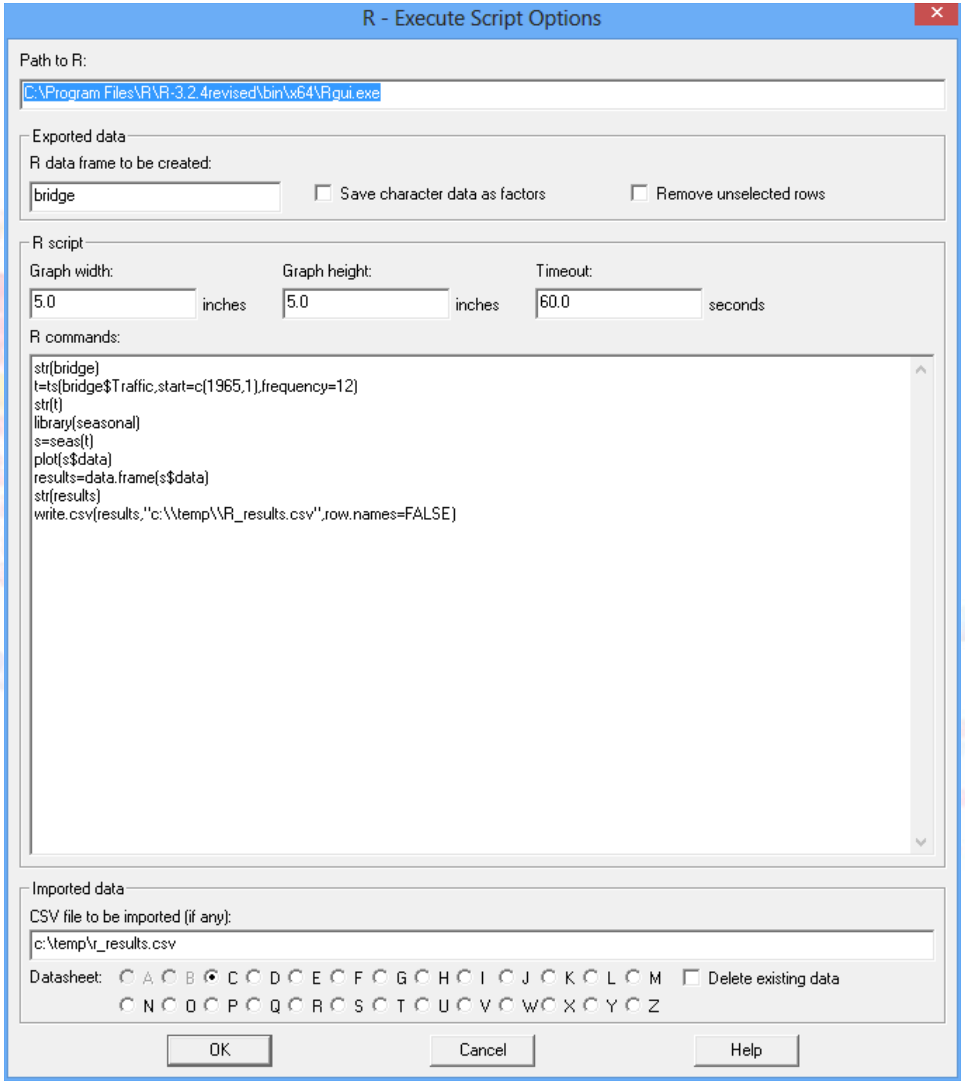
Creating the R Script



Path to R: C:\Program Files\R\R-3.2.4revised\bin\x64\Rgui.exe

Exported data

R data frame to be created: bridge

□ Save character data as factors

□ Remove unselected rows

R script

Graph width: 5.0 inches

Graph height: 5.0 inches

Timeout: 60.0 seconds

R commands:

```
str(bridge)
t=ts(bridge$Traffic,start=c(1965,1),frequency=12)
str(t)
library(seasonal)
s=seas(t)
plot(s$data)
results=data.frame(s$data)
str(results)
write.csv(results,"c:\\temp\\R_results.csv",row.names=FALSE)
```

Imported data

CSV file to be imported (if any): c:\temp\r_results.csv

Datasheet: ○ A ○ B ● C ○ D ○ E ○ F ○ G ○ H ○ I ○ J ○ K ○ L ○ M □ Delete existing data
○ N ○ O ○ P ○ Q ○ R ○ S ○ T ○ U ○ V ○ W ○ X ○ Y ○ Z

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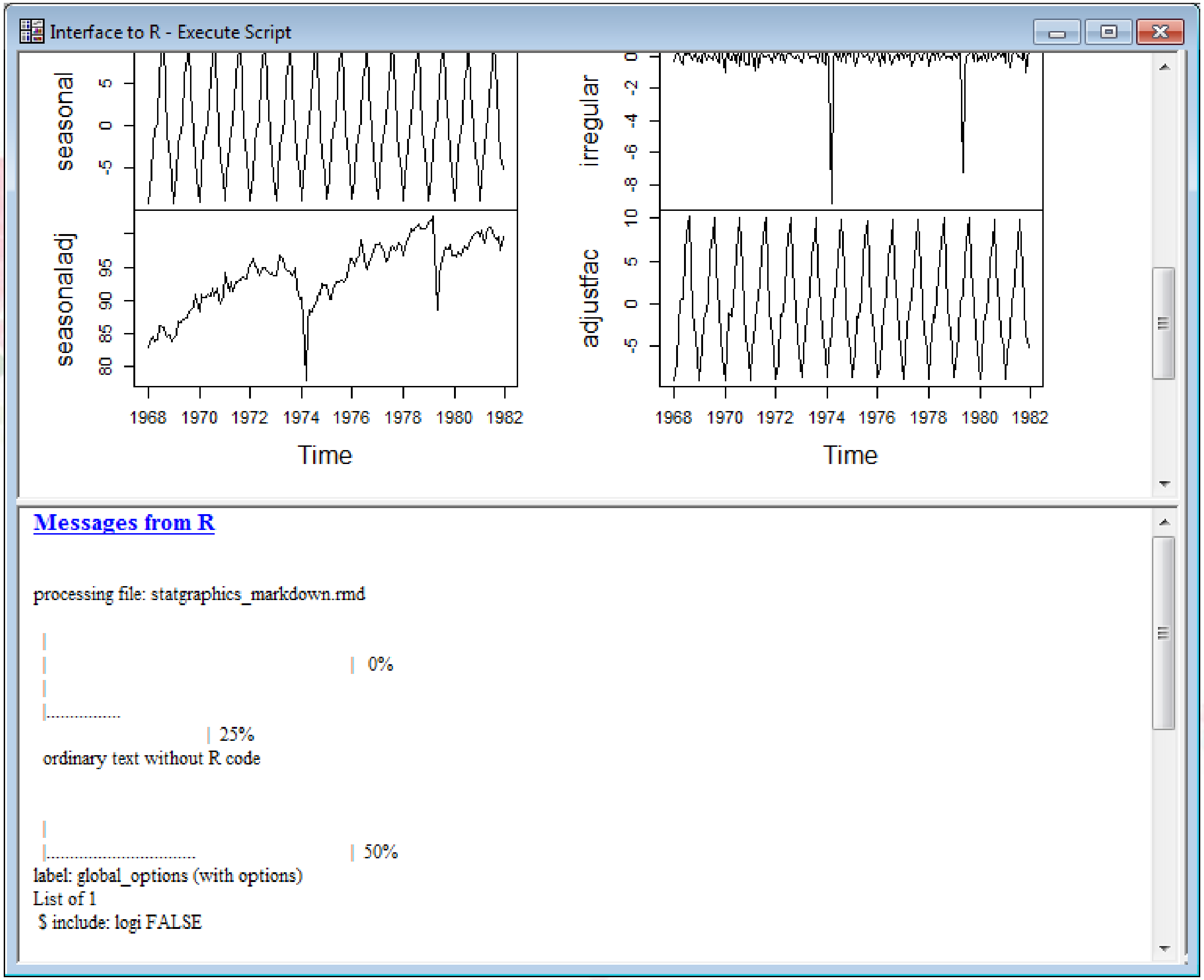
Procedure Output



Messages from R

```
processing file: statgraphics_markdown.rmd

  |
  |                                                                 |   0%
  |
  |................
                                    |  25%
  ordinary text without R code


  |
  |................................                                 |  50%
label: global_options (with options)
List of 1
 $ include: logi FALSE
```

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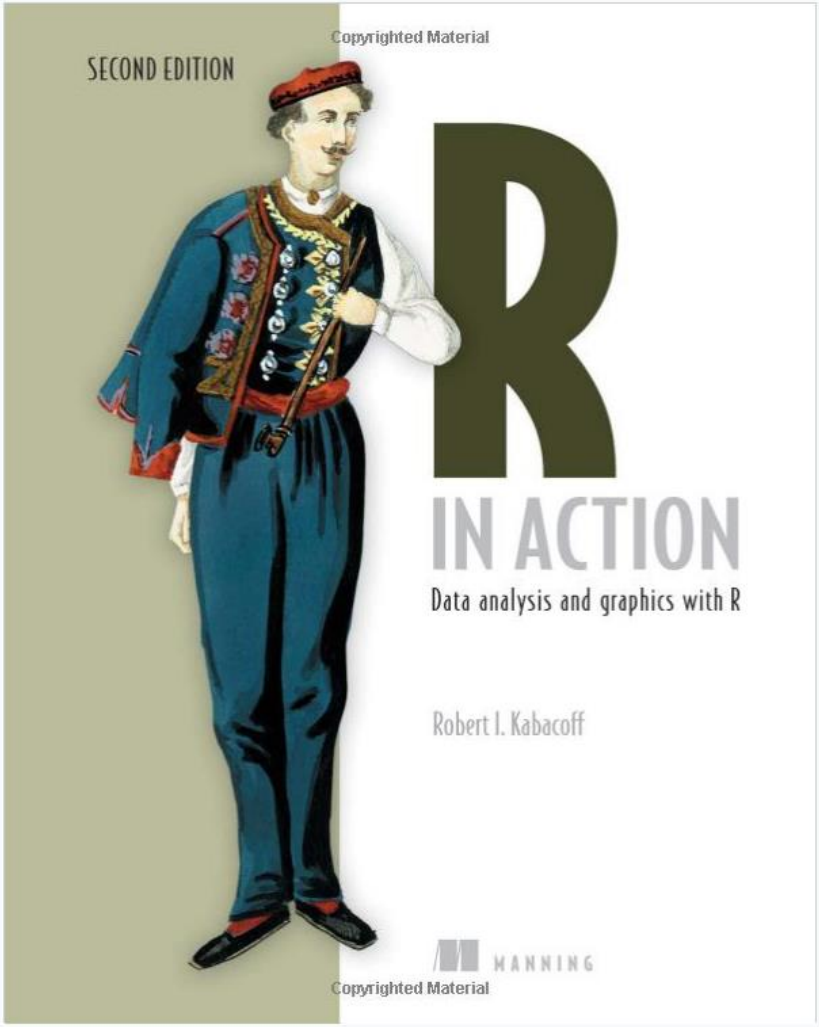
Good Reference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