# r2excel: Read, write and format easily Excel files using R software

## Many solutions to read and write Excel files using R software

**Excel files** are used by many people to save and analyze their data. There are many **R packages** and solutions to **import data** from **Excel** to **R** and to **export data** from R to Excel:

- **ODBC connection**: For Windows only and it requires the Excel ODBC driver
- **gdata package**: it is available for Windows, Mac and Linux but it requires the installation of additional perl libraries.
- **xlsReadWrite package** : For Windows only and there is no longer an updated version of xlsReadWrite package.
- **RExcel software** : This is a powerful tool that can be used to **execute directly R code from an Excel** spreadsheet but it is available for windows only.
- **XLConnect package** : **XLConnect** is a java-based solution, so it is available for Windows, Mac and Linux. It may be slow for large data sets
- **xlsx package**: This is my favorite package to **read**, **write** and **format Excel files** in **R**. It is a java-based solution and can be used to read and write both **xls** and **xlsx** file formats.

As listed above, there are many ways to **connect R and Excel**, but many of these packages are :

- hard to work with
- or only work in Windows
- or require additional drivers
- or only work with old versions of Excel ( *.xls* but not *.xlsx*)

## The 3 R packages you should know to save your time

The three R packages you should know for importing and exporting data from/to Excel are **xlsx**, **XLConnect** and **r2excel** packages.

Reading and writing Excel files are know an easy task using **xlsx** and **XLConnect** packages. **Formatting Excel files** using **xlsx** package is also possible. However, it requires a hard coding in R. This is why, I implemented **r2excel** package which depends on **xlsx** package and it provides an easy to use functions to quickly import data from excel and to create a nice Excel report.

The aim of this article is to show you how to use **r2excel** package to easily read, write and format Excel files.

## r2excel package

### Install and load r2excel package

To install the package, use the following R code :

```
install.packages("devtools")
devtools::install_github("kassambara/r2excel")
```

Load the package using the following R code:

```
library(r2excel)
```

## Available R functions

The list of functions available in **r2excel** package are :

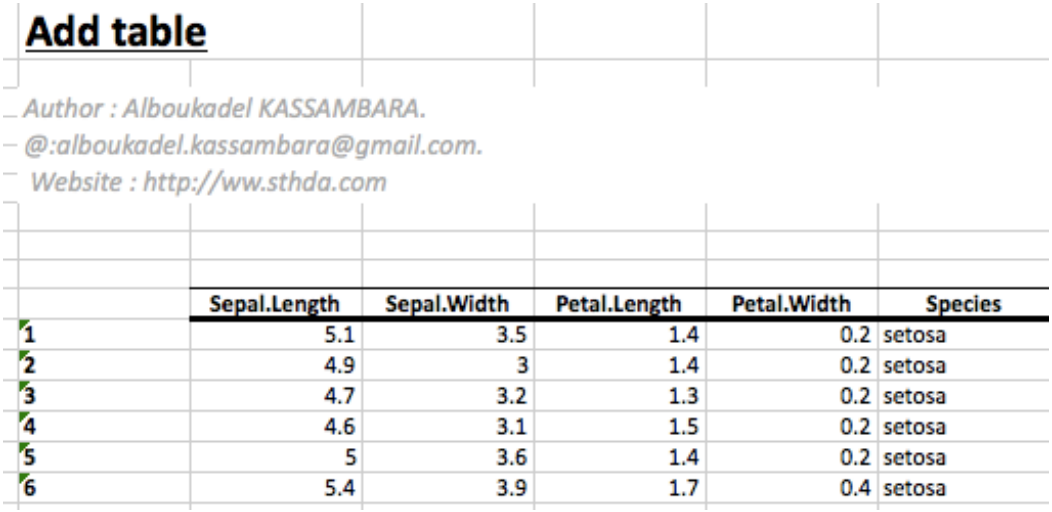
- **xlsx.addHeader** for adding headers.
- **xlsx.addPlot** for adding plots.
- **xlsx.addParagraph** for adding a paragraph of text.
- **xlsx.addTable** for adding a data frame.
- **xlsx.addLineBreak** for adding a line break. This is useful to skip lines between two data frames.
- **xlsx.addHyperlink** for adding a hyperlink.
- **xlsx.readFile** for reading an Excel file.
- **xlsx.writeFile** for writing a data to an Excel file.
- **xlsx.writeMultipleData** for exporting quickly multiple data to the same Excel workbook
- **xlsx.openFile** for opening an Excel file.

These functions are described in the next sections

## Create your first Excel file

```
library("r2excel")


filename <- "r2excel-example1.xlsx"
wb <- createWorkbook(type="xlsx")

sheet <- createSheet(wb, sheetName = "example1")


xlsx.addHeader(wb, sheet, value="Add table",level=1,
               color="black", underline=1)
xlsx.addLineBreak(sheet, 1)


author=paste("Author : Alboukadel KASSAMBARA. \n",
             "@:alboukadel.kassambara@gmail.com.",
             "\n Website : http://ww.sthda.com", sep="")
xlsx.addParagraph(wb, sheet,value=author, isItalic=TRUE, colSpan=5,
                  rowSpan=4, fontColor="darkgray", fontSize=14)
xlsx.addLineBreak(sheet, 3)


xlsx.addTable(wb, sheet, head(iris), startCol=2)
xlsx.addLineBreak(sheet, 2)


saveWorkbook(wb, filename)
xlsx.openFile(filename)
```

The image of the excel file created by the above code is :



**Add table**

*Author : Alboukadel KASSAMBARA.*
*@:alboukadel.kassambara@gmail.com.*
*Website : http://ww.sthda.com*

| | Sepal.Length | Sepal.Width | Petal.Length | Petal.Width | Species |
|---|---|---|---|---|---|
| 1 | 5.1 | 3.5 | 1.4 | 0.2 | setosa |
| 2 | 4.9 | 3 | 1.4 | 0.2 | setosa |
| 3 | 4.7 | 3.2 | 1.3 | 0.2 | setosa |
| 4 | 4.6 | 3.1 | 1.5 | 0.2 | setosa |
| 5 | 5 | 3.6 | 1.4 | 0.2 | setosa |
| 6 | 5.4 | 3.9 | 1.7 | 0.4 | setosa |

## Add headers

To add a header to a worksheet the **xlsx.addHeader()** function can be used. A simplified format is :

```
xlsx.addHeader(wb, sheet, value="Header", level=1,
               color="#FFFFFF",
underline=c(0,1,2))
```

- wb : workbook object

- sheet : sheet object
- value : the text to write as a header
- level : header level; possible values are form 1 to 6
- color : the color to use for the header
- underline : a numeric value specifying whether the header should be underlined or not. Possible values are 0 (default value, no underline), 1 (underline with one line), 2 (underline with two lines)

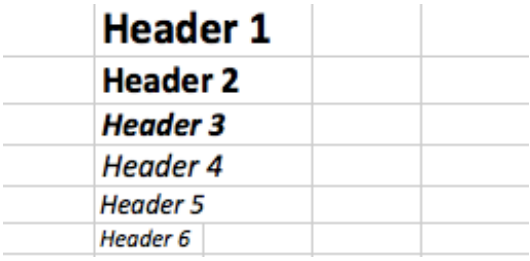
Examples :

```
wb <- createWorkbook(type="xlsx")
sheet <- xlsx::createSheet(wb, sheetName = "example1")


xlsx.addHeader(wb, sheet, value="Header 1",level=1,
color="black")

xlsx.addHeader(wb, sheet, value="Header 2",level=2,
color="black")

xlsx.addHeader(wb, sheet, value="Header 3",level=3,
color="black")

xlsx.addHeader(wb, sheet, value="Header 4",level=4,
color="black")

xlsx.addHeader(wb, sheet, value="Header 5",level=5,
color="black")

xlsx.addHeader(wb, sheet, value="Header 6",level=6,
color="black")


saveWorkbook(wb, "examples_add_header.xlsx")
xlsx.openFile("examples_add_header.xlsx")
```

The image of the excel file created by the above code is :

## Add a paragraph of texts

The function **xlsx.addParagraph()** can be used. A simplified format is :



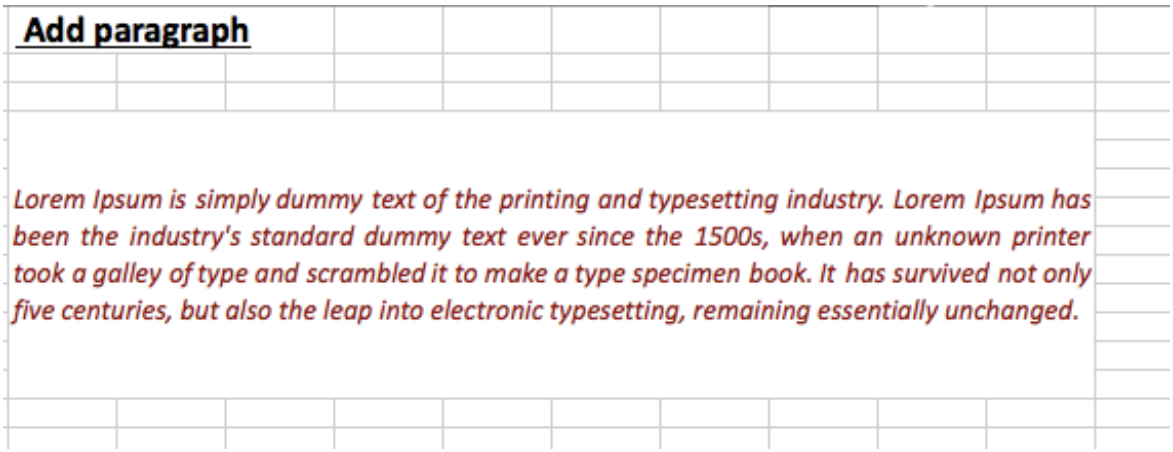

```
xlsx.addParagraph(wb, sheet, value, fontColor="#FFFFFF",
    fontSize=12, isBold=FALSE, isItalic=FALSE,
    colSpan=10, rowSpan=5)
```

- wb : workbook object

- sheet : sheet object
- value : the text to write
- fontColor : color of the text
- fontSize : size of the text
- isBold : if TRUE, the text is written in bold format
- isItalic : if TRUE, the text is written in italic format
- colSpan : number of columns to be merged (paragraph : width)
- rowSpan : number of rows to be merged (paragraph height)

Examples :

```
wb <- createWorkbook(type="xlsx")
sheet <- createSheet(wb, sheetName = "example1")


xlsx.addHeader(wb, sheet, " Add paragraph", level=2, underline=1)
xlsx.addLineBreak(sheet, 2)
paragraph="Lorem Ipsum is simply dummy text of the printing and typesetting
industry. Lorem Ipsum has been the industry's standard dummy text ever since the
1500s, when an unknown printer took a galley of type and scrambled it to make a
type specimen book. It has survived not only five centuries, but also the leap
into electronic typesetting, remaining essentially unchanged."
xlsx.addParagraph(wb, sheet, paragraph, fontSize=14, isItalic=TRUE,
                  fontColor="darkred", colSpan=10, rowSpan=10)

saveWorkbook(wb, "examples_add_paragraph.xlsx")
xlsx.openFile("examples_add_paragraph.xlsx")
```




## Add a hyperlink

The function **xlsx.addHyperlink()** can be used. A simplified format is:

```
xlsx.addHyperlink(wb,sheet, address, friendlyName)
```

- wb : workbook object

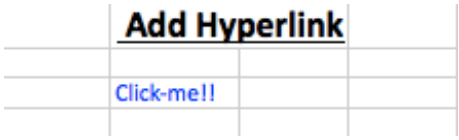
- sheet : sheet object
- address : text indicating the url
- friendlyName : text specifying the name of the link

Examples :

```
wb <- createWorkbook(type="xlsx")
sheet <- createSheet(wb, sheetName = "example1")
```

```
xlsx.addHeader(wb, sheet, " Add Hyperlink", level=2, underline=1)
xlsx.addLineBreak(sheet, 1)
xlsx.addHyperlink(wb, sheet, "http://www.sthda.com", "Click-me!",
fontSize=12)
xlsx.addLineBreak(sheet, 2)

saveWorkbook(wb, "examples_add_hyperlink.xlsx")
xlsx.openFile("examples_add_hyperlink.xlsx")
```

## Add a data frame

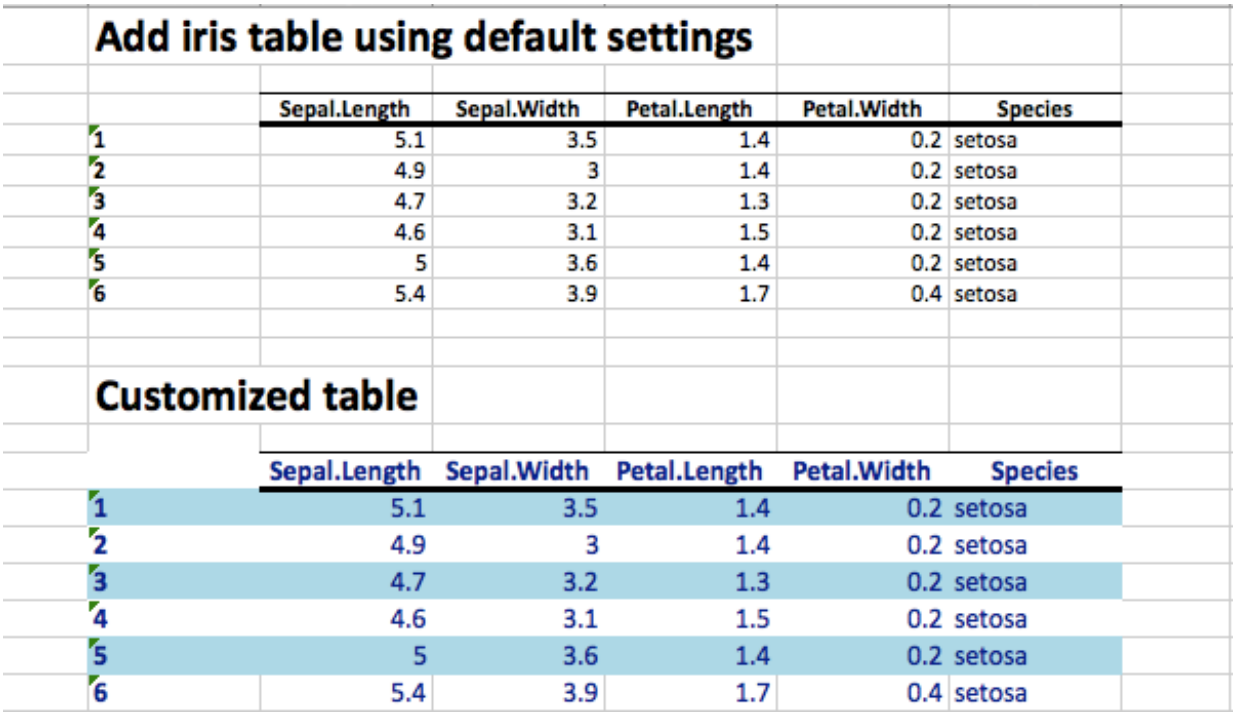



The function **xlsx.addTable** can be used. A simplified format is :

```
xlsx.addTable(wb, sheet, data, col.names=TRUE, row.names=TRUE,
     fontColor="#FFFFFF", fontSize=12, rowFill=c("white",
"white"))
```

- wb : workbook object
- sheet : sheet object
- data : a data frame
- col.names, row.names : a logical value indicating whether the column names / row names of the data are to be written to the file. Default is TRUE
- font.color : the color of the text
- font.size : the size of text
- rowFill : a vector of two colors for filling odd and even rows. Default is c(“white”, “white”)

```
wb <- createWorkbook(type="xlsx")
sheet <- createSheet(wb, sheetName = "example1")

data(iris)
xlsx.addHeader(wb, sheet,
     value="Add iris table using default
settings")
xlsx.addLineBreak(sheet, 1)
xlsx.addTable(wb, sheet, head(iris))
xlsx.addLineBreak(sheet, 2)


xlsx.addHeader(wb, sheet, value="Customized
table")
xlsx.addLineBreak(sheet, 1)
xlsx.addTable(wb, sheet, data= head(iris),
              fontColor="darkblue", fontSize=14,
              rowFill=c("white", "lightblue")
)
xlsx.addLineBreak(sheet, 2)

saveWorkbook(wb, "examples_add_table.xlsx")
xlsx.openFile("examples_add_table.xlsx")
```



**Add iris table using default settings**

| | Sepal.Length | Sepal.Width | Petal.Length | Petal.Width | Species |
|---|---|---|---|---|---|
| 1 | 5.1 | 3.5 | 1.4 | 0.2 | setosa |
| 2 | 4.9 | 3 | 1.4 | 0.2 | setosa |
| 3 | 4.7 | 3.2 | 1.3 | 0.2 | setosa |
| 4 | 4.6 | 3.1 | 1.5 | 0.2 | setosa |
| 5 | 5 | 3.6 | 1.4 | 0.2 | setosa |
| 6 | 5.4 | 3.9 | 1.7 | 0.4 | setosa |

**Customized table**

| | Sepal.Length | Sepal.Width | Petal.Length | Petal.Width | Species |
|---|---|---|---|---|---|
| 1 | 5.1 | 3.5 | 1.4 | 0.2 | setosa |
| 2 | 4.9 | 3 | 1.4 | 0.2 | setosa |
| 3 | 4.7 | 3.2 | 1.3 | 0.2 | setosa |
| 4 | 4.6 | 3.1 | 1.5 | 0.2 | setosa |
| 5 | 5 | 3.6 | 1.4 | 0.2 | setosa |
| 6 | 5.4 | 3.9 | 1.7 | 0.4 | setosa |

## Add a plot

The function **xlsx.addPlot()** can be used. A simplified format is :

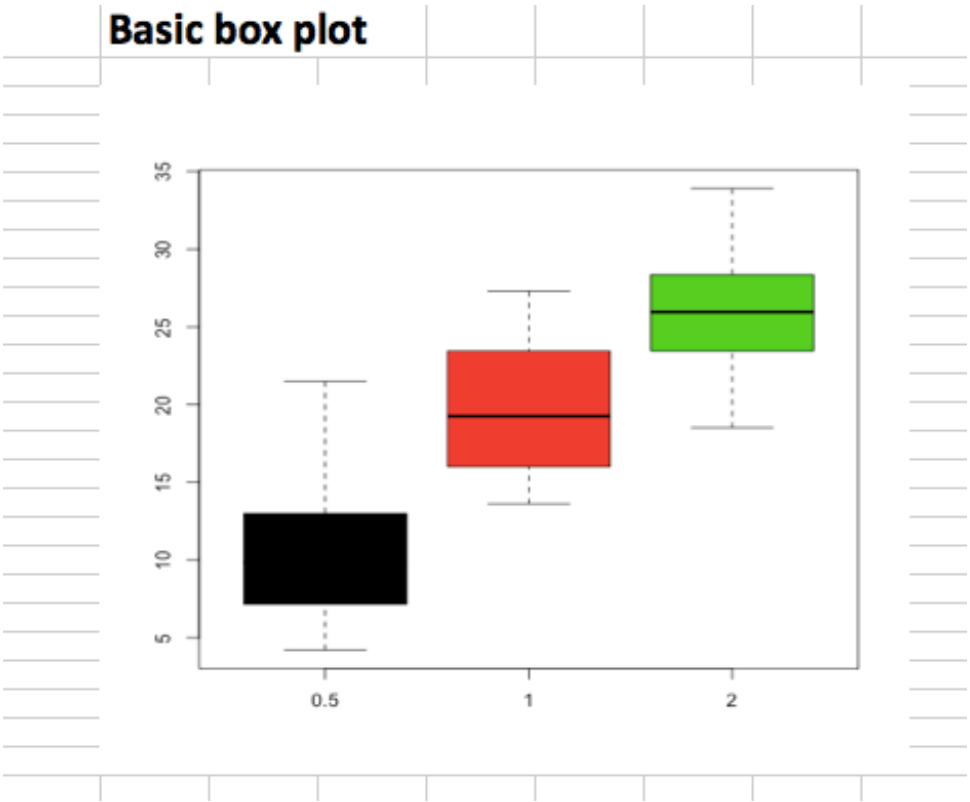
```
xlsx.addPlot(wb, sheet, plotFunction,
             width = 480, height = 480,
...)
```

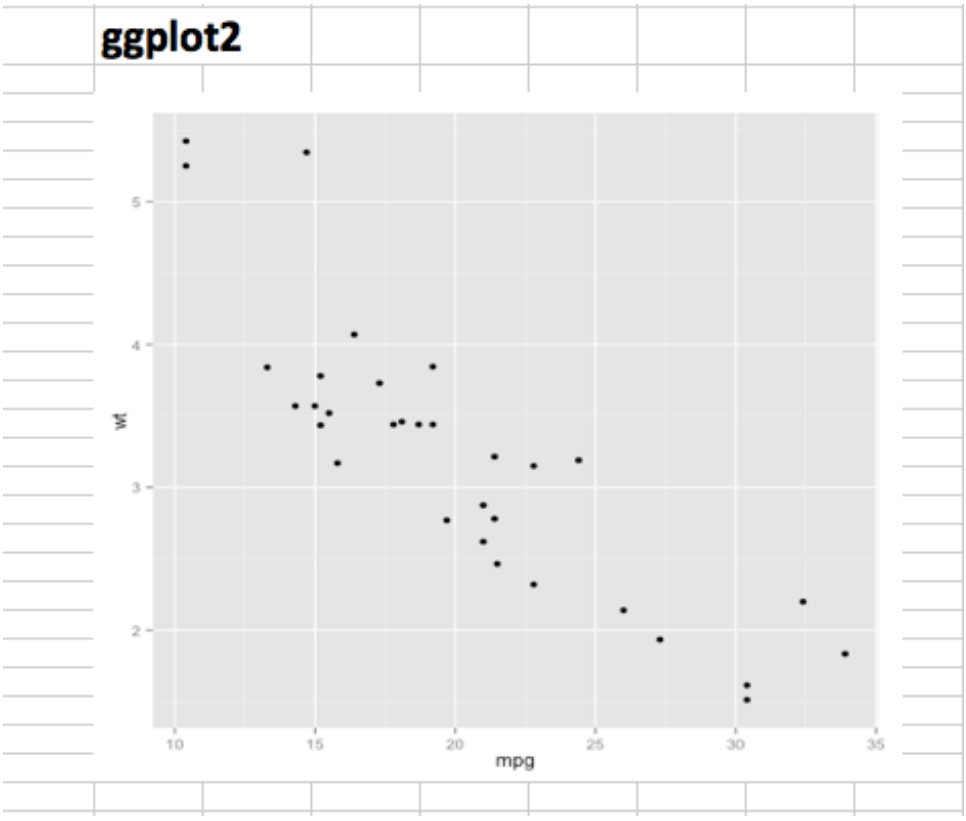
- wb : workbook object

- sheet : sheet object
- plotFunction : an R function creating a plot.
- width, height : the width and the height of the plot
- … : others arguments to png() function

Examples :

```
wb <- createWorkbook(type="xlsx")
sheet <- createSheet(wb, sheetName = "example1")


data(ToothGrowth)
xlsx.addHeader(wb, sheet, "Basic box plot")
xlsx.addLineBreak(sheet, 1)
plotFunction<-function(){boxplot(len ~ dose, data = ToothGrowth, col =
1:3)}
xlsx.addPlot(wb, sheet, plotFunction())

library("ggplot2")
xlsx.addHeader(wb, sheet, "ggplot2")
xlsx.addLineBreak(sheet, 1)
plotFunction<-function(){
  p<-qplot(mpg, wt, data=mtcars)
  print(p)
  }
xlsx.addPlot(wb, sheet, plotFunction())

saveWorkbook(wb, "examples_add_plot.xlsx")
xlsx.openFile("examples_add_plot.xlsx")
```






## Read an Excel file

The function **xlsx.readFile()** can be used. A simplified format is :

```
xlsx.readFile(file, sheetIndex = 1, header =
TRUE)
```

- file : the path to the file to read
- sheetIndex : a number indicating the index of the sheet to read from the workbook
- header : a logical value. If TRUE, the first row is used as the names of the variables

Examples :

```
file <- system.file("tests", "test_import.xlsx", package =
"xlsx")
res <- xlsx.readFile(file, 1)
head(res)
```

```
  Population Income Illiteracy Life.Exp Murder HS.Grad Frost
Area
1       3615   3624        2.1    69.05   15.1    41.3    20
50708
2        365   6315        1.5    69.31   11.3    66.7   152
566432
3       2212   4530        1.8    70.55    7.8    58.1    15
113417
4       2110   3378        1.9    70.66   10.1    39.9    65
51945
5      21198   5114        1.1    71.71   10.3    62.6    20
156361
6       2541   4884        0.7    72.06    6.8    63.9   166
103766
```

## Write an Excel file

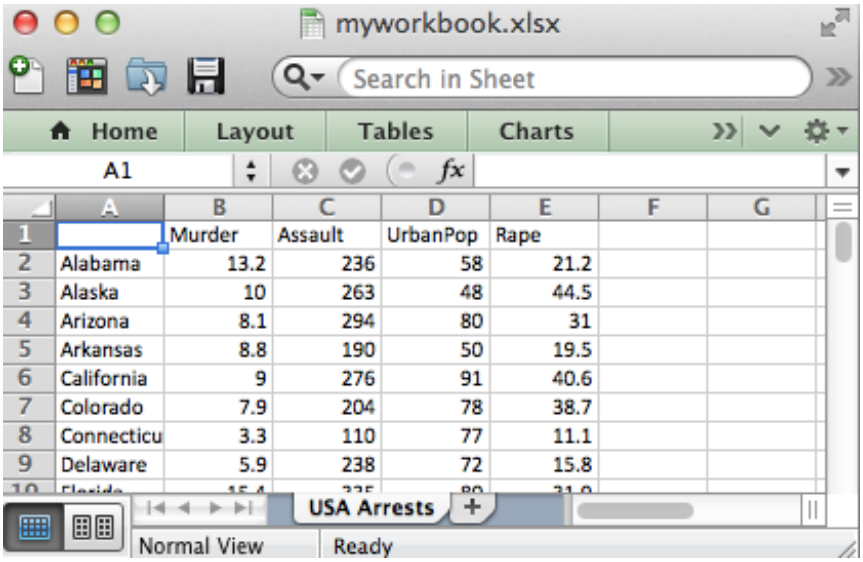
The function **xlsx.writeFile** can be used. A simplified format is :

```
xlsx.writeFile(data, file, sheetName = "Sheet1",
  col.names = TRUE, row.names = TRUE, append =
FALSE)
```

- data : a data.frame to write to the workbook
- file : the path to the output file
- sheetName : a character string to use for the sheet name.
- col.names, row.names : a logical value specifying whether the column names/row names of the data are to be written to the file
- append : a logical value indicating if the data should be appended to an existing file.

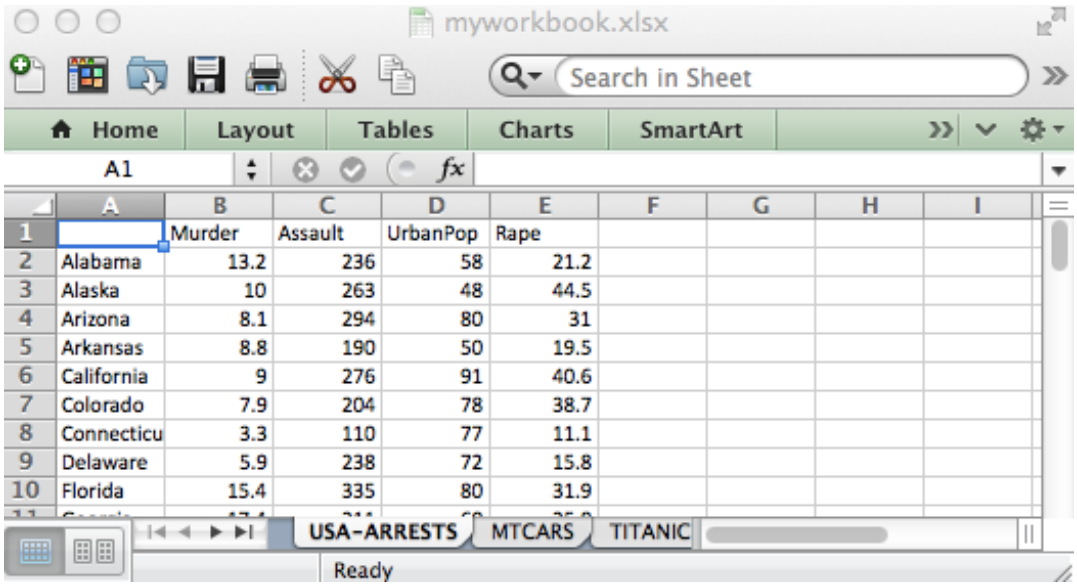
Examples :

```
xlsx.writeFile(USArrests, file="myworkbook.xlsx",
               sheetName="USA Arrests")
xlsx.openFile("myworkbook.xlsx")
```



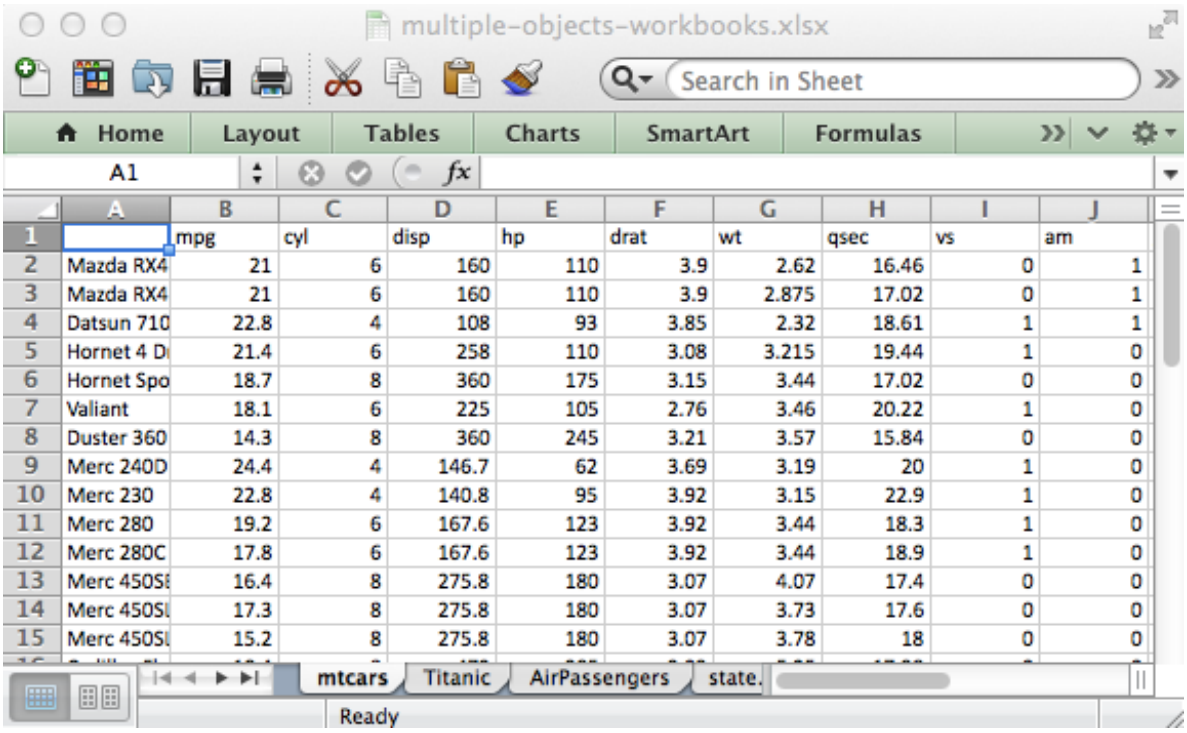

Use the argument **append = TRUE** to add multiple data.frame in the same Excel workbook :

```
xlsx.writeFile(USArrests, file="myworkbook.xlsx",
            sheetName="USA-ARRESTS",
append=FALSE)

xlsx.writeFile(mtcars, file="myworkbook.xlsx",
          sheetName="MTCARS", append=TRUE)

xlsx.writeFile(Titanic, file="myworkbook.xlsx",
          sheetName="TITANIC", append=TRUE)
xlsx.openFile("myworkbook.xlsx")
```




The method above is very repetitive. You can use the function **xlsx.writeMultipleData()** to add multiple data sets to the same workbook in a single call.

```
xlsx.writeMultipleData("myworkbook.xlsx",
          mtcars, Titanic, AirPassengers,
state.x77)
xlsx.openFile("myworkbook.xlsx")
```




| | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | mpg | cyl | disp | hp | drat | wt | qsec | vs | am |
| 2 | Mazda RX4 | 21 | 6 | 160 | 110 | 3.9 | 2.62 | 16.46 | 0 | 1 |
| 3 | Mazda RX4 | 21 | 6 | 160 | 110 | 3.9 | 2.875 | 17.02 | 0 | 1 |
| 4 | Datsun 710 | 22.8 | 4 | 108 | 93 | 3.85 | 2.32 | 18.61 | 1 | 1 |
| 5 | Hornet 4 D | 21.4 | 6 | 258 | 110 | 3.08 | 3.215 | 19.44 | 1 | 0 |
| 6 | Hornet Spo | 18.7 | 8 | 360 | 175 | 3.15 | 3.44 | 17.02 | 0 | 0 |
| 7 | Valiant | 18.1 | 6 | 225 | 105 | 2.76 | 3.46 | 20.22 | 1 | 0 |
| 8 | Duster 360 | 14.3 | 8 | 360 | 245 | 3.21 | 3.57 | 15.84 | 0 | 0 |
| 9 | Merc 240D | 24.4 | 4 | 146.7 | 62 | 3.69 | 3.19 | 20 | 1 | 0 |
| 10 | Merc 230 | 22.8 | 4 | 140.8 | 95 | 3.92 | 3.15 | 22.9 | 1 | 0 |
| 11 | Merc 280 | 19.2 | 6 | 167.6 | 123 | 3.92 | 3.44 | 18.3 | 1 | 0 |
| 12 | Merc 280C | 17.8 | 6 | 167.6 | 123 | 3.92 | 3.44 | 18.9 | 1 | 0 |
| 13 | Merc 450S | 16.4 | 8 | 275.8 | 180 | 3.07 | 4.07 | 17.4 | 0 | 0 |
| 14 | Merc 450S | 17.3 | 8 | 275.8 | 180 | 3.07 | 3.73 | 17.6 | 0 | 0 |
| 15 | Merc 450S | 15.2 | 8 | 275.8 | 180 | 3.07 | 3.78 | 18 | 0 | 0 |

The function **xlsx.writeMultipleData** works for data frames (mtcars), matrices (state.x77), time series (AirPassengers) and tables (Titanic).

## A full and nice report using R and Excel

The following R code can be used to create a full Excel report :

```
filename<-"r2excel-example.xlsx"
wb <- createWorkbook(type="xlsx")

sheet <- xlsx::createSheet(wb, sheetName = "example1")


xlsx.addHeader(wb, sheet, value="Excel file written with r2excel packages",
            level=1, color="darkblue", underline=2)
xlsx.addLineBreak(sheet, 2)

author=paste("Author : Alboukadel KASSAMBARA. \n",
             "@:alboukadel.kassambara@gmail.com.",
             "\n Website : http://ww.sthda.com", sep="")
xlsx.addParagraph(wb, sheet,value=author, isItalic=TRUE, colSpan=5,
                  rowSpan=4, fontColor="darkgray", fontSize=14)
xlsx.addLineBreak(sheet, 3)


data(iris)
xlsx.addHeader(wb, sheet, value="Add iris table using default settings", level=2)
xlsx.addLineBreak(sheet, 1)
xlsx.addTable(wb, sheet, head(iris), startCol=2)
xlsx.addLineBreak(sheet, 2)


xlsx.addHeader(wb, sheet, value="Customized table", level=2)
```

```
xlsx.addLineBreak(sheet, 1)
xlsx.addTable(wb, sheet, data= head(iris),
              fontColor="darkblue", fontSize=14,
              rowFill=c("white", "lightblue")
)
xlsx.addLineBreak(sheet, 2)


xlsx.addHeader(wb, sheet, "Add paragraph", level=2)
xlsx.addLineBreak(sheet, 2)
paragraph="Lorem Ipsum is simply dummy text of the printing and typesetting
industry. Lorem Ipsum has been the industry's standard dummy text ever since the
1500s, when an unknown printer took a galley of type and scrambled it to make a
type specimen book. It has survived not only five centuries, but also the leap
into electronic typesetting, remaining essentially unchanged."
xlsx.addParagraph(wb, sheet, paragraph, fontSize=14, isItalic=TRUE,
                  fontColor="darkred", backGroundColor="gray")
xlsx.addLineBreak(sheet, 2)


xlsx.addHeader(wb, sheet, " Add Hyperlink", level=2)
xlsx.addLineBreak(sheet, 1)
xlsx.addHyperlink(wb, sheet, "http://www.sthda.com", "Click-me!!", fontSize=12)
xlsx.addLineBreak(sheet, 2)


data(ToothGrowth)
xlsx.addHeader(wb, sheet, " Add Plot", level=2)
xlsx.addLineBreak(sheet, 1)
plotFunction<-function(){boxplot(len ~ dose, data = ToothGrowth, col = 1:3)}
xlsx.addPlot(wb, sheet, plotFunction())

xlsx::saveWorkbook(wb, filename)
xlsx.openFile(filename)
```