Superior gRaphics in Statistical Reports

Sameer Bamnote

Cytel Statistical Software & Services Pvt. Ltd., Pune, India

16 October, 2012
Any views or opinions presented in this presentation are solely those of the author and do not necessarily represent those of the company.
Agenda

1. Introduction
2. Calling R from SAS
3. Features of R Graphics
   - Example 1
   - Example 2
4. Limitations
5. Conclusion
Introduction

- Statistical Report = Tables + Listings + Graphs
Introduction

- Statistical Report = Tables + Listings + Graphs

- Graphics play a vital role
Introduction

- Statistical Report = Tables + Listings + Graphs
- Graphics play a vital role
- SAS is widely used to produce TLG’s
Introduction

- Statistical Report = Tables + Listings + Graphs
- Graphics play a vital role
- SAS is widely used to produce TLG’s
- Best of two worlds
Introduction

- Statistical Report = Tables + Listings + Graphs

- Graphics play a vital role

- SAS is widely used to produce TLG’s

- Best of two worlds
  - Tables and Listings - SAS
Introduction

- Statistical Report = Tables + Listings + Graphs

- Graphics play a vital role

- SAS is widely used to produce TLG’s

- Best of two worlds
  - Tables and Listings - SAS
  - Graphs - R
Introduction

- Statistical Report = Tables + Listings + Graphs
- Graphics play a vital role
- SAS is widely used to produce TLG’s
  - Best of two worlds
    - Tables and Listings - SAS
    - Graphs - R
- Sole use of SAS
SAS users are more comfortable working in SAS environment
R from SAS

- SAS users are more comfortable working in SAS environment
- Good idea to call "R from SAS"
SAS users are more comfortable working in SAS environment
Good idea to call ”R from SAS”
Is it possible?
R from SAS

- SAS users are more comfortable working in SAS environment
- Good idea to call "R from SAS"
- Is it possible?
  - Yes
R from SAS

- SAS users are more comfortable working in SAS environment
- Good idea to call "R from SAS"
- Is it possible?
  - Yes
- How?
R from SAS

- SAS users are more comfortable working in SAS environment
- Good idea to call "R from SAS"
- Is it possible?
  - Yes
- How?
  - PROC IML 9.22/SAS IML Studio 3.2
R from SAS

- SAS users are more comfortable working in SAS environment
- Good idea to call "R from SAS"
- Is it possible?
  - Yes
- How?
  - PROC IML 9.22/SAS IML Studio 3.2
  - Call R system in line command mode using SAS X statement - Philip R Holland in his paper SAS2R2SAS
R from SAS

- SAS users are more comfortable working in SAS environment
- Good idea to call ”R from SAS”
- Is it possible?
  - Yes
- How?
  - PROC IML 9.22/SAS IML Studio 3.2
  - Call R system in line command mode using SAS X statement - Philip R Holland in his paper SAS2R2SAS
  - Use of two macros - Liang Xie (Conduct R analysis within SAS)
RScript Macro

```r
%macro RScript(Rscript);
   data _null_;
   file "&Rscript";
   infile cards;
   input;
   put _infile_;
%mend;
```

CallR Macro

```r
%macro CallR(Rscript, Rlog);
   systask command "C:\Program Files\R\R-2.15.1\bin\R.exe CMD BATCH --vanilla --quiet &Rscript &Rlog"
      taskname=rjob1 wait status=rjobstatus1;
%mend;
```
Writing R code

R from SAS

%RScript(c:\rscript.r)
cards4;

<write R code here>

;;;;
run;

%CallR(c:/rscript.r, c:/rlog1.txt);

/*Printing R log in the sas log window*/
data _null_
   infile "c:\rlog1.txt";
   input;
   put _infile_;
run;
Introduction

Calling R from SAS

Features of R Graphics

Limitations

Conclusion

Superior Graphics in Statistical Reports
Multiple Figures in Single Panel

- Requirement - Multiple figures in a single panel
Multiple Figures in Single Panel

- Requirement - Multiple figures in a single panel
Example 1 Contd...

R Code:

```r
pdf("D:/Example1.pdf")
par(mfrow=c(2,2)) # Divide the plotting area

# <Code for Plot 1>
plot(b,a, xaxt = 'n', xlab = 'Treatment',ylab = 'Individual Values',
xlim=c(1,5),main = "Plot 1",cex=1.5,col='blue', pch = 'o')
axis(1,at=c(2,4),labels = c('Trt A', 'Trt B'))

# <Code for Plot 2>
plot(jitter(b,amount=0.2),a, xaxt = 'n', xlab = 'Treatment',ylab =
'Individual Values', xlim=c(1,5),main = "Plot 2", cex=1.5,col='blue',
pch = 'o')
axis(1,at=c(2,4),labels = c('Trt A', 'Trt B'))
# <Code for Plot 3>
# <Code for Plot 4>

dev.off()
```

Sameer Bamnote
PhUSE 2012

Superior gRaphics in Statistical Reports
Example 2

**Errorbar Plot**

- Using an inbuilt data in R named ToothGrowth whose variables are renamed as rep, trt and time.
- Errorbar plot using 'lineplot.CI' from 'sciplot' package in R

![Errorbar plot using lineplot.CI function in sciplot package](attachment:image.png)
Errorbar plot using sciplot package

R Code

```r
lineplot.CI(time, rep, group = trt, data = tg, cex = 1.5,
  xlab = "Time (Hours)", ylab = "Value (MEAN +/- SE)",
  cex.lab = 1.3, x.leg = 1, y.leg=30, col = c("red","dark green"),
  pch = c(16,16), ylim=c(5,30), err.width = 0.05, xaxt = 'n', lwd=2)

axis(1, at=c(1,2,3), labels=c(0.5, 1, 2))

title("Errorbar plot using 'lineplot.CI' function in sciplot package")
```
Errorbar plot using `ggplot2` package in R
Errorbar plot using ggplot2 package

Errorbar plot using 'ggplot2' package in R
Errorbar plot using ggplot2 package

R Code

```r
ggplot(summary, aes(x=time, y=rep, colour=trt)) +
  geom_errorbar(aes(ymin=rep-se, ymax=rep+se), width=.05, lwd = 0.8) +
  geom_line(lwd=0.8) +
  geom_point(cex=3) + xlab("Time (Hours)") + ylab("Value (Mean +/- SE)") +
  ggtitle("Errorbar plot in ggplot2 package") +
  theme_bw() +
  scale_y_continuous(limits=c(5,30), breaks=0:30*5)
```
Errorbar plot using ggplot2 package

R Code

```r
pd <- position_dodge(.1)
ggplot(summary, aes(x=time, y=rep, colour=trt)) +
  geom_errorbar(aes(ymin=rep-se, ymax=rep+se), width=.1, position=pd, lwd =0.8) + geom_line(position=pd,lwd =0.8) + geom_point(position=pd, cex = 3) + xlab("Time (Hours)") + ylab("Value (Mean +/- SE)")+ ...
```
Example 2

Errorbar plot using ggplot2 package

```
<table>
<thead>
<tr>
<th>Time (Hours)</th>
<th>Value Mean ± SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>5</td>
</tr>
<tr>
<td>1.0</td>
<td>10</td>
</tr>
<tr>
<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td>2.0</td>
<td>20</td>
</tr>
</tbody>
</table>
```

```
    Errorbar plot with Jittering in ggplot2 package
```

Superior gRaphics in Statistical Reports
Example 2

What we observe

1. Multiple figures in single panel are easily done -

   - reduces writing numerous lines of codes
   - Choice to choose the Best and most suited
   - Jittering made easy!!!
What we observe

1. Multiple figures in single panel are easily done - reduces writing numerous lines of codes
Example 2

What we observe

1. Multiple figures in single panel are easily done -

2. Same task by using different packages (sciplot and ggplot2 package) -
What we observe

1. Multiple figures in single panel are easily done -

2. Same task by using different packages (sciplot and ggplot2 package) - Choice to choose the Best and most suited
What we observe

1. Multiple figures in single panel are easily done -

2. Same task by using different packages (sciplot and ggplot2 package) -

3. How easy is to separate overlapping values -
What we observe

1. Multiple figures in single panel are easily done -

2. Same task by using different packages (sciplot and ggplot2 package) -

3. How easy is to separate overlapping values - Jittering made easy!!!
Some Points to Mention

Annotation is used to -

- Add text on the graph
Some Points to Mention

Annotation is used to -

- Add text on the graph
- Axis Break
Some Points to Mention

Annotation is used to -

- Add text on the graph
- Axis Break
- Legend at a desired location on the graph
Some Points to Mention

Annotation is used to -

- Add text on the graph
- Axis Break
- Legend at a desired location on the graph
Some Points to Mention

In R functions are available -

- `text`
Some Points to Mention

In R functions are available -

- text
- mtext
Some Points to Mention

In R functions are available -

- `text`
- `mtext`
- `axis.brake` in `plotrix` library
Some Points to Mention

In R functions are available -

- text
- mtext
- axis.brake in ’plotrix’ library
- legend
Some Points to Mention

- Conventional requirement from most of sponsors - Output in RTF format
Some Points to Mention

- Conventional requirement from most of sponsors - Output in RTF format

- ’rtf’ package in R
Some Points to Mention

- Conventional requirement from most of sponsors - Output in RTF format

- ‘rtf’ package in R

- Graphical output from R can be saved in various formats - bmp, png, jpeg, gif.
Some Points to Mention

- Conventional requirement from most of sponsors - Output in RTF format
- ‘rtf’ package in R
- Graphical output from R can be saved in various formats - bmp, png, jpeg, gif.
- Best choice - PNG format
Limitations

- Capabilities of SAS 9.2, SAS GTL or SAS 9.3 are not considered.

- Help in R is more technical. It is not well organized as in other software. So first time users may find it difficult.
From examples we have seen, how graphs generated in R have an edge over SAS in terms of appearance, time taken for coding and overall quality of the graph. So, R can be an ideal choice for creating graphs. Since we are calling R from SAS, we are able to create superior figures in SAS itself providing a sense of comfort to SAS users as well.
Questions?

Contact Detail:

Sameer Bamnote
sameer.bamnote@cytel.com