Data Analysis Tools and Practice(Using R)

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R基本图形II

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课堂测试时间

课堂测试04

30分钟

1. 使用鸢尾花数据iris

1）先用names()观察其结构，然后用花瓣长度和宽度做散点图

2）在plot函数里面添加细节。修改点的形状和颜色由白色空心圆换成红色雪花；修改坐标轴名称并添加标题 ”relationship between width and length of Iris petal”。

2. 使用 airquality 数据

1）绘温度 Temp 直方图，加一个横坐标"Temperature",加一个标题"The Distribution of Temperature“

2）频数变频率，并设置颜色为绿色

3）四幅图放在一个面板里，两个一排。并使用MASS包的trueHist函数画出频率直方图：

第一幅图，airquality里温度变量的直方图（频数）

第二幅图，airquality里该变量的直方图（频率）并添加密度曲线，填充红色

第三幅图，airquality里风速变量的直方图（频数）

第四幅图，airquality里该变量的直方图（频率），并添加密度曲线，填充蓝色

3. 使用mtcars里的mpg做箱图

给箱图添加坐标轴：x轴为”Number of Cylinders”，y轴为=“Miles Per Gallon”标题”Car Milage Data”。根据不同cyl变量下mpg的箱线图，并添加x轴”Number of Cylinders”,y轴”Miles Per Gallon”

4. 按要求作图：

1) 创建字符向量colors,元素为"green","orange","brown“;创建字符向量months,元素为"一月","二月","三月","四月","五月“;创建字符向量regions,元素为"东部地区","西部地区","南部地区“;创建矩阵values,元素为值2,9,3,11,9,4,8,7,3,12,5,2,8,10,11，要求3行5列

2) 使用矩阵values创建推叠的条形图，添加标题为”总收入”，x轴名称为”月份”，y轴名称为”收入”，条形图的标签为字符向量months(使用names.arg参数)，推叠台型图的颜色设置为创建的字符向量colors

3) 添加图例，内容为字符向量regions，分别对应条形图中的三种颜色

上次课程内容回顾

- 图形函数：
  - ✴ plot(); barplot(); pie(); hist(); boxplot();
- 图形参数：
  - ✴ col; font; pch; cex; lty; lwd; xlab; ylab; xlim; ylim; type; main; horiz; beside;
- 图例函数：
  - ✴ legend(location, title, legend, …);
- 图形组合：
  - ✴ par(); layout();
- 其余函数：
  - ✴ title(); abline(); line(); text(); mtext();

图形

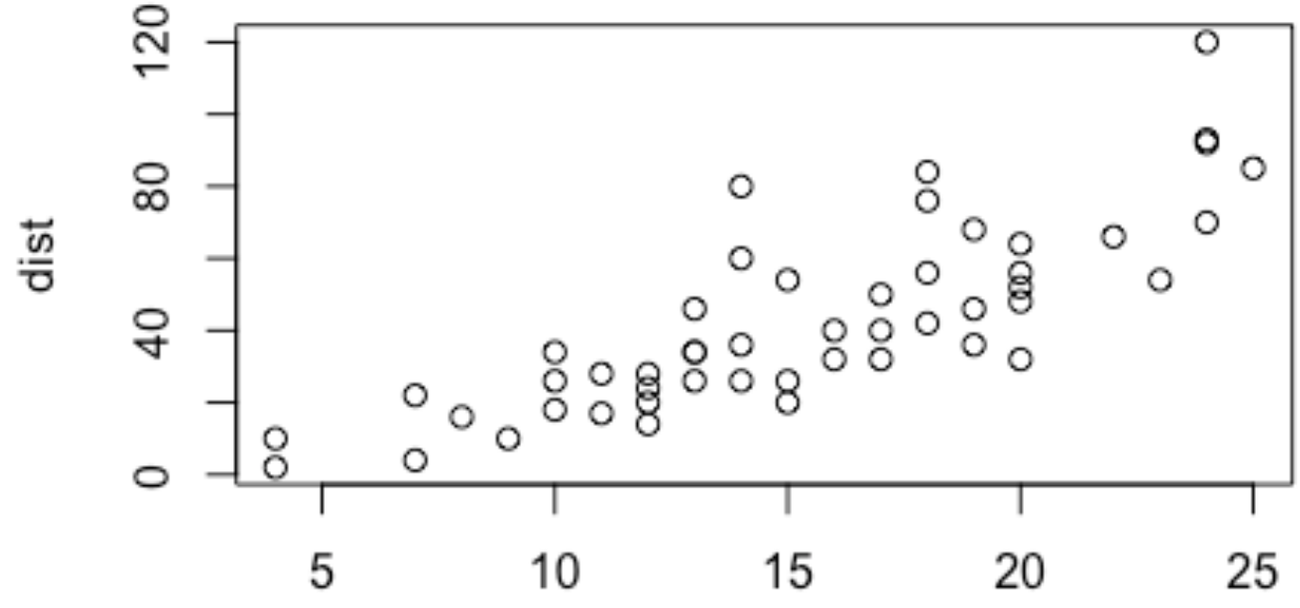
R Cookbook

CH10@ R Cookbook v1.0

散点图

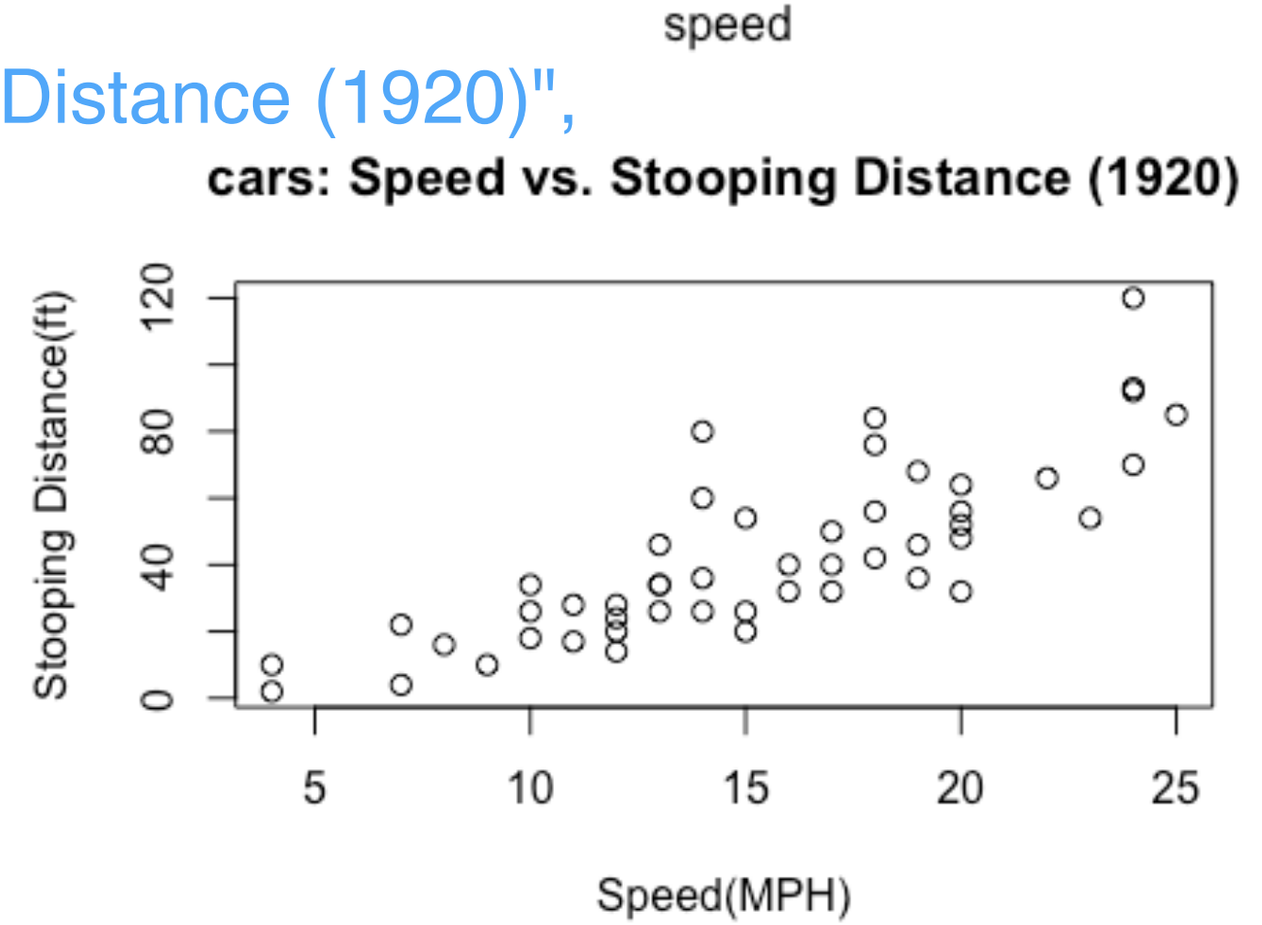
plot(cars)

```
> cars
   speed dist
1      4    2
2      4   10
3      7    4
4      7   22
5      8   16
6      9   10
7     10   18
8     10   26
```




```
plot(cars,
    main = "cars: Speed vs. Stooping Distance (1920)",
    xlab = "Speed(MPH)",
    ylab = "Stooping Distance(ft)")
```

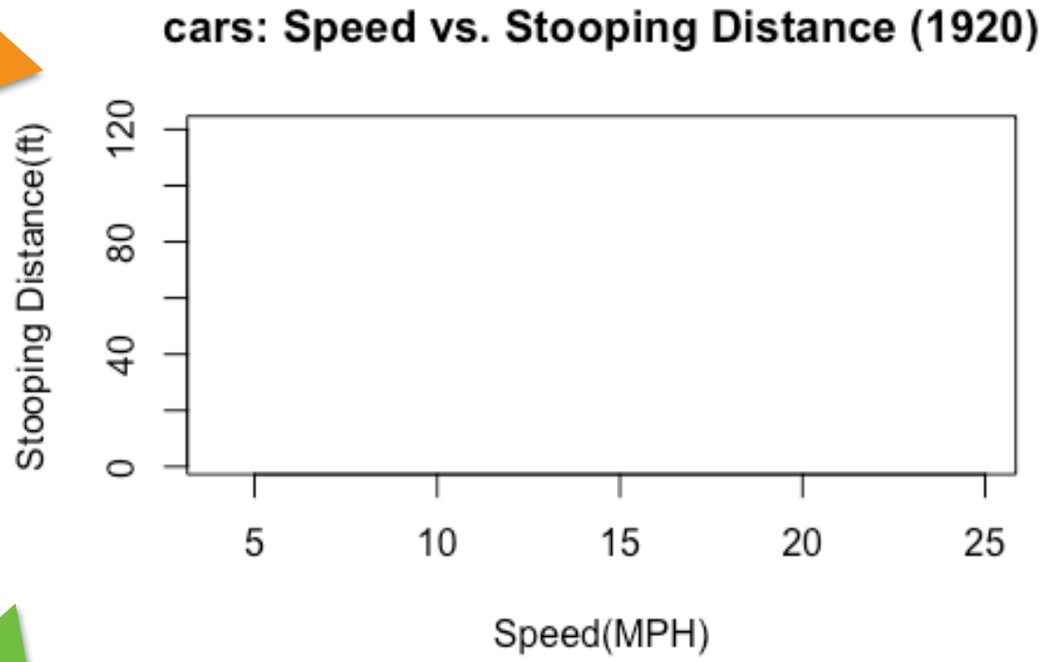
```
44    22    66
45    23    54
46    24    70
47    24    92
48    24    93
49    24   120
50    25    85
```

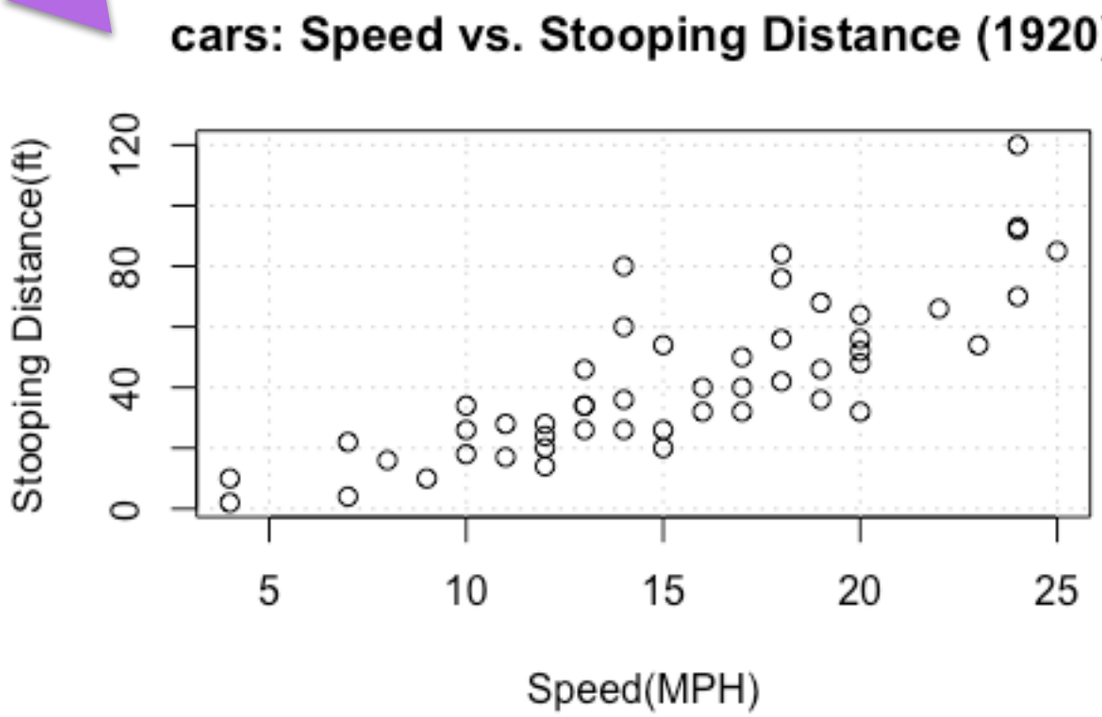


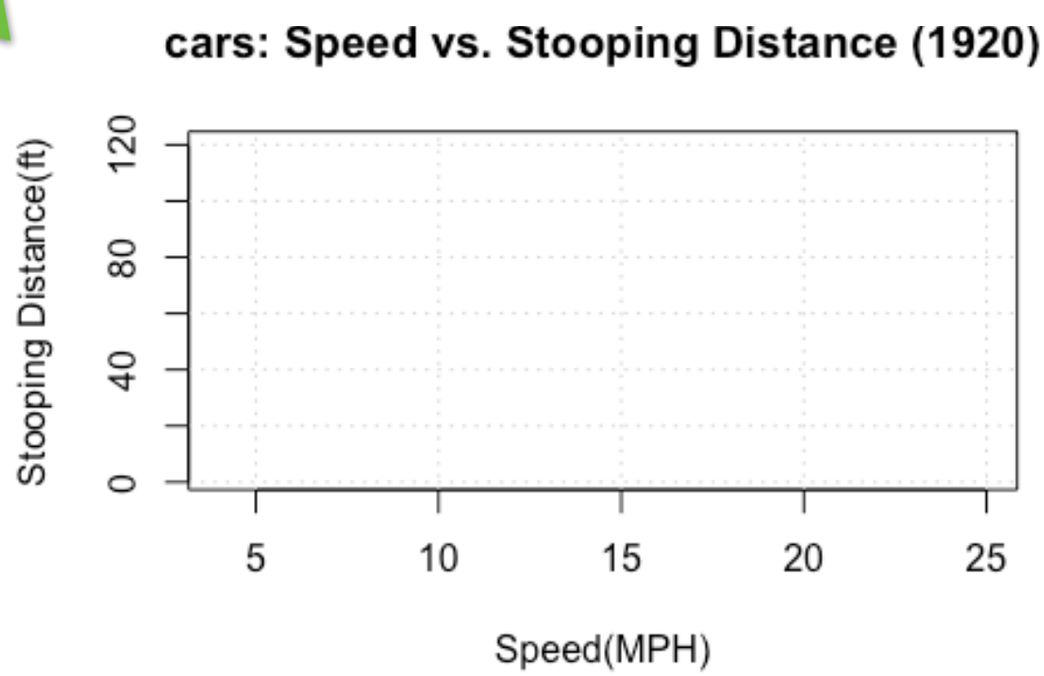
散点图

```
plot(cars,
     main = "cars: Speed vs. Stooping Distance (1920)",
     xlab = "Speed(MPH)",
     ylab = "Stooping Distance(ft)",
     type = “n")
grid()
points(cars)
```

低级函数







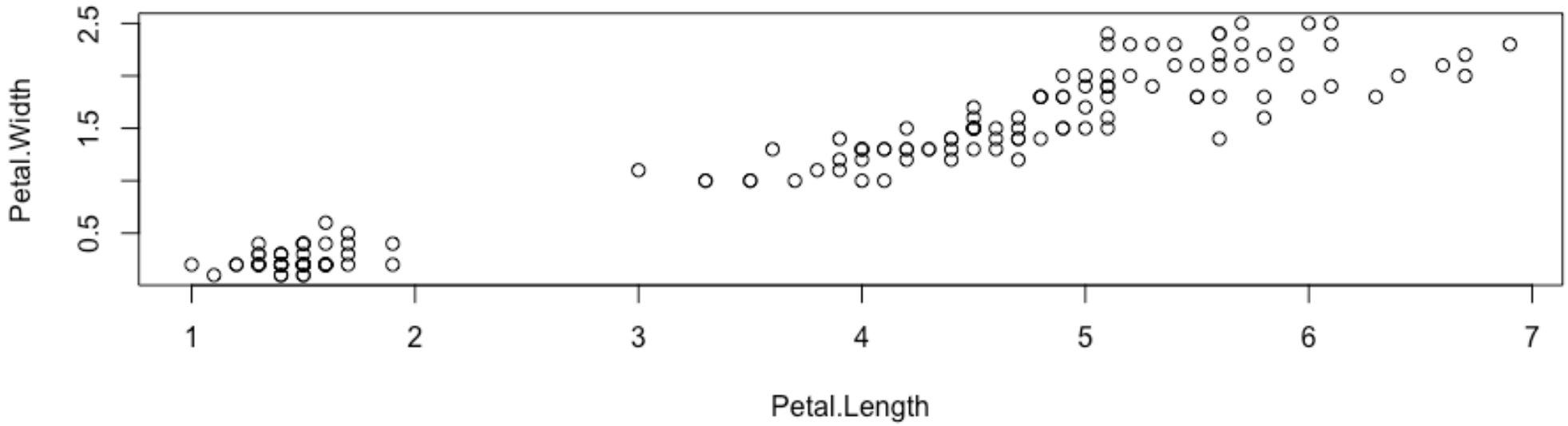
多组散点图

```
> iris
    Sepal.Length Sepal.Width Petal.Length Petal.Width    Species
1            5.1         3.5          1.4         0.2     setosa
2            4.9         3.0          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            5.0         3.6          1.4         0.2     setosa

50           5.0         3.3          1.4         0.2     setosa
51           7.0         3.2          4.7         1.4 versicolor
52           6.4         3.2          4.5         1.5 versicolor
53           6.9         3.1          4.9         1.5 versicolor
54           5.5         2.3          4.0         1.3 versicolor
55           6.5         2.8          4.6         1.5 versicolor

99           5.1         2.5          3.0         1.1 versicolor
100          5.7         2.8          4.1         1.3 versicolor
101          6.3         3.3          6.0         2.5  virginica

148          6.5         3.0          5.2         2.0  virginica
149          6.2         3.4          5.4         2.3  virginica
150          5.9         3.0          5.1         1.8  virginica
```

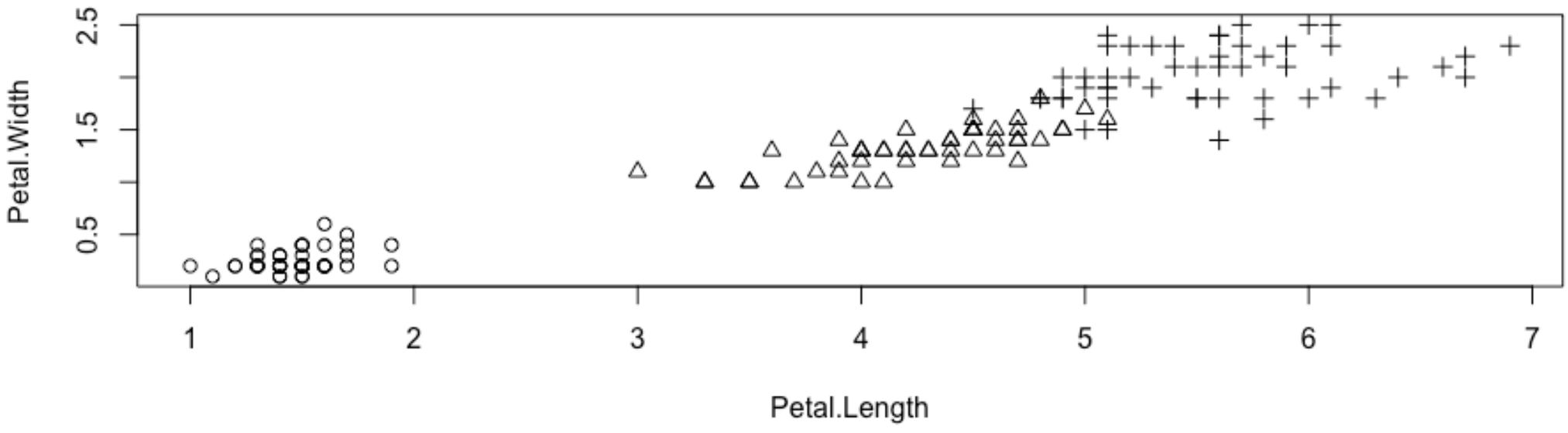
因子

多组散点图

```
with(iris,plot(Petal.Length,Petal.Width))
```

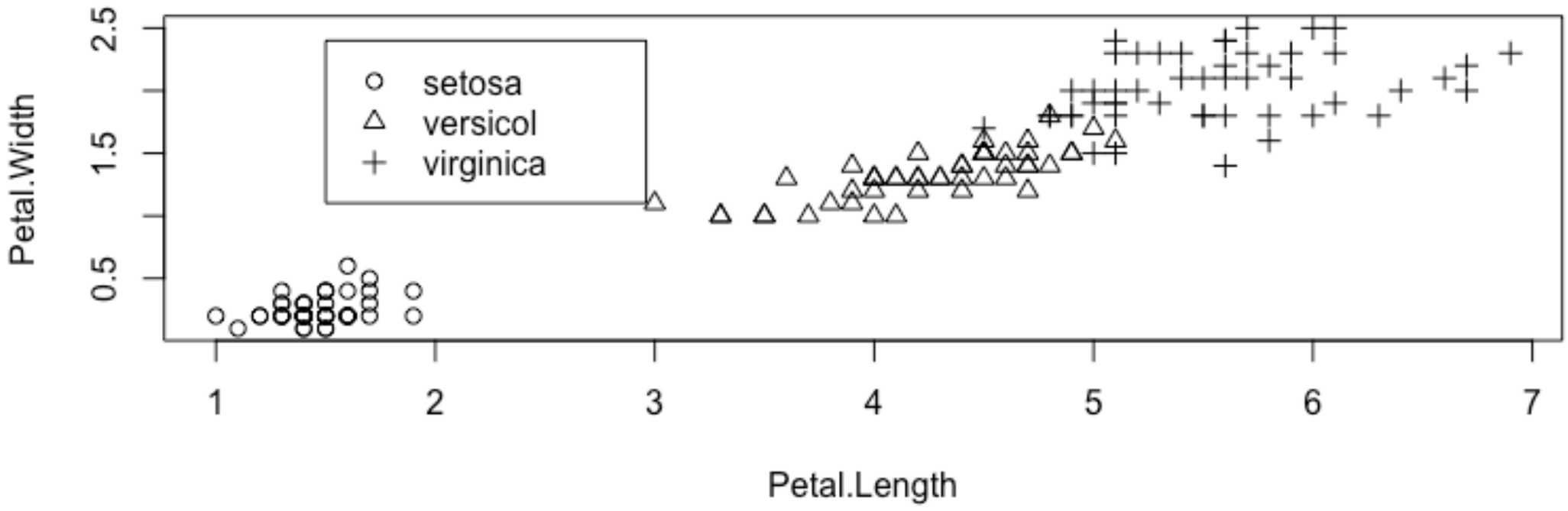



```
with(iris,plot(Petal.Length,Petal.Width,pch=as.integer(Species)))
```



图例

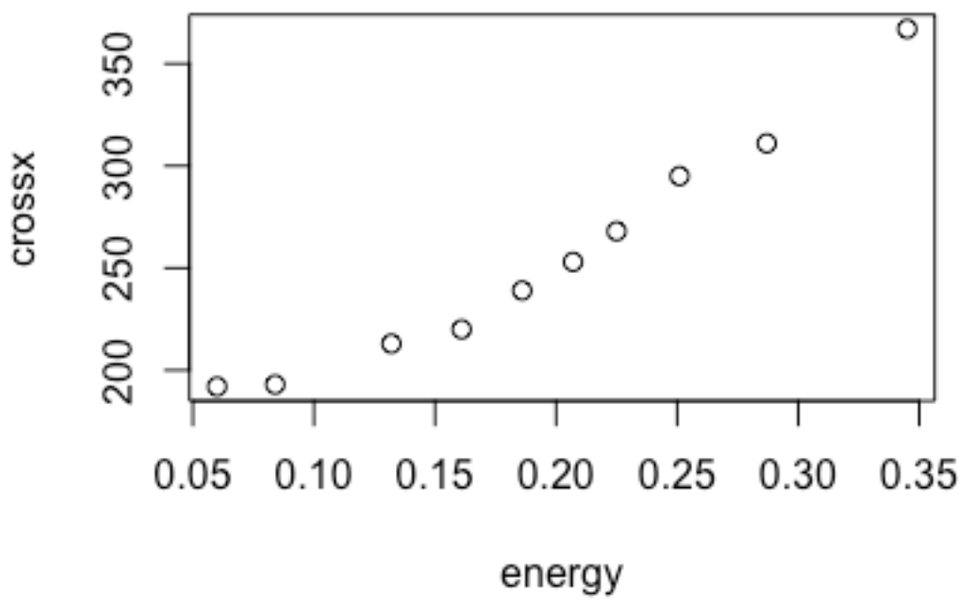
```
legend(1.5, 2.4, c("setosa", "versicol", "virginica"), pch = 1:3)

f <- factor(iris$Species)
with(iris,plot(Petal.Length, Petal.Width, pch=as.integer(Species)))
legend(1.5, 2.4, as.character(levels(f)), pch = 1:3)
```

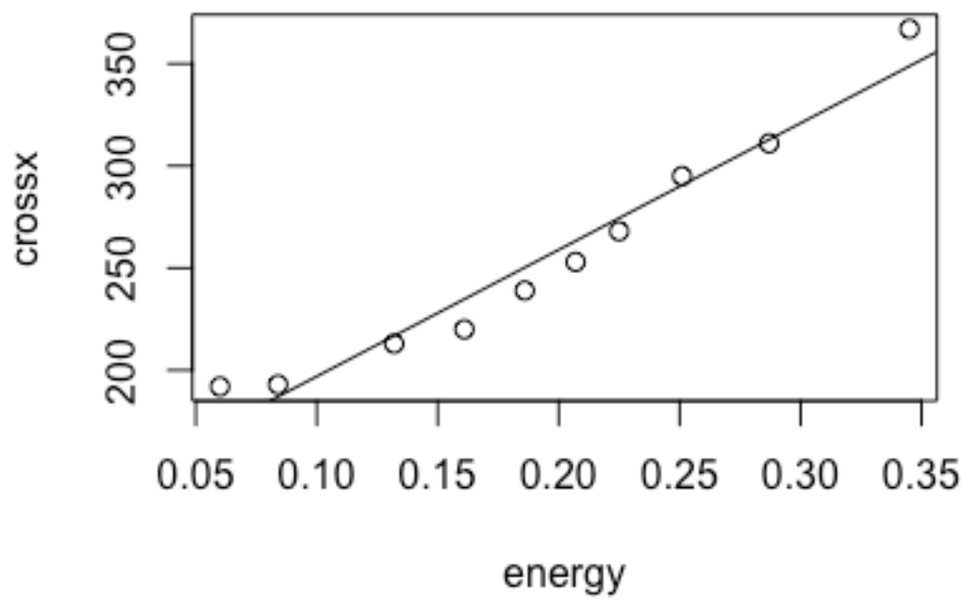


回归线

```
strongx
m <- lm(crossx ~ energy, data = strongx)

plot(crossx ~ energy, data = strongx)
abline(m)
```

```
> strongx
   momentum energy crossx sd
1         4  0.345    367 17
2         6  0.287    311  9
3         8  0.251    295  9
4        10  0.225    268  7
5        12  0.207    253  7
6        15  0.186    239  6
7        20  0.161    220  6
8        30  0.132    213  6
9        75  0.084    193  5
10      150  0.060    192  5
```



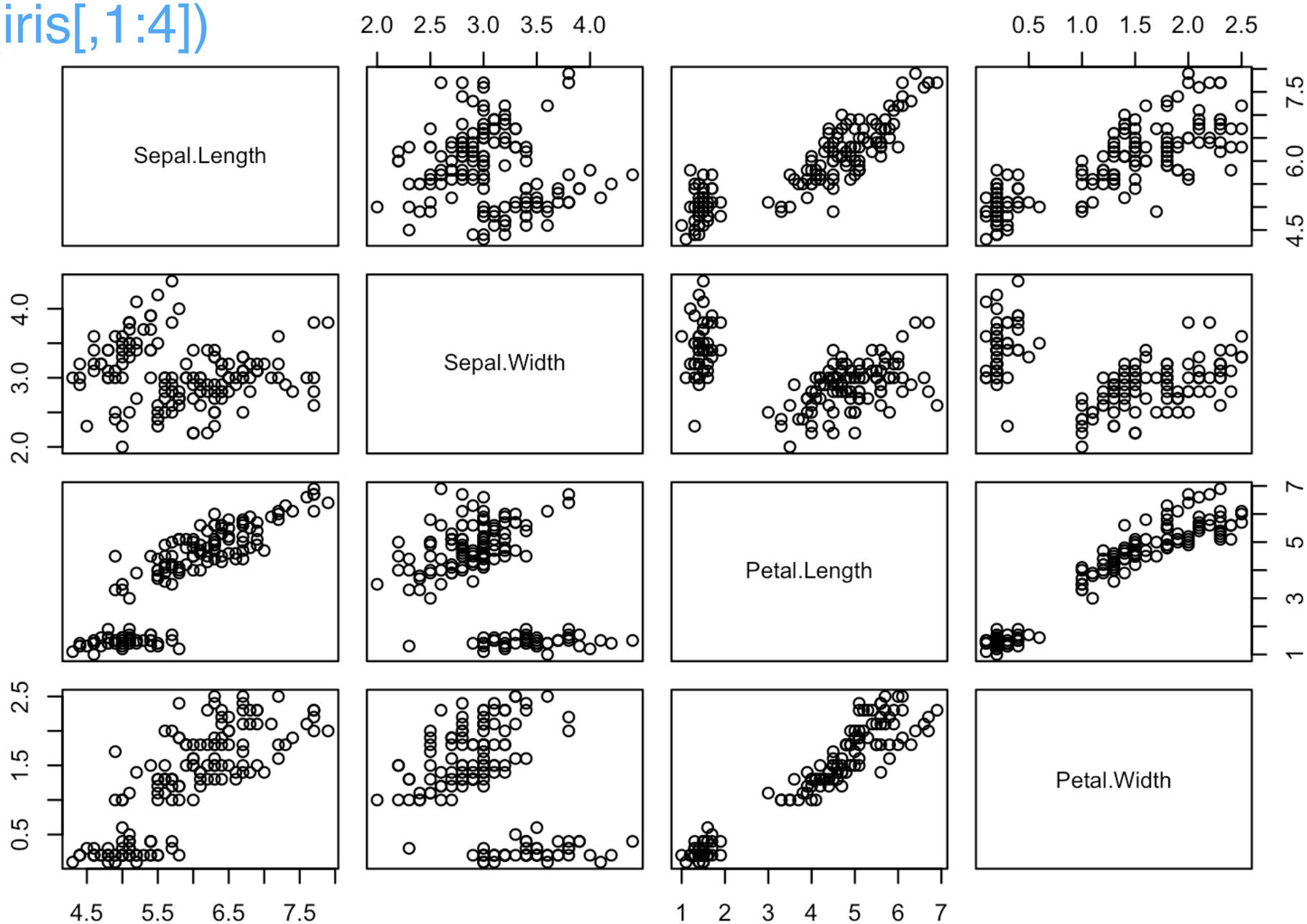


多变量散点图

head(iris)

```
> head(iris)
  Sepal.Length Sepal.Width Petal.Length Petal.Width Species
1          5.1         3.5          1.4         0.2  setosa
2          4.9         3.0          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          5.0         3.6          1.4         0.2  setosa
6          5.4         3.9          1.7         0.4  setosa
```

plot(iris[,1:4])



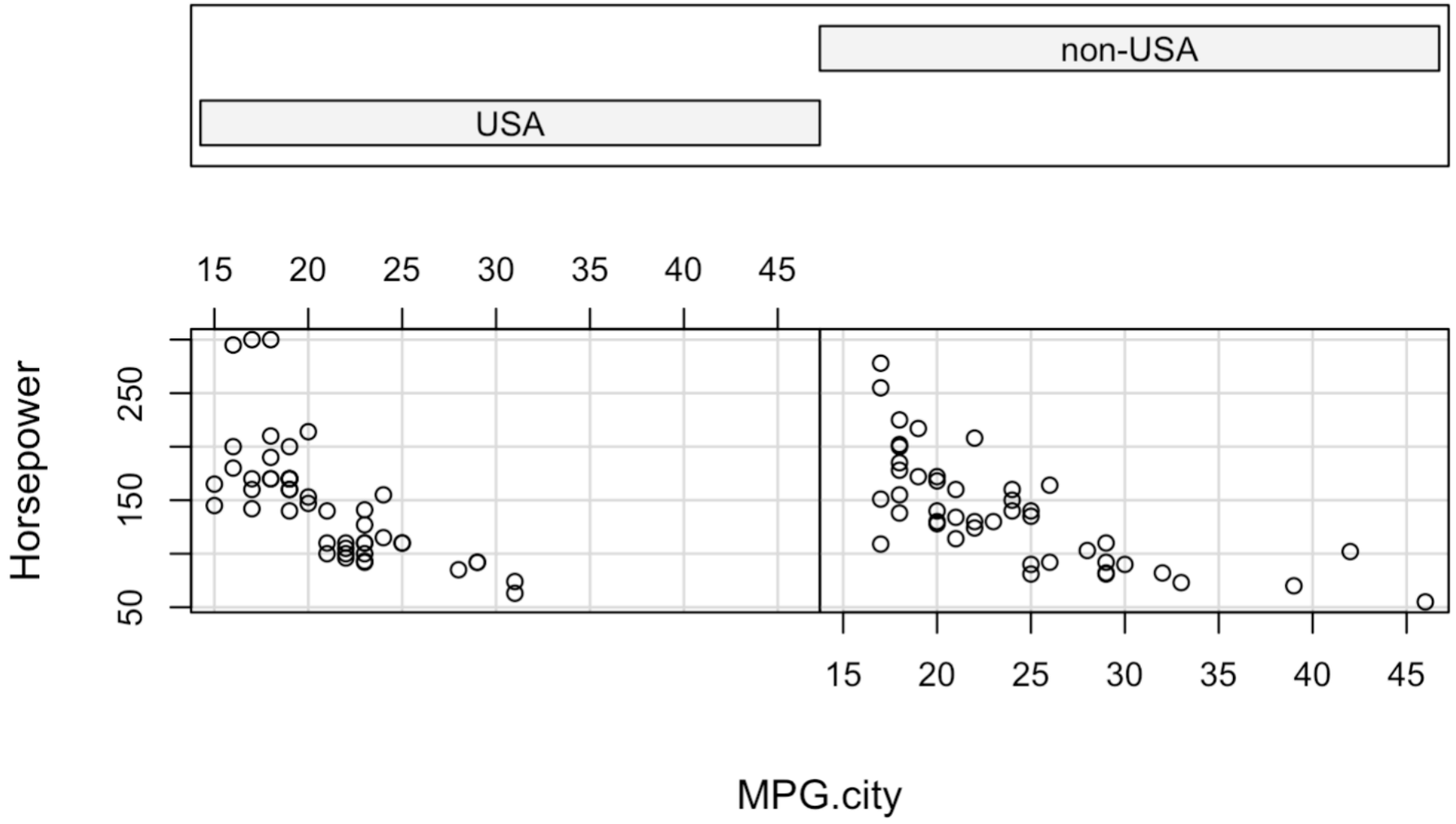
每个因子水平的散点图

```
> head(Cars93)
  Manufacturer   Model    Type Min.Price Price Max.Price MPG.city MPG.highway             AirBags DriveTrain Cylinders EngineSize
1        Acura Integra   Small      12.9  15.9      18.8       25          31                None      Front         4        1.8
2        Acura  Legend Midsize      29.2  33.9      38.7       18          25 Driver & Passenger      Front         6        3.2
3         Audi      90 Compact      25.9  29.1      32.3       20          26        Driver only      Front         6        2.8
4         Audi     100 Midsize      30.8  37.7      44.6       19          26 Driver & Passenger      Front         6        2.8
5          BMW    535i Midsize      23.7  30.0      36.2       22          30        Driver only       Rear         4        3.5
6        Buick Century Midsize      14.2  15.7      17.3       22          31        Driver only      Front         4        2.2
  Horsepower  RPM Rev.per.mile Man.trans.avail Fuel.tank.capacity Passengers Length Wheelbase Width Turn.circle Rear.seat.room
1        140 6300         2890             Yes               13.2          5    177       102    68          37           26.5
2        200 5500         2335             Yes               18.0          5    195       115    71          38           30.0
3        172 5500         2280             Yes               16.9          5    180       102    67          37           28.0
4        172 5500         2535             Yes               21.1          6    193       106    70          37           31.0
5        208 5700         2545             Yes               21.1          4    186       109    69          39           27.0
6        110 5200         2565              No               16.4          6    189       105    69          41           28.0
  Luggage.room Weight  Origin          Make
1           11   2705 non-USA Acura Integra
2           15   3560 non-USA  Acura Legend
3           14   3375 non-USA       Audi 90
4           17   3405 non-USA      Audi 100
5           13   3640 non-USA      BMW 535i
6           16   2880     USA Buick Century
```

head(Cars93)

Given : Origin

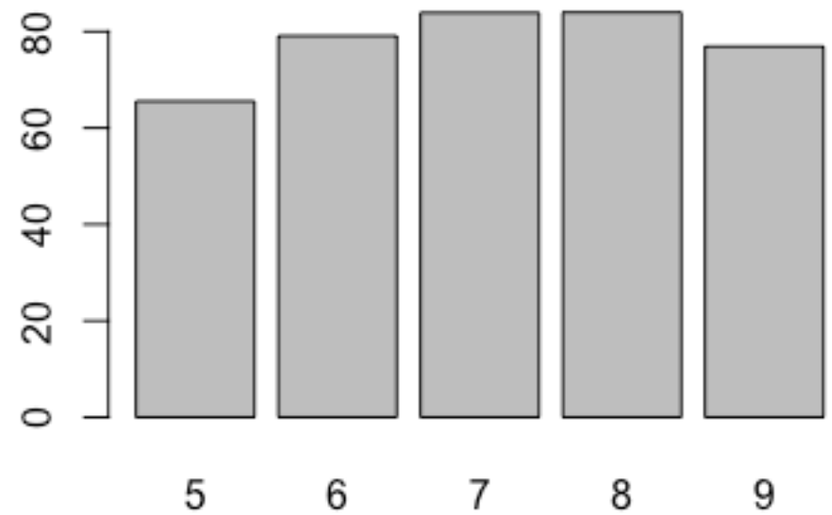
coplot(Horsepower ~ MPG.city|Origin, data = Cars93)



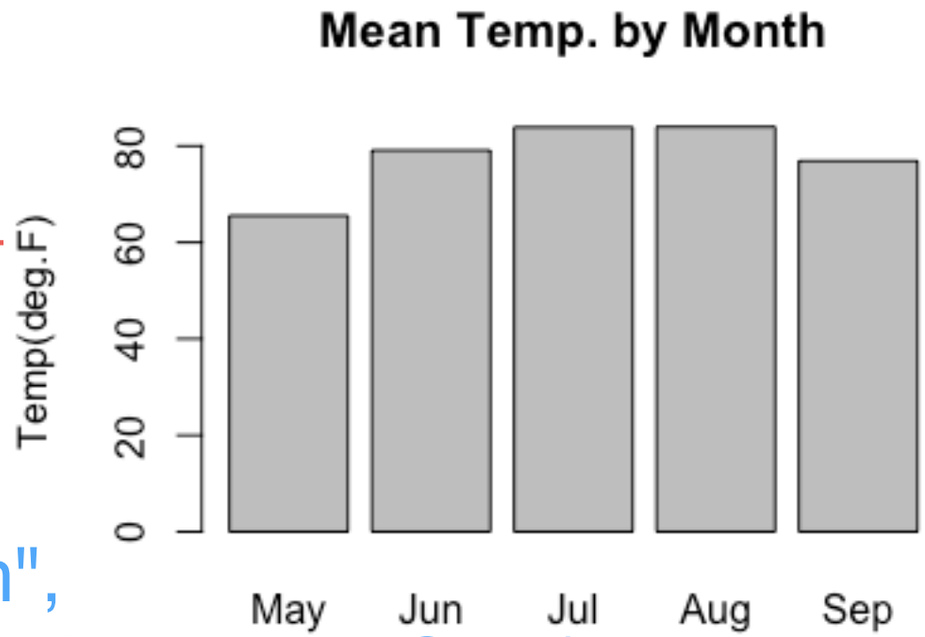
条形图

```
> head(airquality)
  Ozone Solar.R Wind Temp Month Day
1    41     190  7.4   67     5   1
2    36     118  8.0   72     5   2
3    12     149 12.6   74     5   3
4    18     313 11.5   62     5   4
5    NA      NA 14.3   56     5   5
6    28      NA 14.9   66     5   6
```

barplot(height)



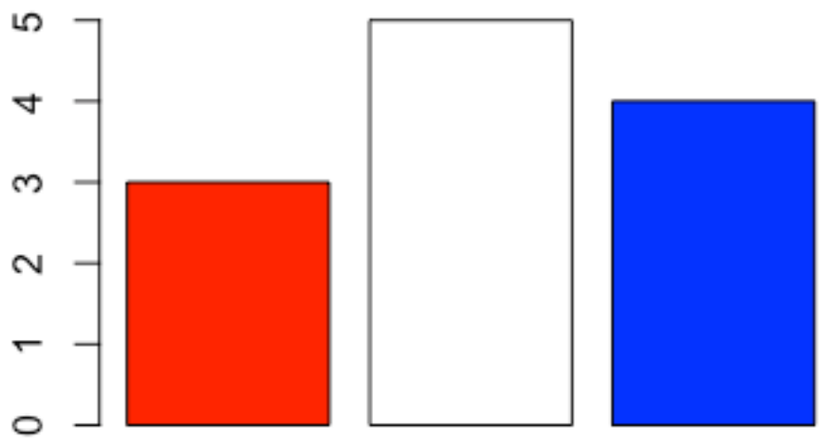

```
> height <- tapply(airquality$Temp, airquality$Month, mean)
> height
       5        6        7        8        9
65.54839 79.10000 83.90323 83.96774 76.90000
```



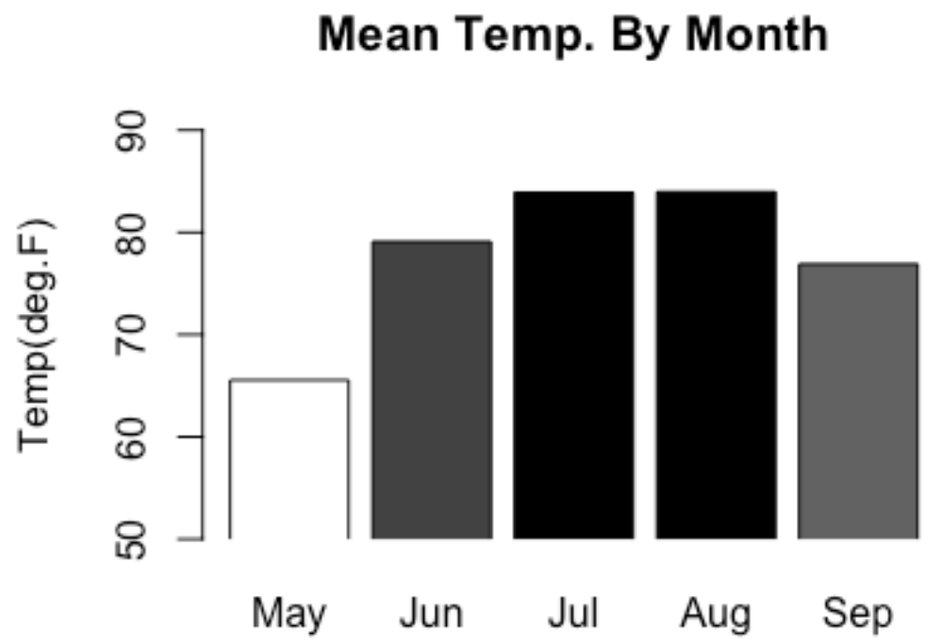

```
barplot(height,
        main = "Mean Temp. by Month",
        names.arg = c("May", "Jun", "Jul", "Aug", "Sep"),
        ylab = "Temp(deg.F)")
```

条形图上色

```
barplot(c(3,5,4),col = c("red","white","blue"))
```

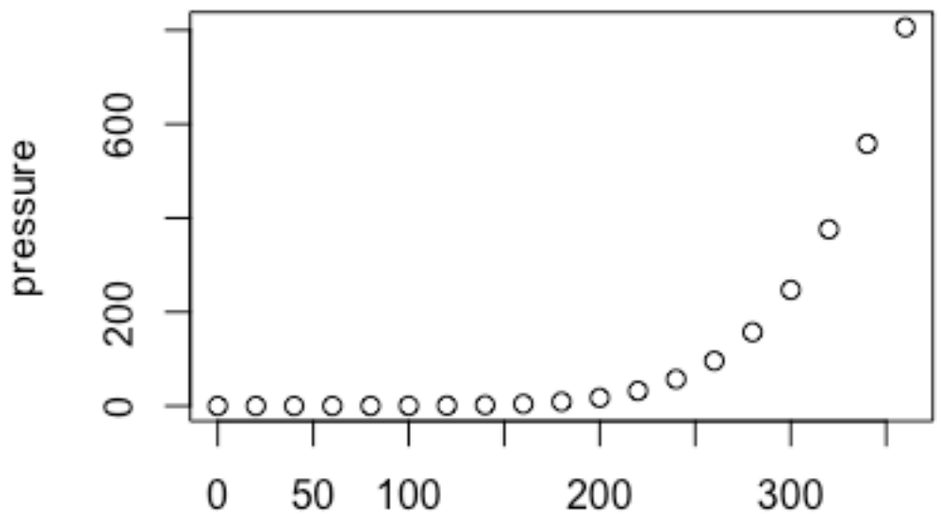



```
rel.hts <- (height - min(height)) / (max(height) - min(height))
grays <- gray(1 - rel.hts)
barplot(height,col = grays,ylim = c(50, 90), xpd = FALSE,main = "Mean
Temp. By Month",names.arg = c("May", "Jun", "Jul", "Aug", "Sep"),ylab =
"Temp(deg.F)")
```

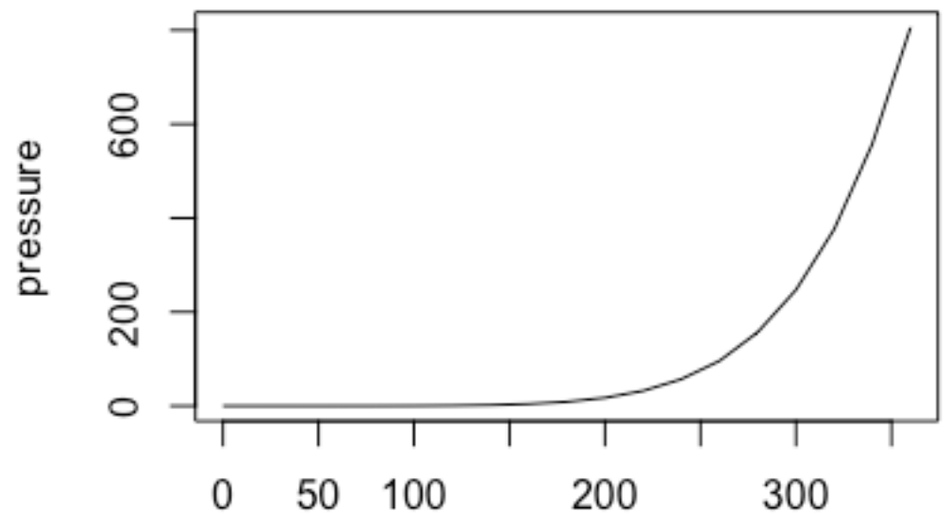


线图

plot(pressure)

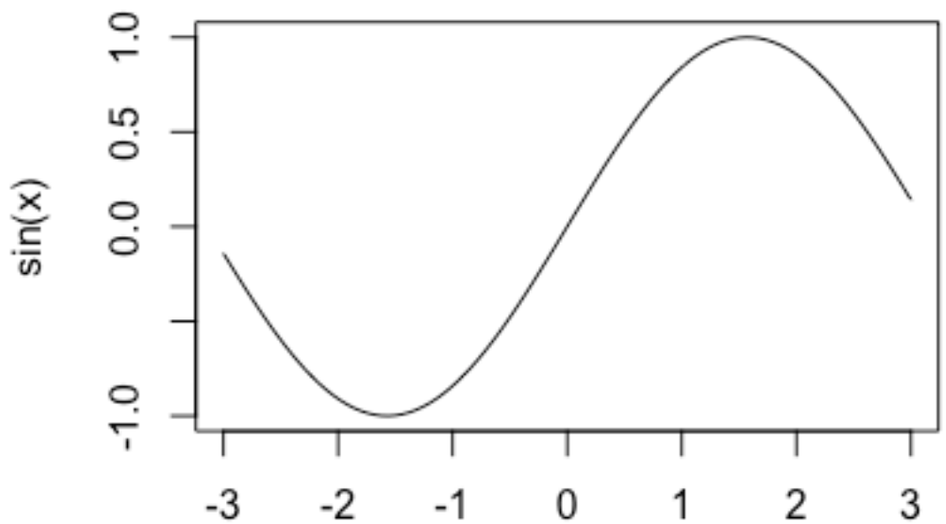


plot(pressure, type = "l")

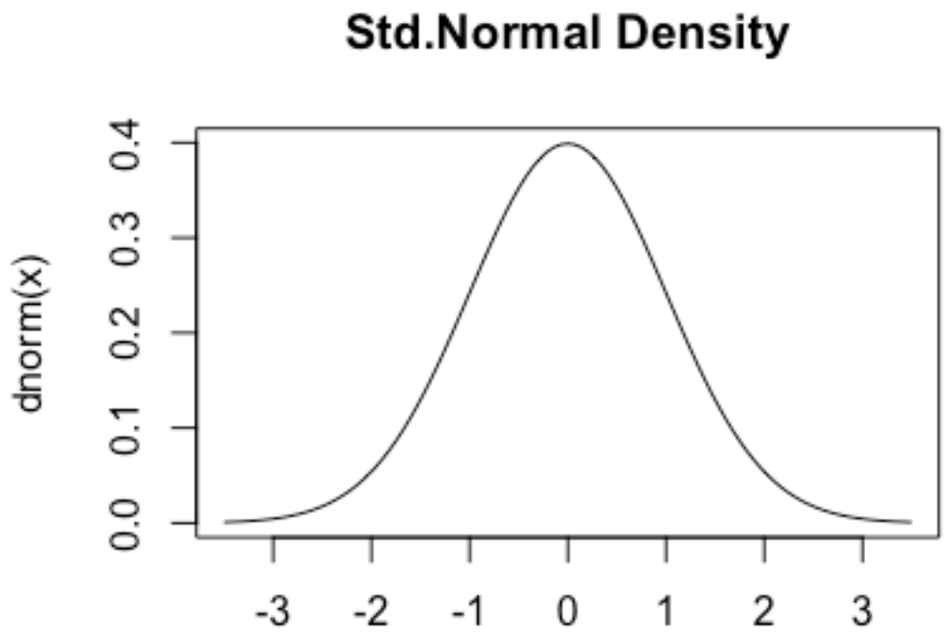


绘制函数

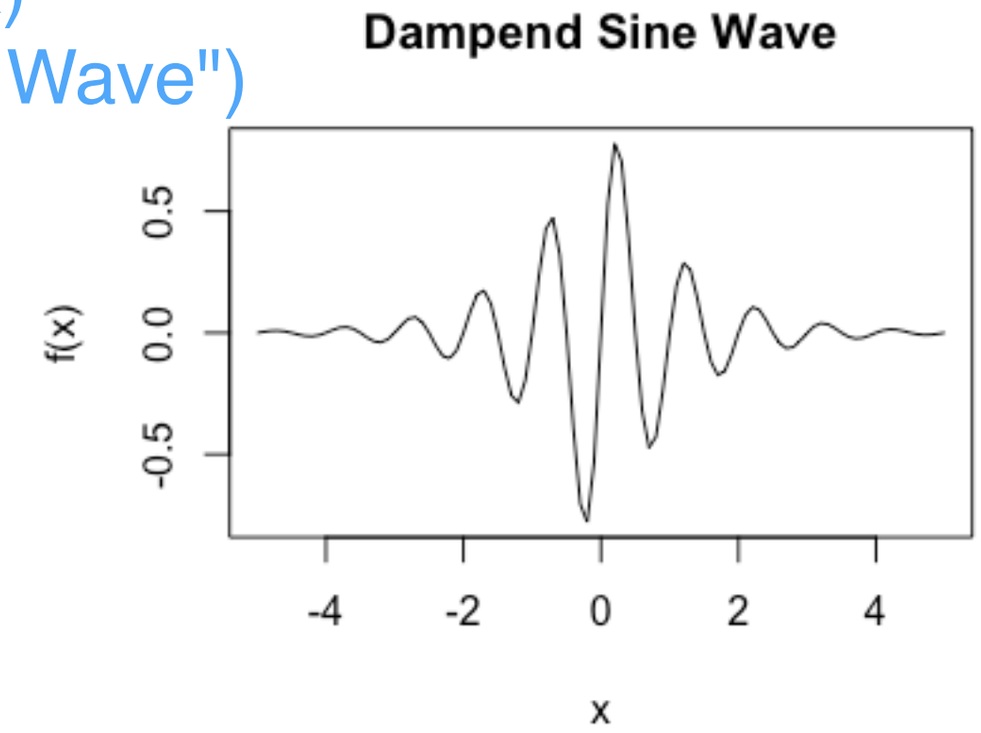
```
curve(sin, -3, 3)
```




```
curve(dnorm, -3.5, +3.5, main="Std.Normal Density")
```




```
f <- function(x) exp(-abs(x)) * sin(2*pi*x)
curve(f, -5, +5, main = "Dampend Sine Wave")
```



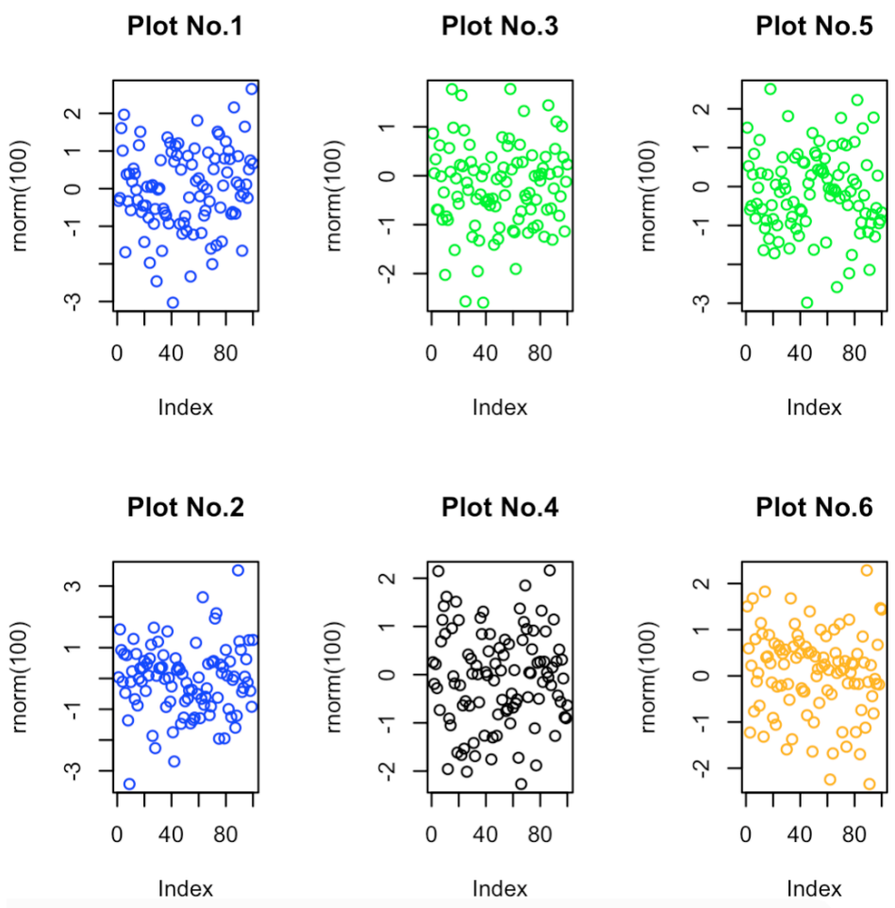
图形控制

R Graphs Cookbook

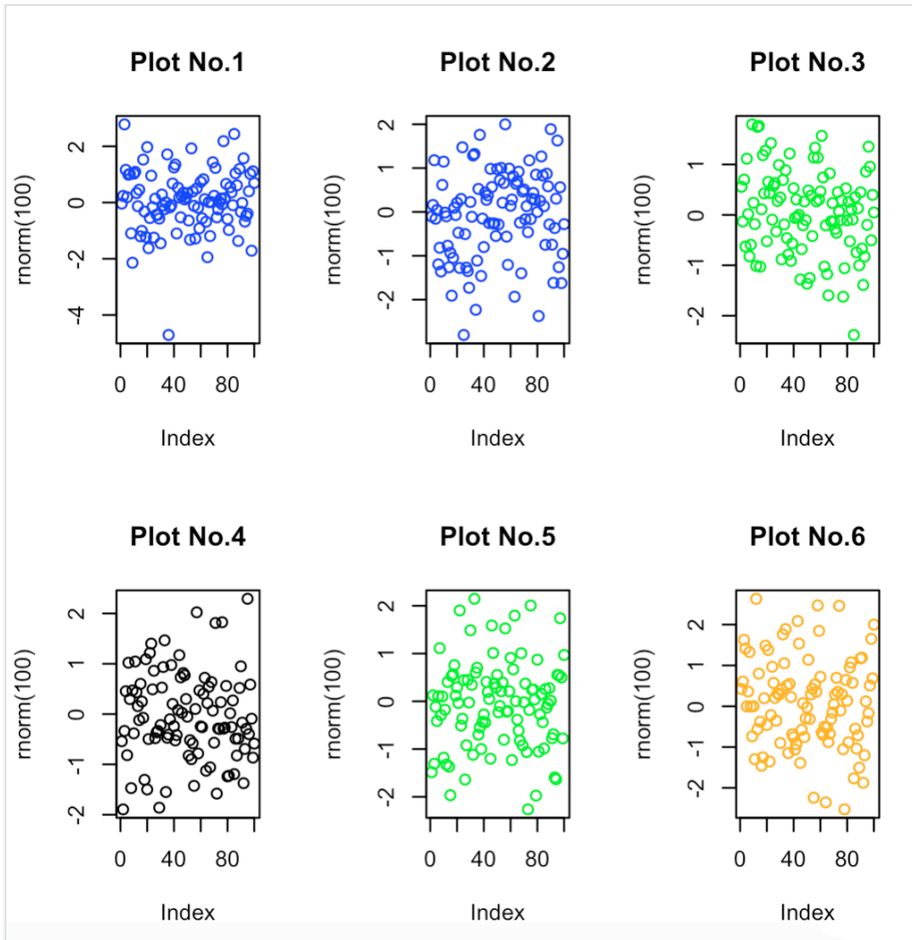
CH1,CH4, CH5@ R Graphs Cookbook

一页显示多个图形

```
par(mfrow=c(2,3))
plot(rnorm(100),col="blue",main="Plot No.1")
plot(rnorm(100),col="blue",main="Plot No.2")
plot(rnorm(100),col="green",main="Plot No.3")
plot(rnorm(100),col="black",main="Plot No.4")
plot(rnorm(100),col="green",main="Plot No.5")
plot(rnorm(100),col="orange",main="Plot No.6")
```

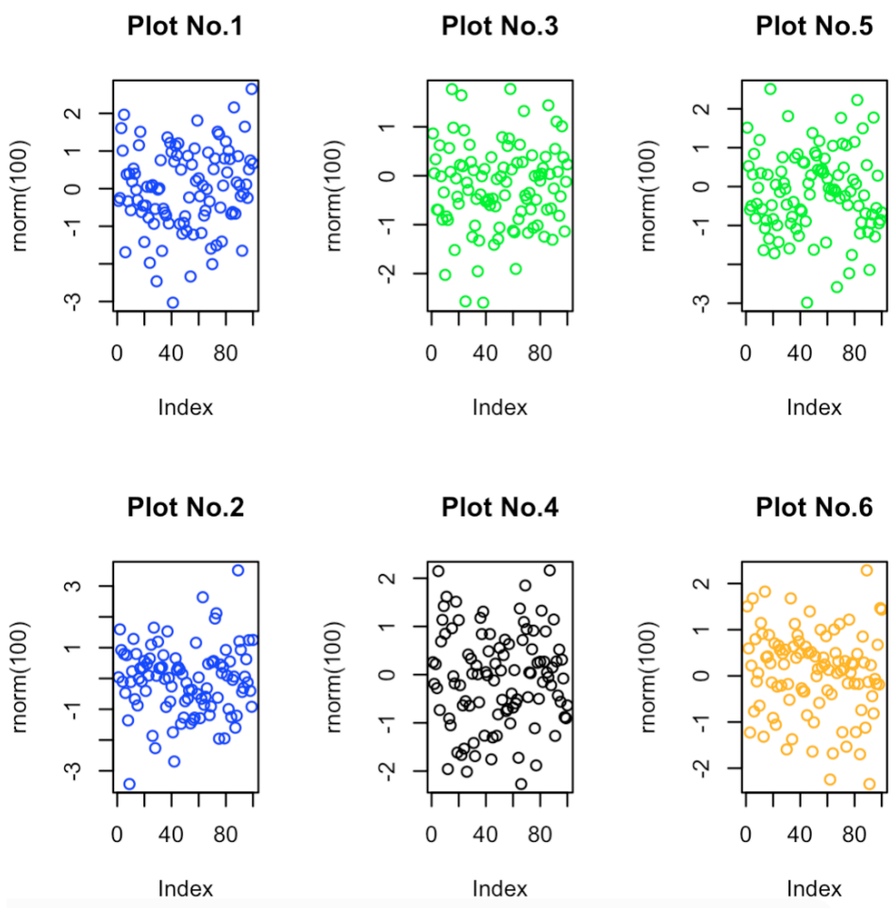



```
par(mfcol=c(2,3))
plot(rnorm(100),col="blue",main="Plot No.1")
plot(rnorm(100),col="blue",main="Plot No.2")
plot(rnorm(100),col="green",main="Plot No.3")
plot(rnorm(100),col="black",main="Plot No.4")
plot(rnorm(100),col="green",main="Plot No.5")
plot(rnorm(100),col="orange",main="Plot No.6")
```

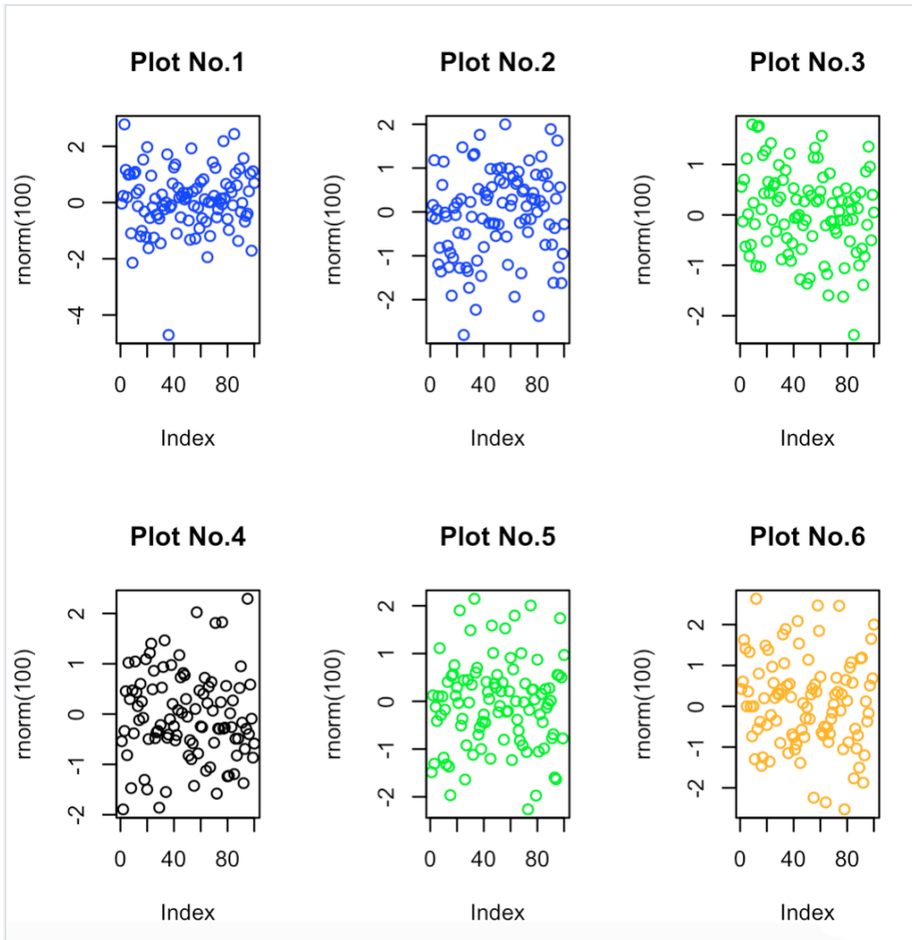


一页显示多个图形

```
par(mfrow=c(2,3))
plot(rnorm(100),col="blue",main="Plot No.1")
plot(rnorm(100),col="blue",main="Plot No.2")
plot(rnorm(100),col="green",main="Plot No.3")
plot(rnorm(100),col="black",main="Plot No.4")
plot(rnorm(100),col="green",main="Plot No.5")
plot(rnorm(100),col="orange",main="Plot No.6")
```

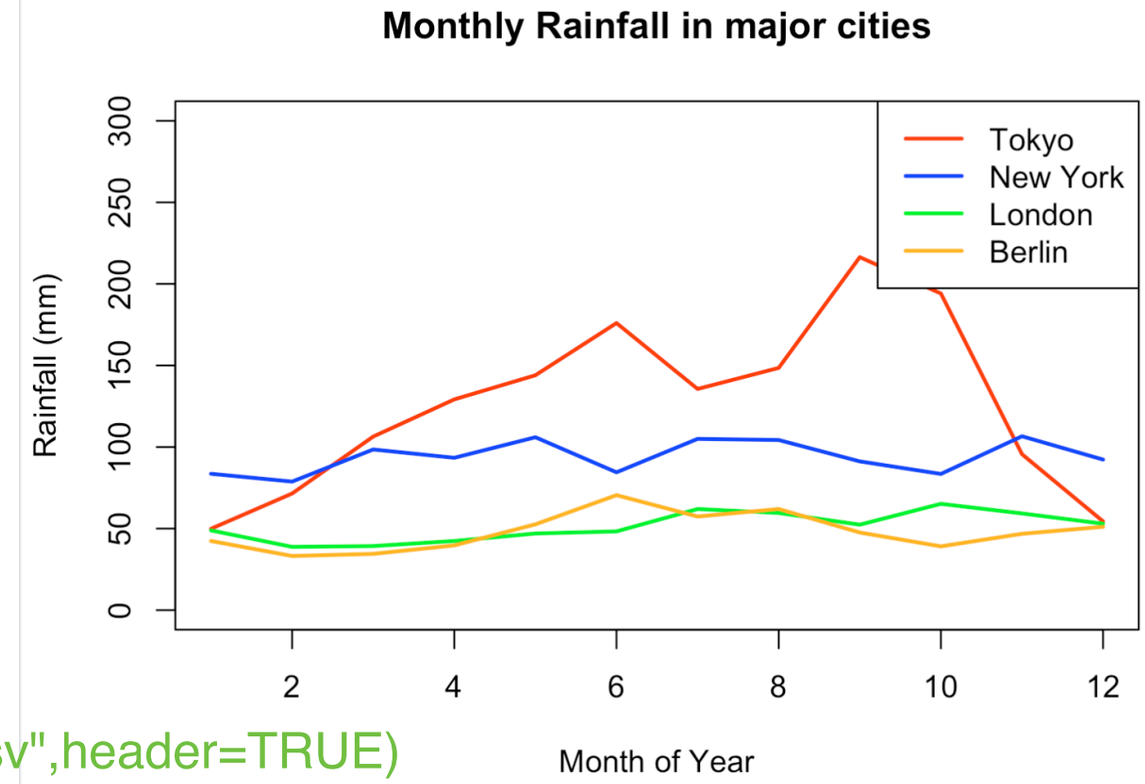



```
par(mfcol=c(2,3))
plot(rnorm(100),col="blue",main="Plot No.1")
plot(rnorm(100),col="blue",main="Plot No.2")
plot(rnorm(100),col="green",main="Plot No.3")
plot(rnorm(100),col="black",main="Plot No.4")
plot(rnorm(100),col="green",main="Plot No.5")
plot(rnorm(100),col="orange",main="Plot No.6")
```



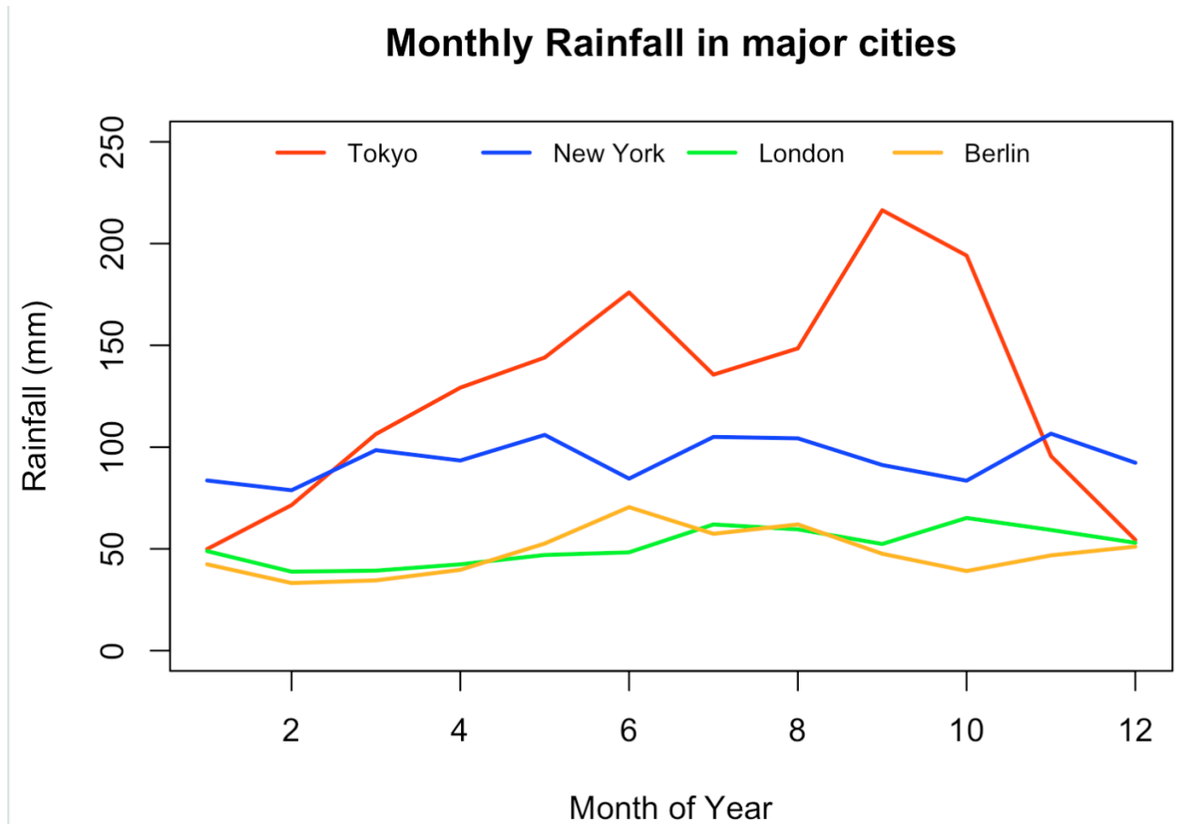
图例 – 基本例子

```
plot(rain$Tokyo,type="l",col="red",
     ylim=c(0,300),
     main="Monthly Rainfall in major cities",
     xlab="Month of Year",ylab="Rainfall (mm)",lwd=2)
lines(rain$NewYork,type="l",col="blue",lwd=2)
lines(rain$London,type="l",col="green",lwd=2)
lines(rain$Berlin,type="l",col="orange",lwd=2)

legend("topright",
       legend=c("Tokyo","New York","London","Berlin"),
       col=c("red","blue","green","orange"),
       lty=1,lwd=2)
```



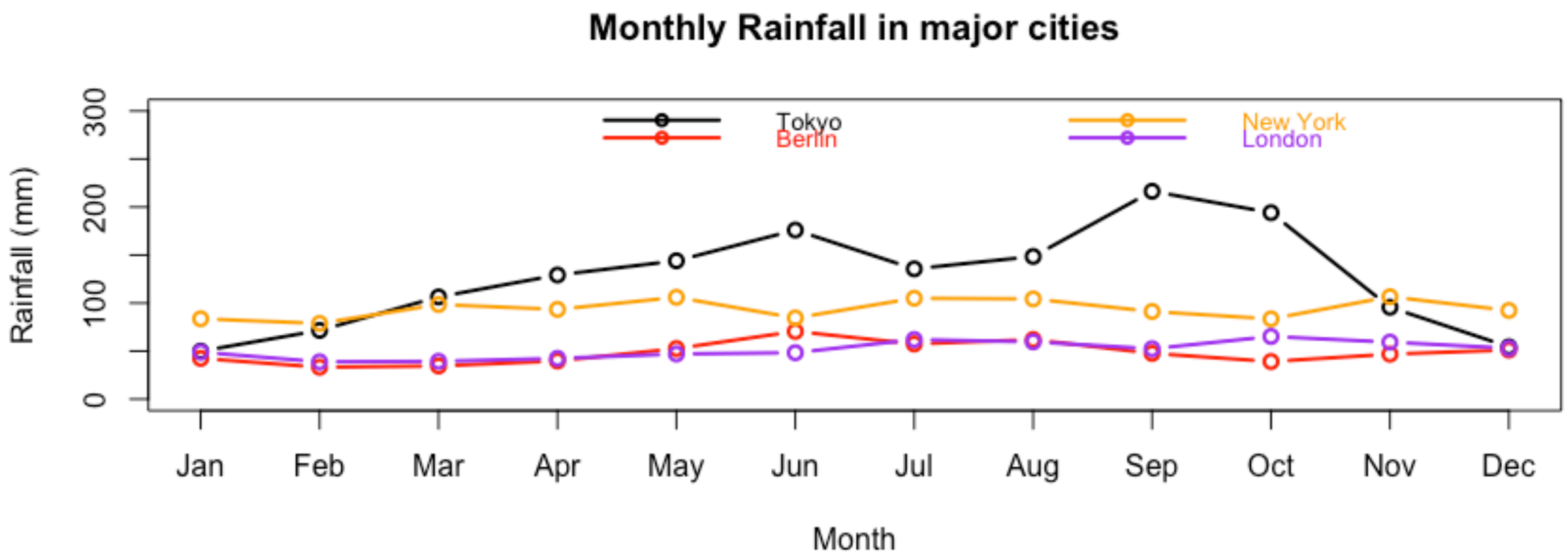

```
rain<-read.csv("cityrain.csv",header=TRUE)
```

```
plot(rain$Tokyo,type="l",col="red",
     ylim=c(0,250),
     main="Monthly Rainfall in major cities",
     xlab="Month of Year",ylab="Rainfall (mm)", lwd=2)
lines(rain$NewYork,type="l",col="blue",lwd=2)
lines(rain$London,type="l",col="green",lwd=2)
lines(rain$Berlin,type="l",col="orange",lwd=2)

legend("top",
       legend=c("Tokyo","New York","London","Berlin"),
       ncol=4,cex=0.8,bty="n",
       col=c("red","blue","green","orange"),
       lty=1,lwd=2)
```



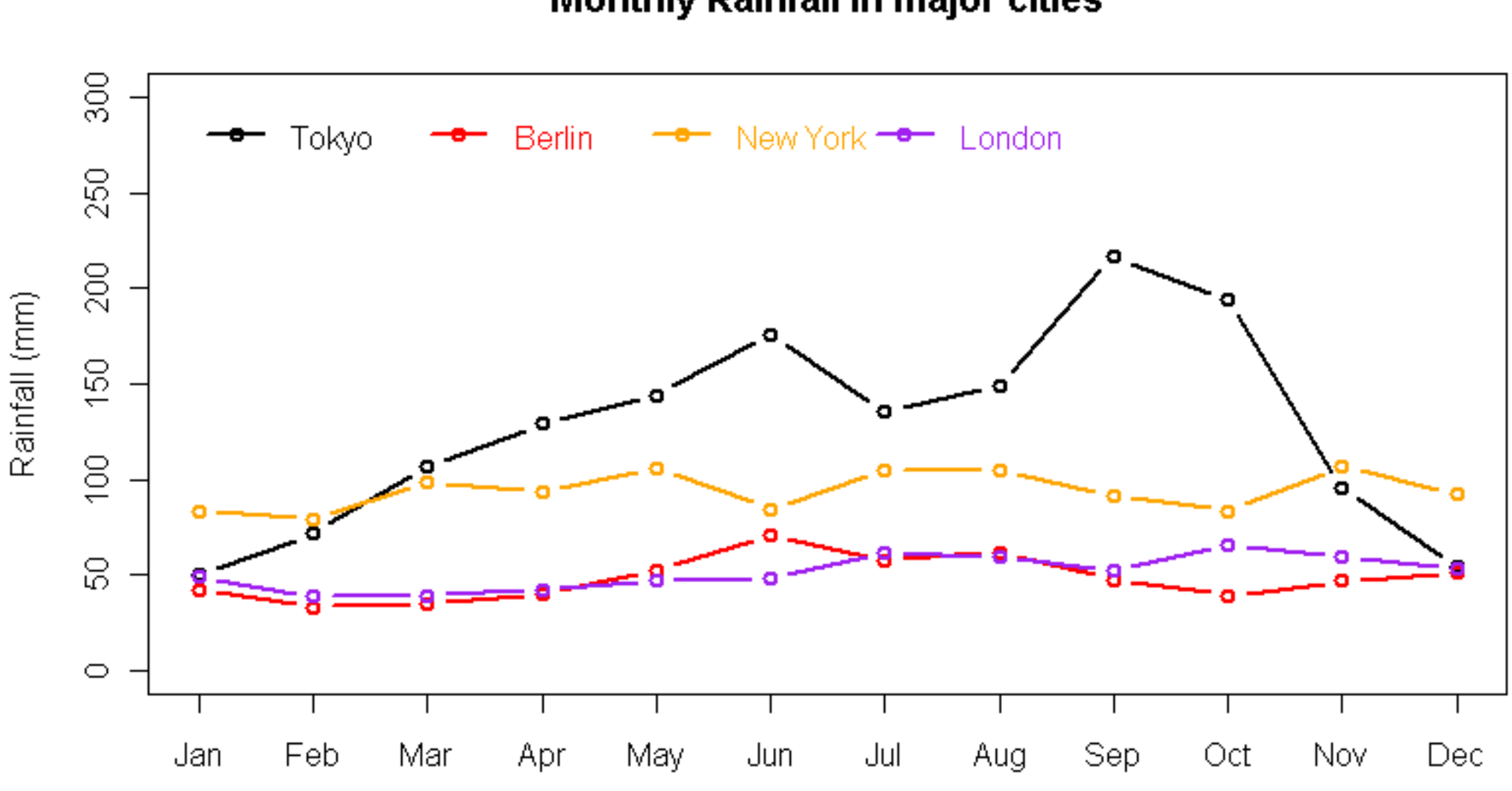
图例 – 使用坐标定位

```
rain<-read.csv("cityrain.csv")
plot(rain$Tokyo,type="b",lwd=2, xaxt="n",ylim=c(0,300),col="black",xlab="Month",ylab="Rainfall
(mm)",main="Monthly Rainfall in major cities")
axis(1,at=1:length(rain$Month),labels=rain$Month)
lines(rain$Berlin,col="red",type="b",lwd=2)
lines(rain$NewYork,col="orange",type="b",lwd=2)
lines(rain$London,col="purple",type="b",lwd=2)

legend("topright",legend=c("Tokyo","Berlin","New York", “London”), lty=1, lwd=2, pch=21,
col=c(“black","red","orange","purple"), ncol=2, bty="n",cex=0.8, text.col=c(“black","red","orange","purple"),
inset=0.01)
```



图例 – 使用坐标定位

```
legend(1,300,legend=c("Tokyo","Berlin","New York","London"),
       lty=1,lwd=2,pch=21,col=c("black","red","orange","purple"),
       horiz=TRUE,bty="n",bg="yellow",cex=1,
       text.col=c("black","red","orange","purple"))
```

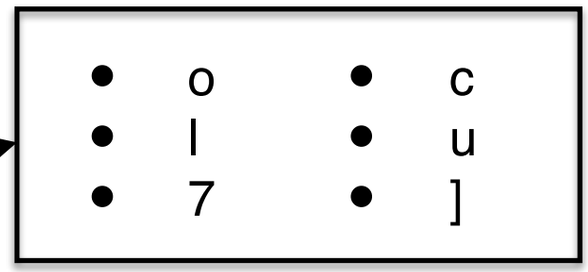


图例 – 边界标记

gdp<-read.table("gdp_long.txt",header=T)

library(RColorBrewer)
pal<-brewer.pal(5,"Set1")

par(mar=par()$mar+c(0,0,0,2),bty="l")



plot(Canada~Year,data=gdp,type="l",lwd=2,lty=1,ylim=c(30,60),col=pal[1],main="Percentage change in GDP",ylab="")
mtext(side=4,at=gdp$Canada[length(gdp$Canada)],text="Canada",col=pal[1],line=0.3,las=2)

lines(gdp$France~gdp$Year,col=pal[2],lwd=2)
mtext(side=4,at=gdp$France[length(gdp$France)],text="France",col=pal[2],line=0.3,las=2)

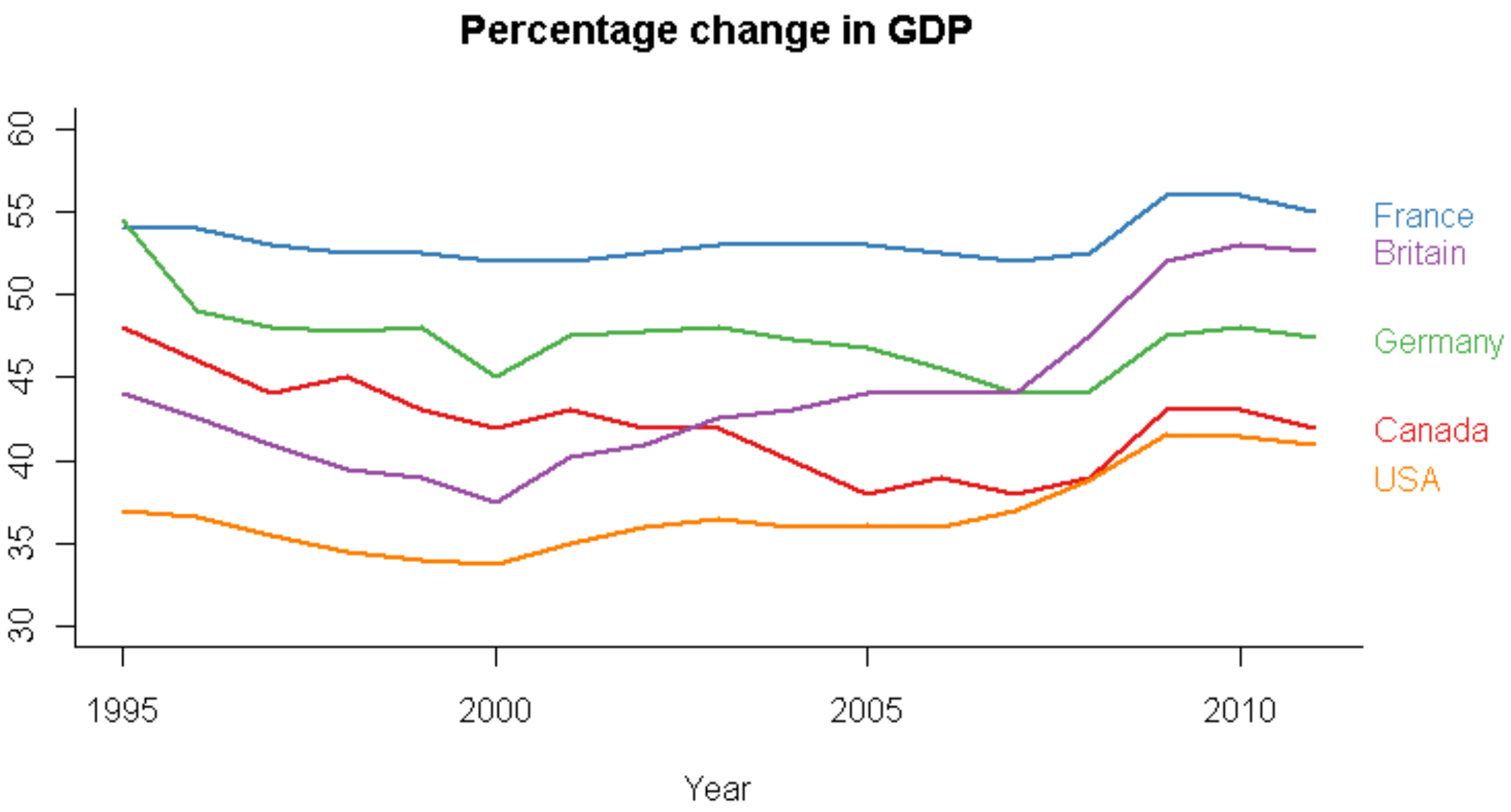
lines(gdp$Germany~gdp$Year,col=pal[3],lwd=2)
mtext(side=4,at=gdp$Germany[length(gdp$Germany)],text="Germany",col=pal[3],line=0.3,las=2)

lines(gdp$Britain~gdp$Year,col=pal[4],lwd=2)
mtext(side=4,at=gdp$Britain[length(gdp$Britain)],text="Britain",col=pal[4],line=0.3,las=2)

lines(gdp$USA~gdp$Year,col=pal[5],lwd=2)
mtext(side=4,at=gdp$USA[length(gdp$USA)]-**2**,text="USA",col=pal[5],line=0.3,las=2)

- **side**
- **1,2,3,4**

图例 – 边界标记

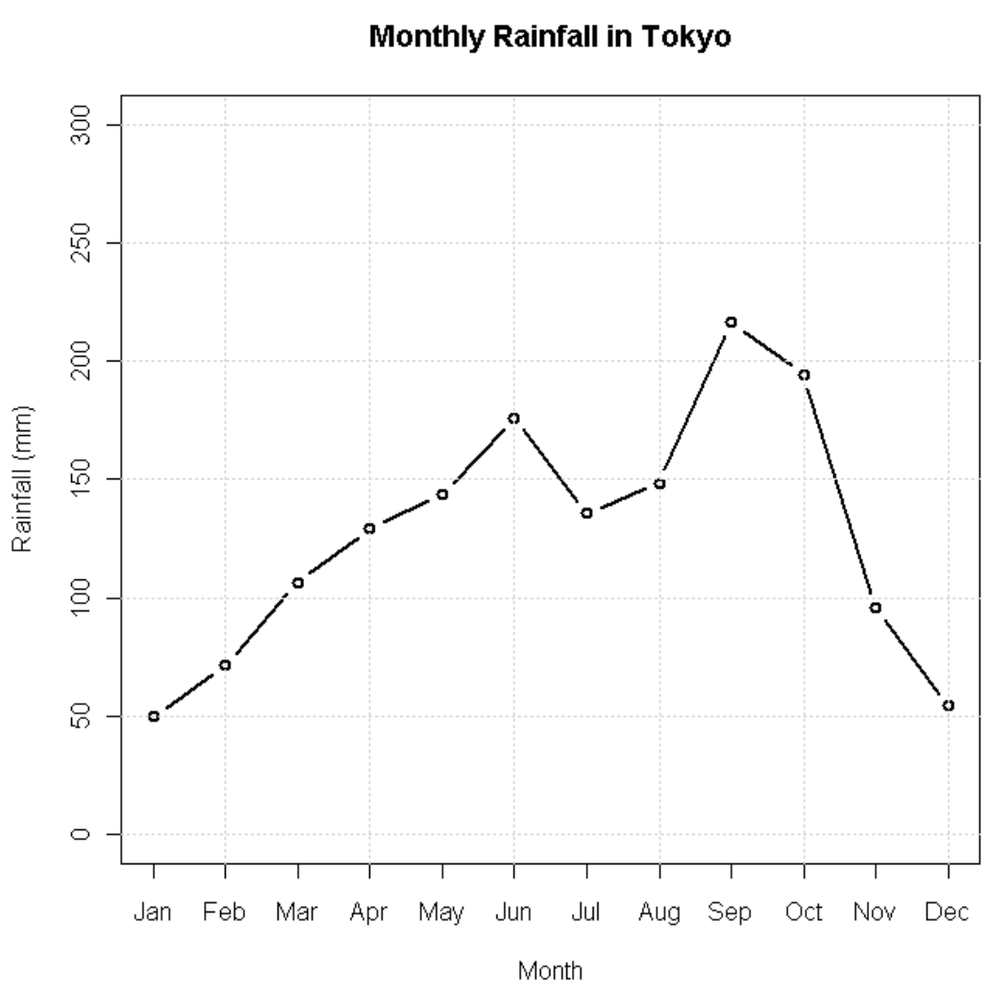

Percentage change in GDP
60
55
50
45
40
35
30
1995
2000
2005
2010
Year
France
Britain
Germany
Canada
USA

折线图 – 网格图

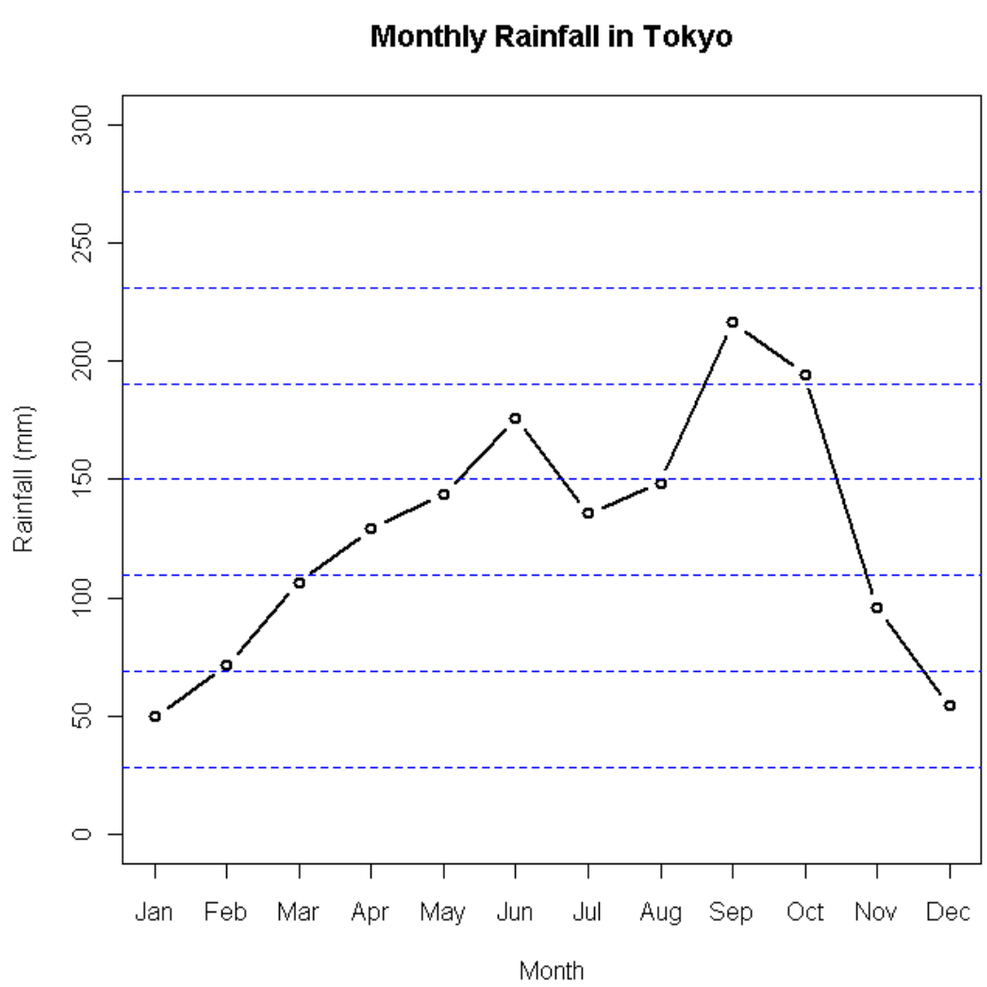
```
rain<-read.csv(“cityrain.csv")
plot(rain$Tokyo,type=“b",lwd=2, xaxt=“n”,ylim=c(0,300),col=“black", xlab=“Month",
      ylab="Rainfall (mm)",main="Monthly Rainfall in Tokyo")
axis(1,at=1:length(rain$Month),labels=rain$Month)
```

---

grid()



grid(nx=NA, ny=8, lwd=1,lty=2,col="blue")

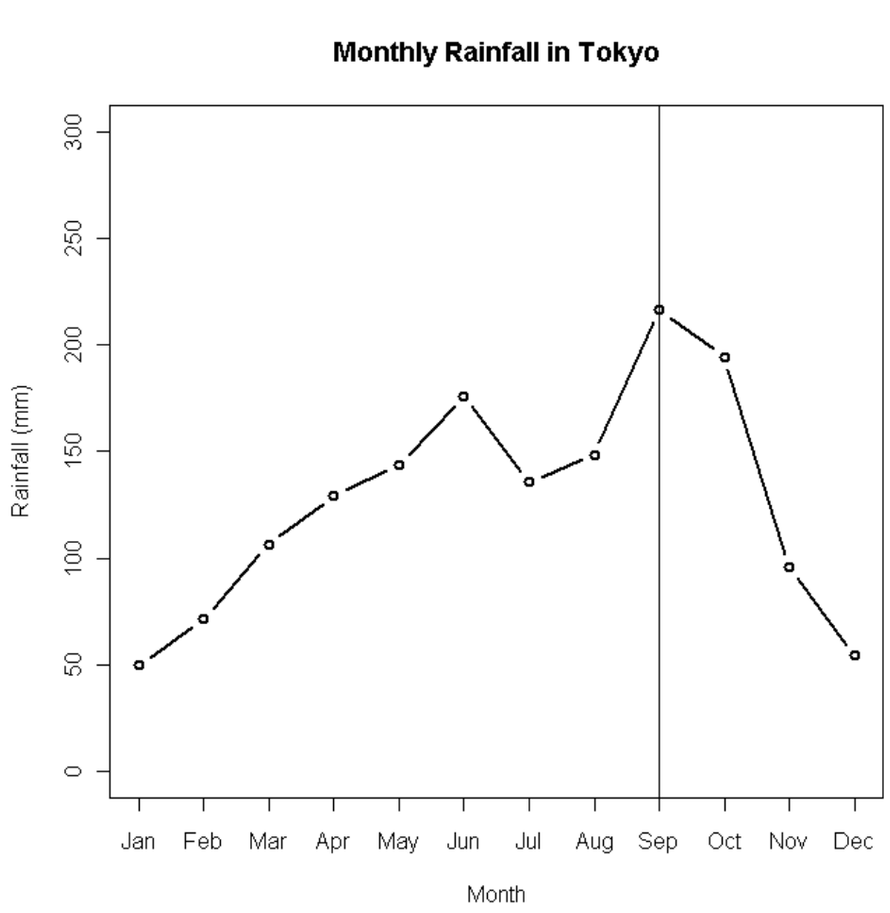


折线图 – 特殊线

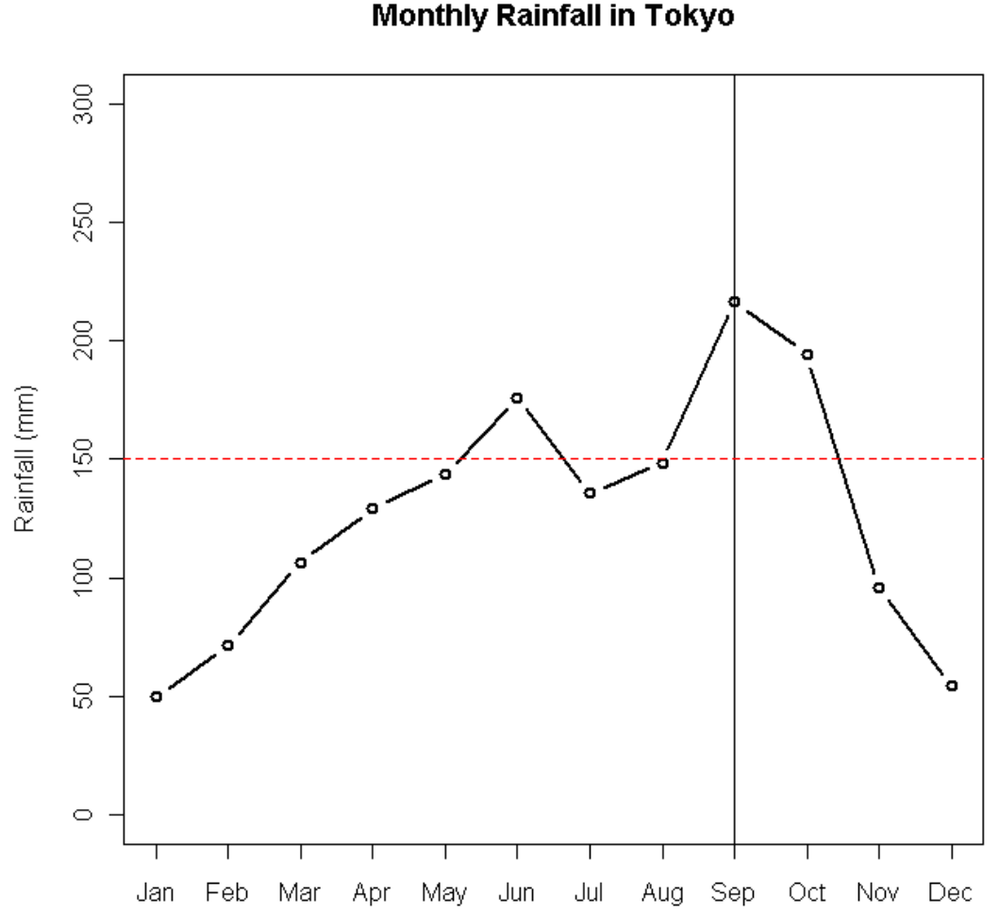
```
rain<-read.csv(“cityrain.csv")
plot(rain$Tokyo,type=“b",lwd=2, xaxt=“n”,ylim=c(0,300),col=“black", xlab=“Month",
      ylab="Rainfall (mm)",main="Monthly Rainfall in Tokyo")
axis(1,at=1:length(rain$Month),labels=rain$Month)
```

---

abline(v=9)



abline(h=150,col="red",lty=2)



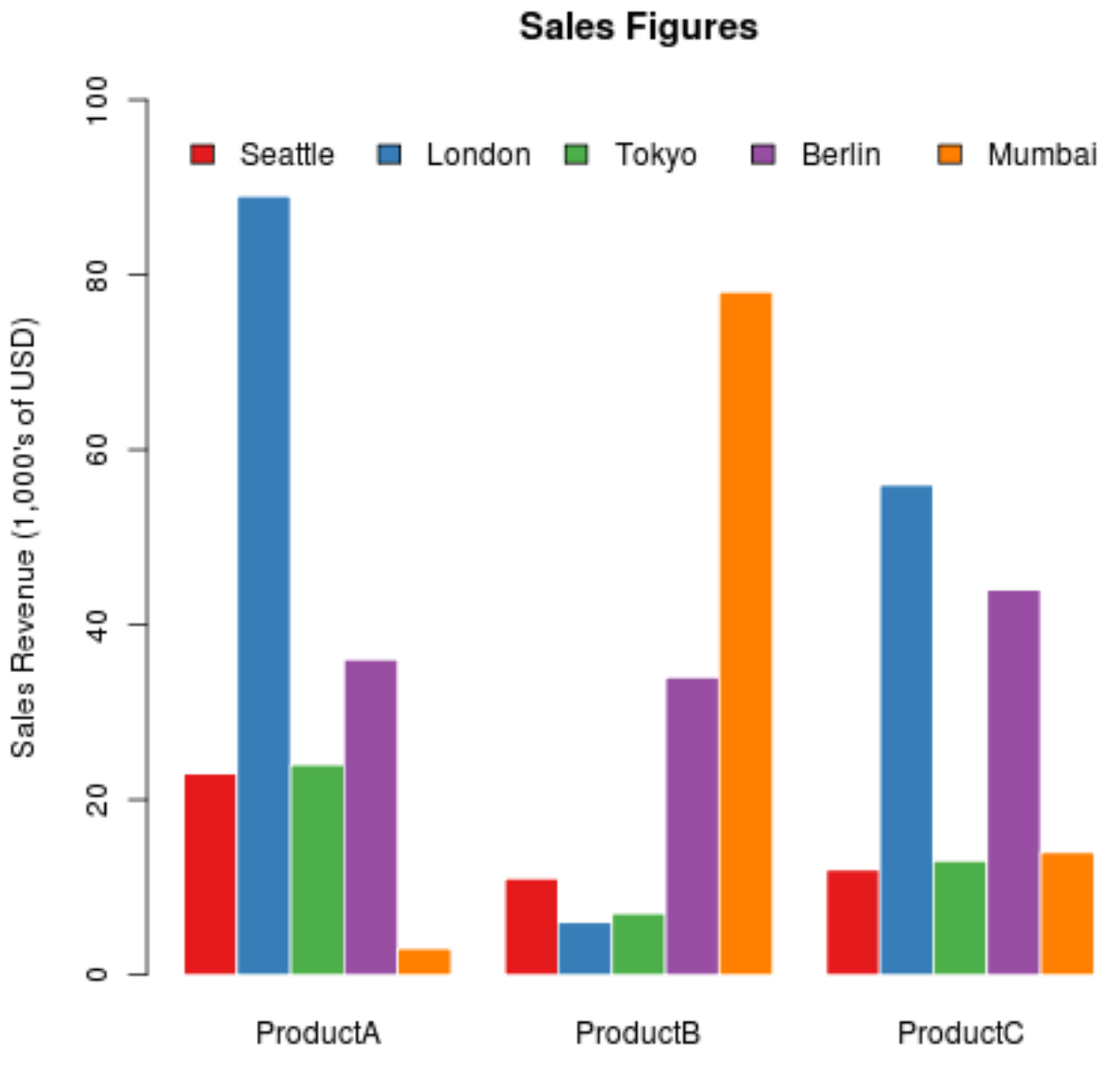
折线图 – 波形线

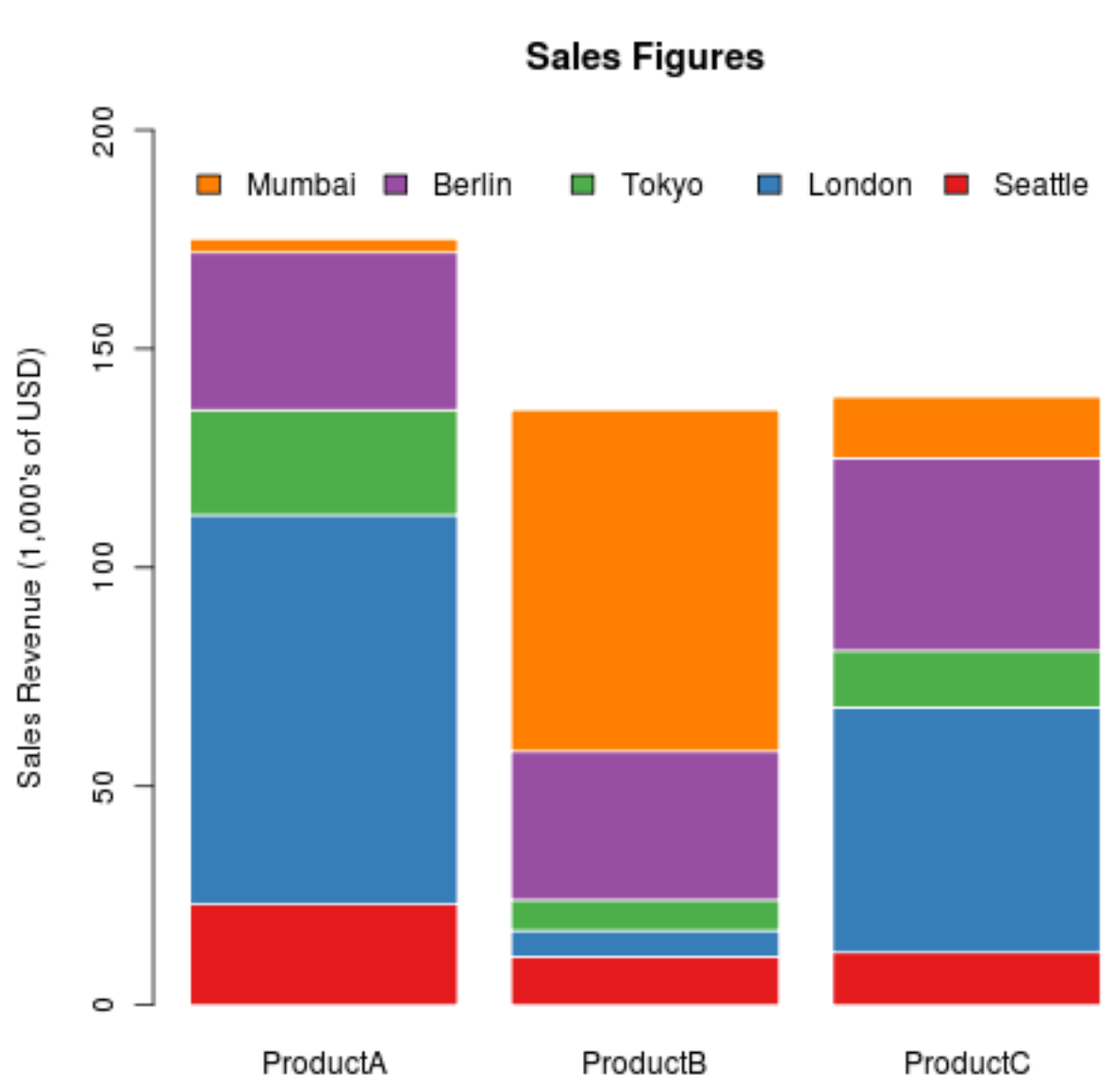
```
rain <- read.csv("cityrain.csv")
par(mfrow=c(4,1),mar=c(5,7,4,2),omi=c(0.2,2,0.2,2))
for(i in 2:5)
{

plot(rain[,i],ann=FALSE,axes=FALSE,type="l",col="g
ray",lwd=2)

mtext(side=2,at=mean(rain[,i]),names(rain[i]),las=2,c
ol="black")

mtext(side=4,at=mean(rain[,i]),mean(rain[i]),las=2,c
ol="black")

points(which.min(rain[,i]),min(rain[,i]),pch=19,col="bl
ue")

points(which.max(rain[,i]),max(rain[,i]),pch=19,col="r
ed")
}
```

条形图 – 堆积

```
citysales<-read.csv("citysales.csv")

barplot(as.matrix(citysales[,2:4]), beside=TRUE,egend.text=citysales$City,
        args.legend=list(bty="n",horiz=TRUE),col=brewer.pal(5,"Set1"),
        border="white",ylim=c(0,100),ylab="Sales Revenue (1,000's of USD)",main="Sales Figures")

box(bty="l")
```

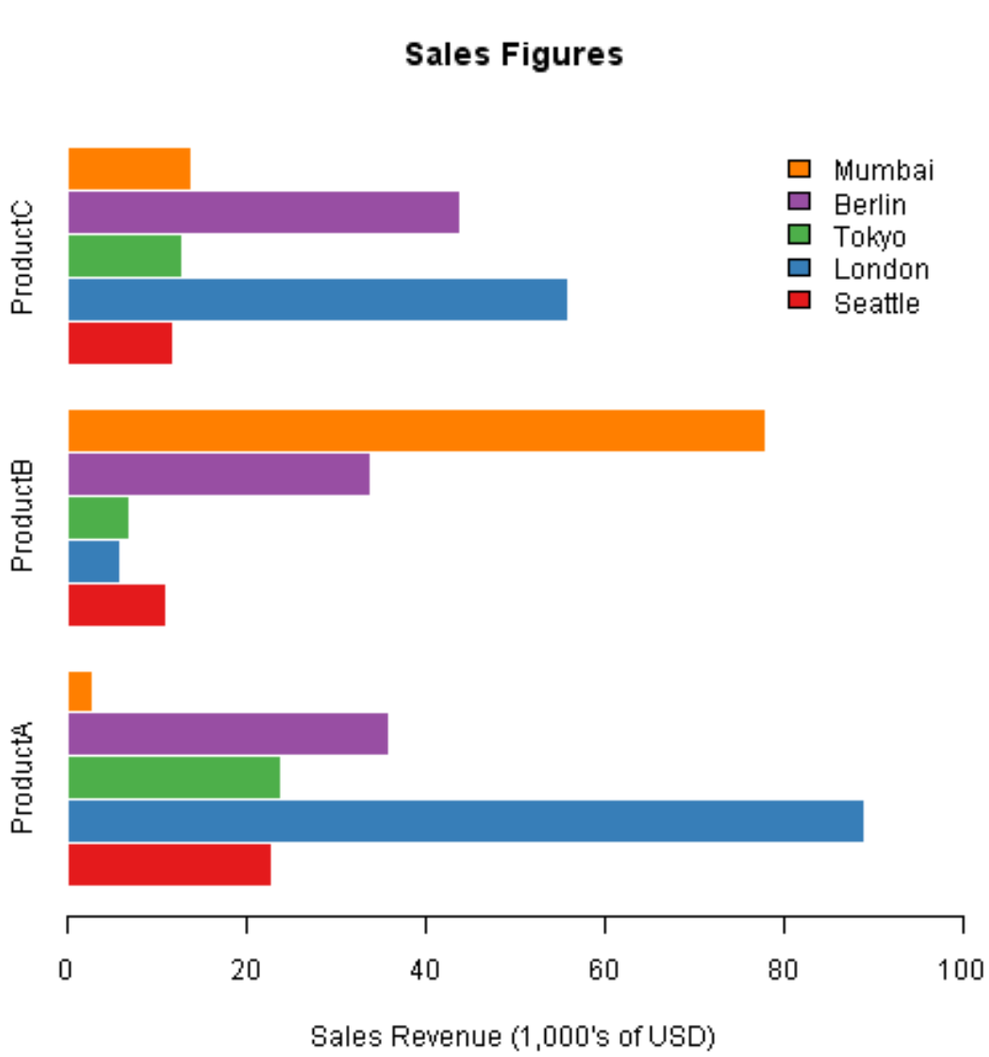
矩阵

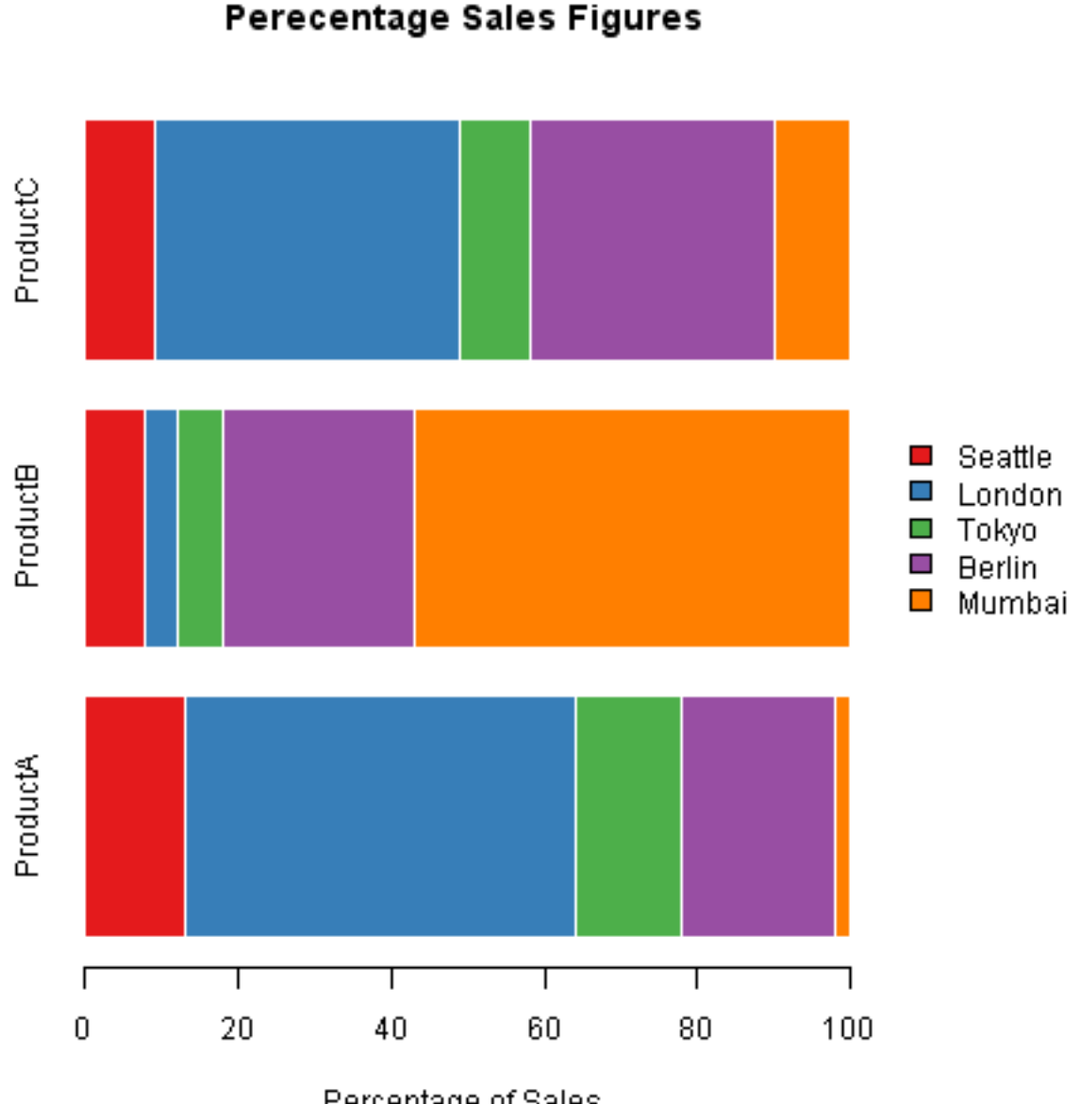




条形图 - 方向

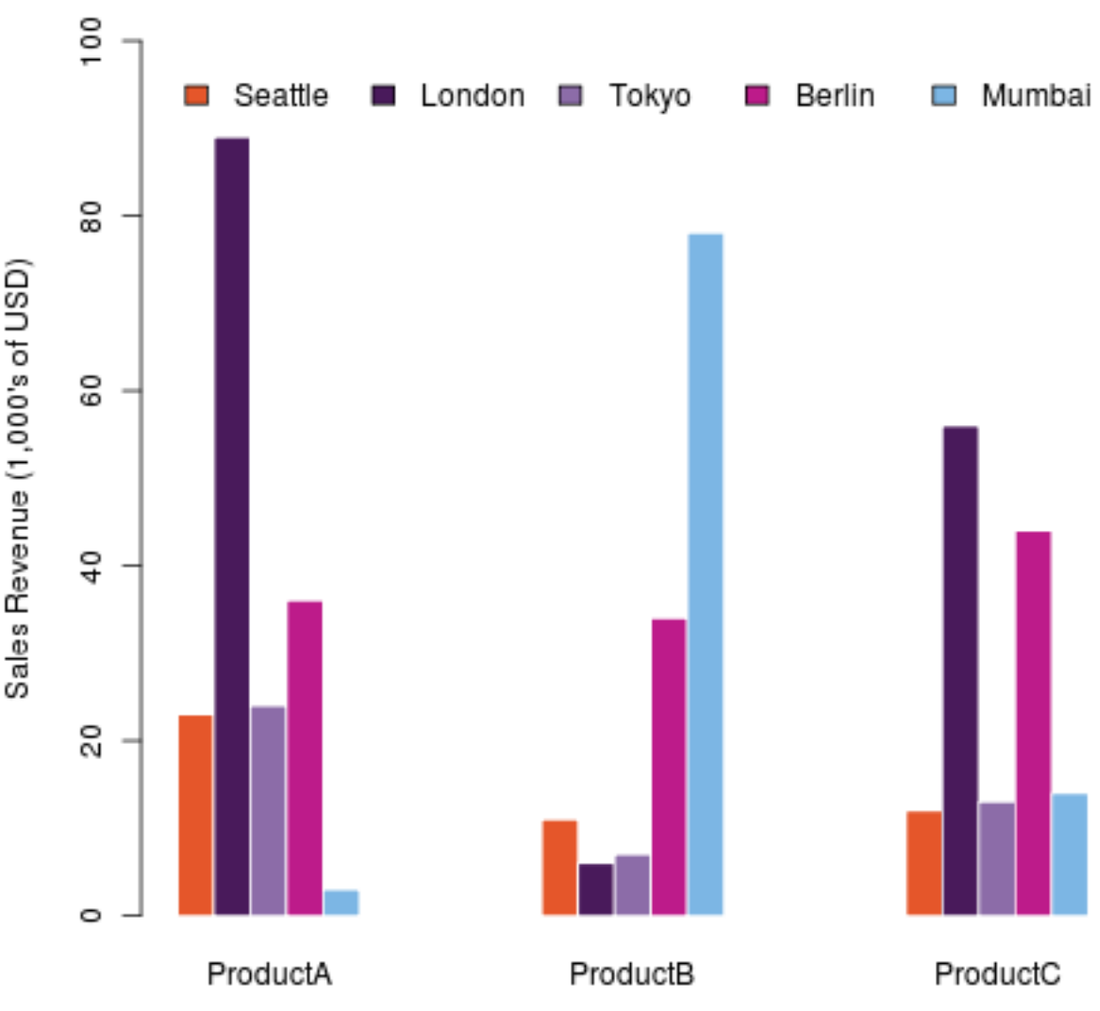
```
barplot(as.matrix(citysales[,2:4]), beside=TRUE,horiz=TRUE,
        legend.text=citysales$City,
        args.legend=list(bty="n"),col=brewer.pal(5,"Set1"), border="white",
        xlim=c(0,100),
        xlab="Sales Revenue (1,000's of USD)",main="Sales Figures")
```



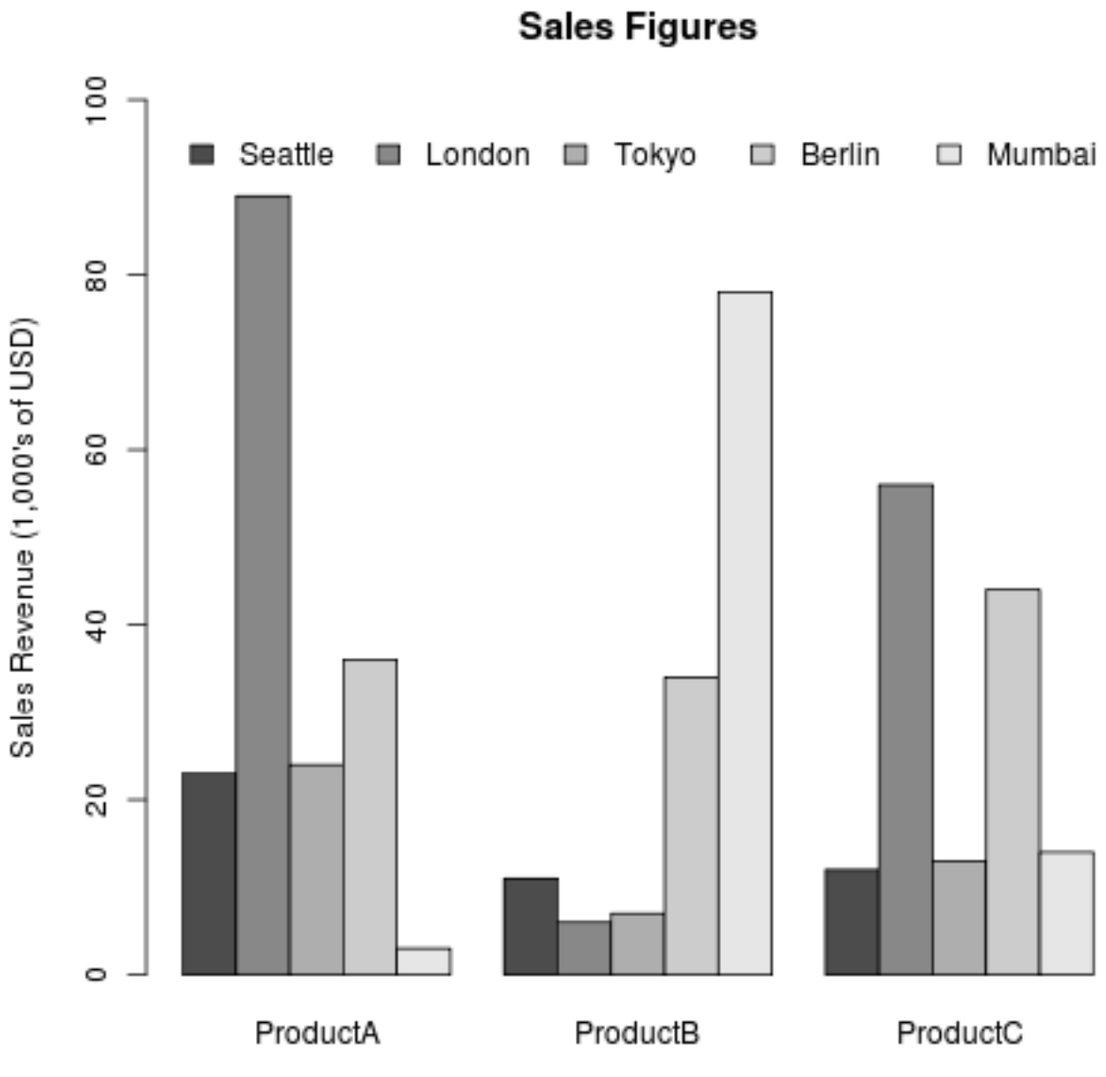


条形图 – 宽度、颜色、边界

```
barplot(as.matrix(citysales[,2:4]), beside=TRUE,
        legend.text=citysales$City,
        args.legend=list(bty="n",horiz=T),
col=c("#E5562A","#491A5B","#8C6CA8","#BD1B8A","
#7CB6E4"),
        border=FALSE,space=c(0,5),ylim=c(0,100),
        ylab="Sales Revenue (1,000's of USD)",
        main="Sales Figures")
```

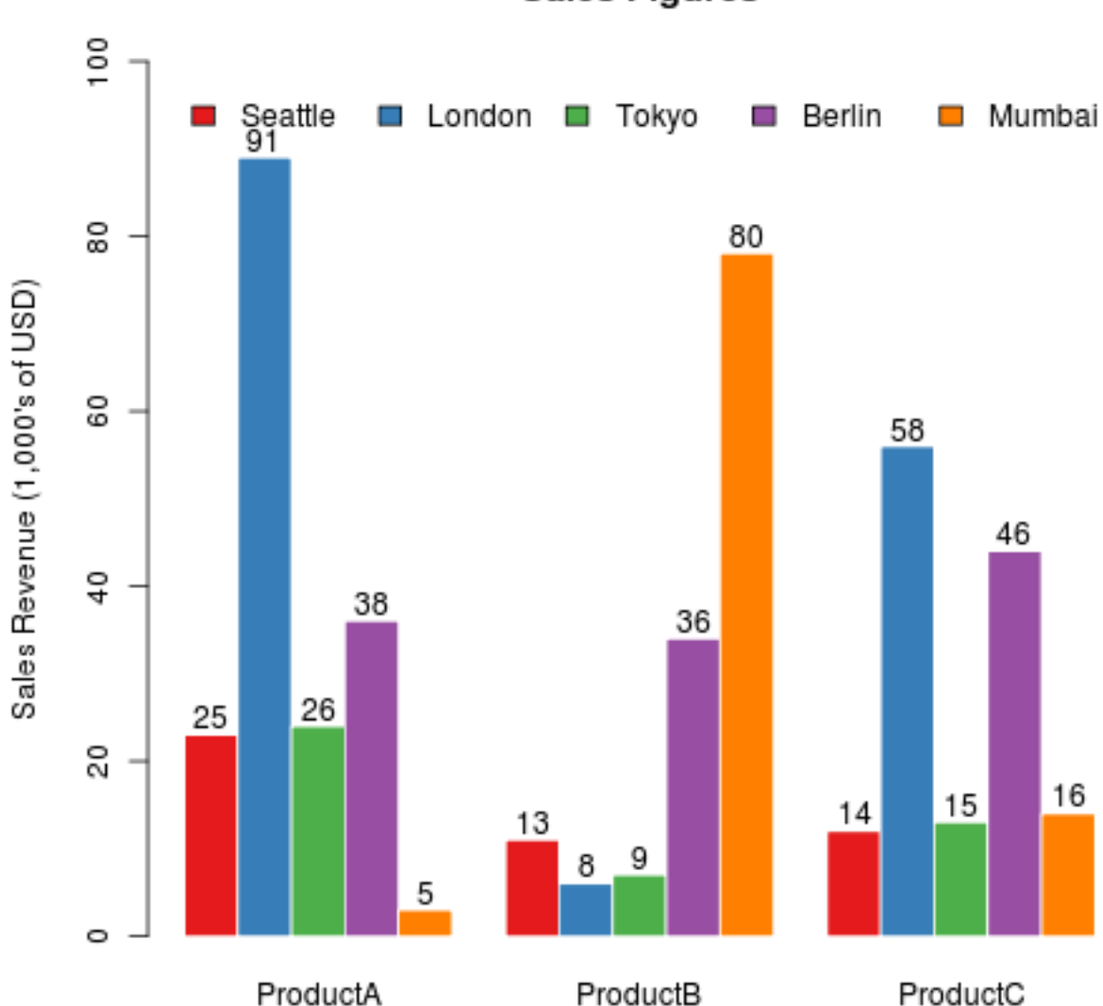



```
barplot(as.matrix(citysales[,2:4]), beside=T,
        legend.text=citysales$City,
        args.legend=list(bty="n",horiz=T),
        ylim=c(0,100),
        ylab="Sales Revenue (1,000's of USD)",
        main="Sales Figures")
```

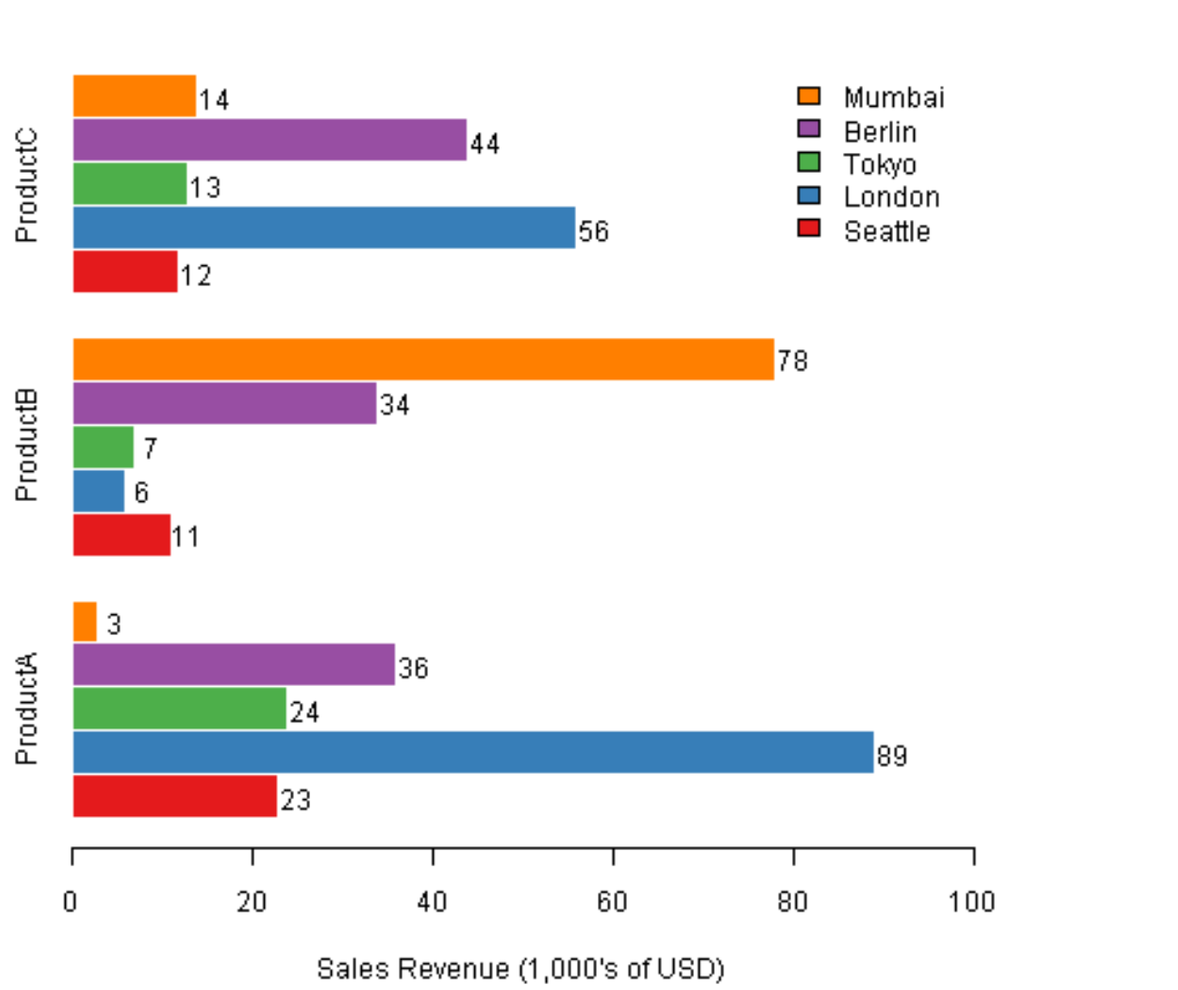


条形图 – 显示数字

```
x<-barplot(as.matrix(citysales[,2:4]), beside=TRUE,
        legend.text=citysales$City,
        args.legend=list(bty="n",horiz=TRUE),
        col=brewer.pal(5,"Set1"),
        border="white",ylim=c(0,100),
        ylab="Sales Revenue (1,000's of USD)",
        main="Sales Figures")
y<-as.matrix(citysales[,2:4])
text(x,y+2,labels=as.character(y))
```

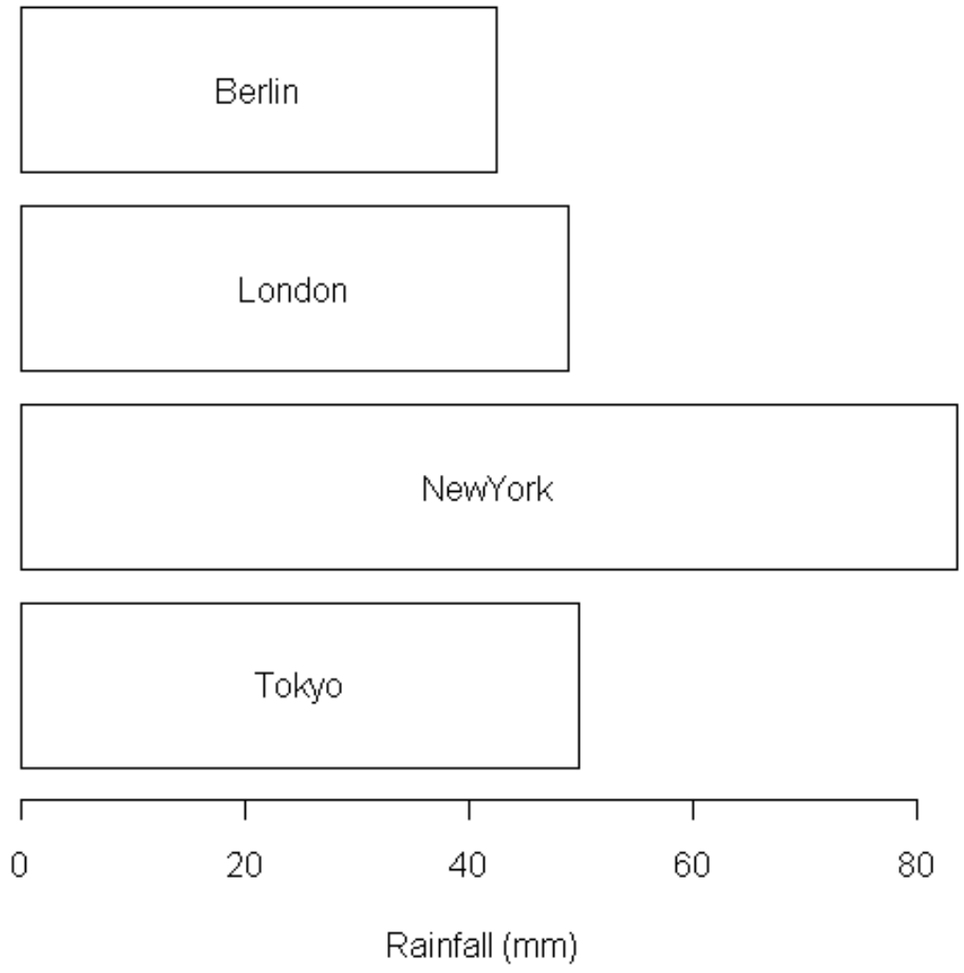



```
y<-barplot(as.matrix(citysales[,2:4]), beside=TRUE,horiz=TRUE,
        legend.text=citysales$City,
        args.legend=list(bty="n"), col=brewer.pal(5,"Set1"),
        border="white", xlim=c(0,100),
        xlab="Sales Revenue (1,000's of USD)",
        main="Sales Figures")
x<-as.matrix(citysales[,2:4])
text(x+2,y,labels=as.character(x))
```



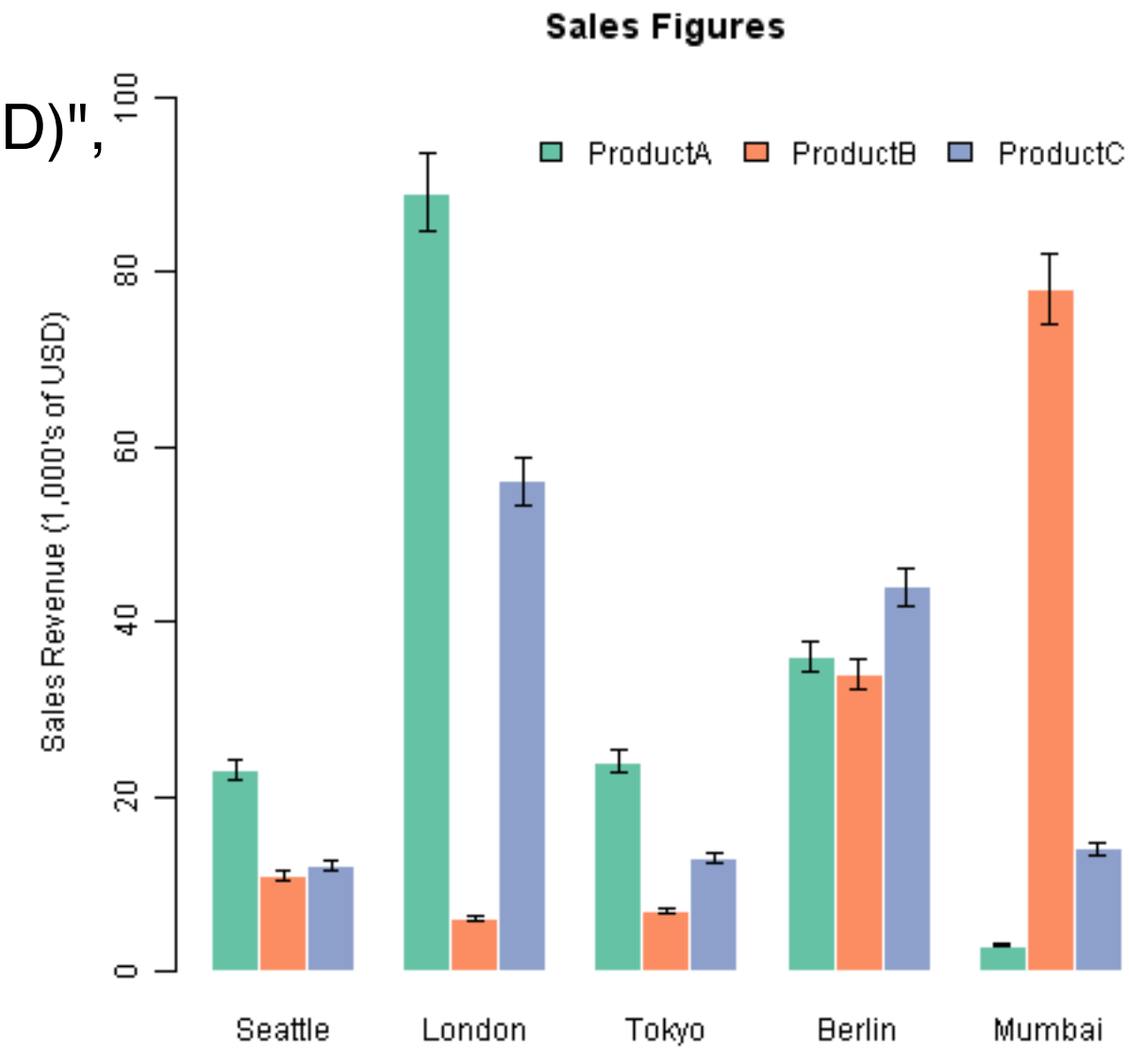
条形图 - 显示标记

```
rain<-read.csv("cityrain.csv")

y<-barplot(as.matrix(rain[1,-1]),horiz=T,col="white",yaxt="n",
        main="Monthly Rainfall in Major CitiesJanuary",
        xlab="Rainfall (mm)")

x<-0.5*rain[1,-1]
text(x,y,colnames(rain[-1]))
```



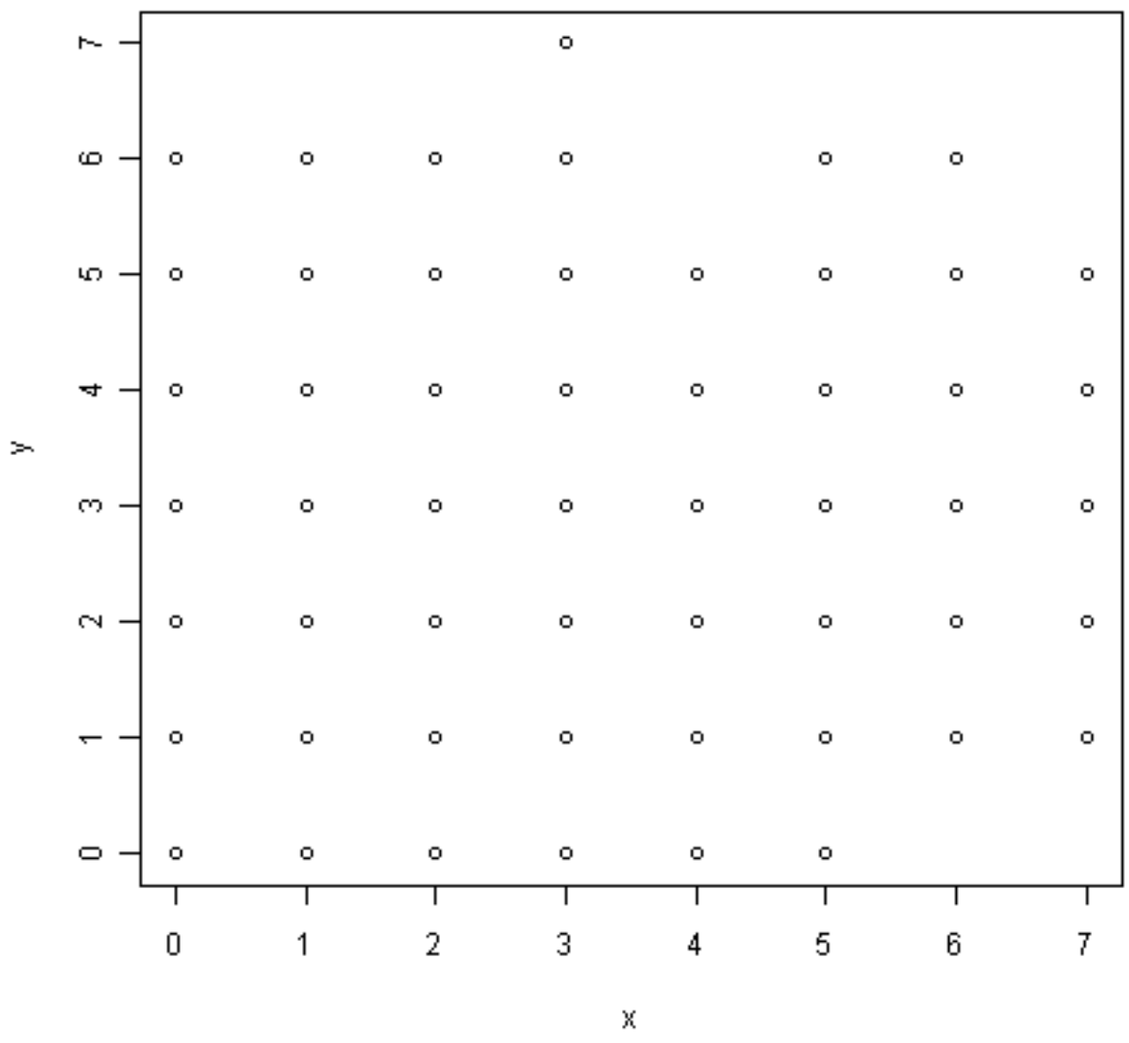
条形图 – 增加误差线

```
sales<-t(as.matrix(citysales[,-1]))
colnames(sales)<-citysales[,1]

x<-barplot(sales,beside=T,legend.text=rownames(sales),
          args.legend=list(bty="n",horiz=T),
          col=brewer.pal(3,”Set2"),
          border="white",ylim=c(0,100),
          ylab="Sales Revenue (1,000's of USD)",
          main="Sales Figures")

arrows(x0=x,
       y0=sales*0.95,
       x1=x,
       y1=sales*1.05,
       angle=90,
       code=3,
       length=0.04,
       lwd=0.4)
```

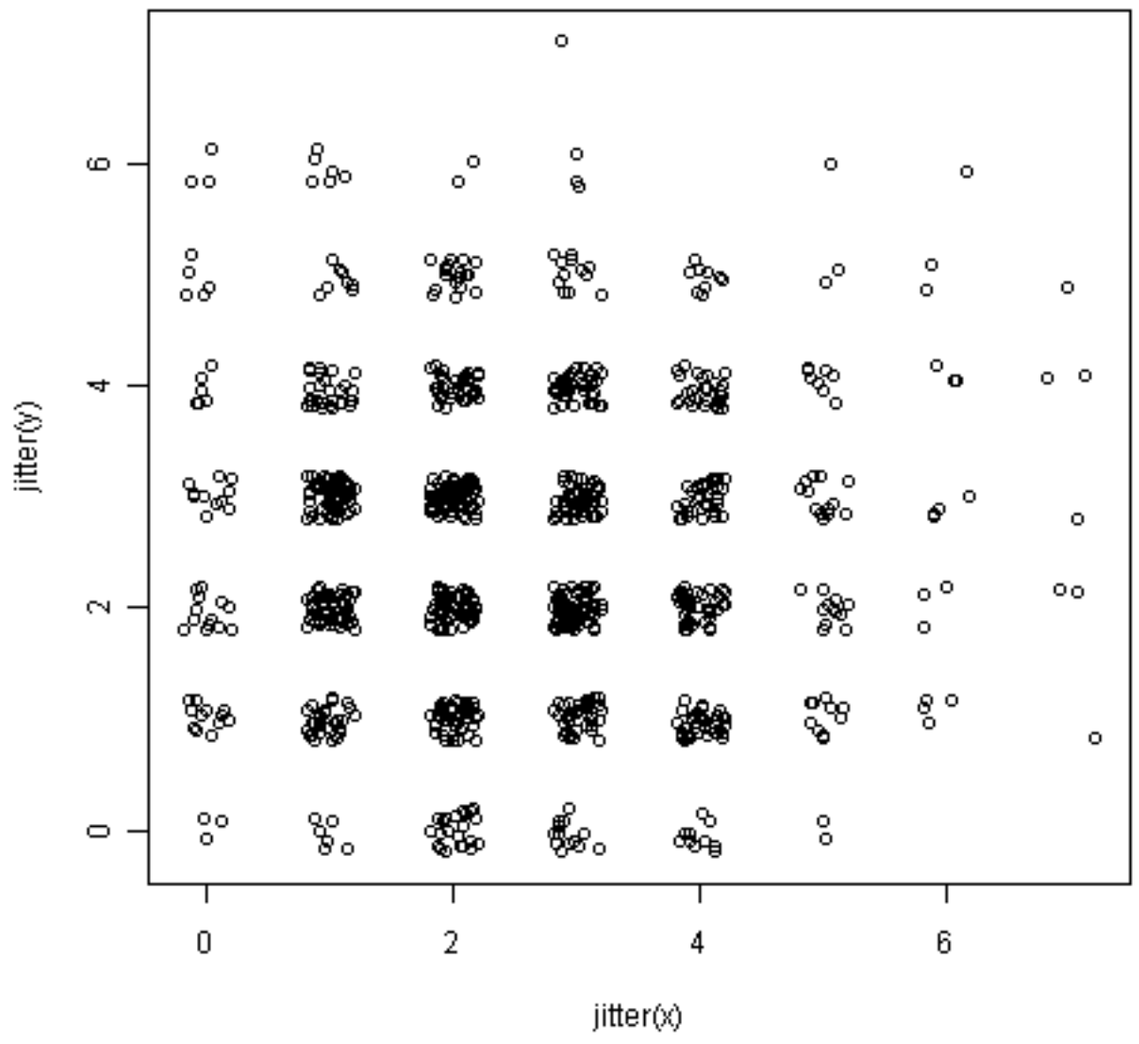


散点图 – 增加抖动

```
x <- rbinom(1000, 10, 0.25)
y <- rbinom(1000, 10, 0.25)
plot(x,y)
```




```
plot(jitter(x), jitter(y))
```



提问时间！

孙惠平

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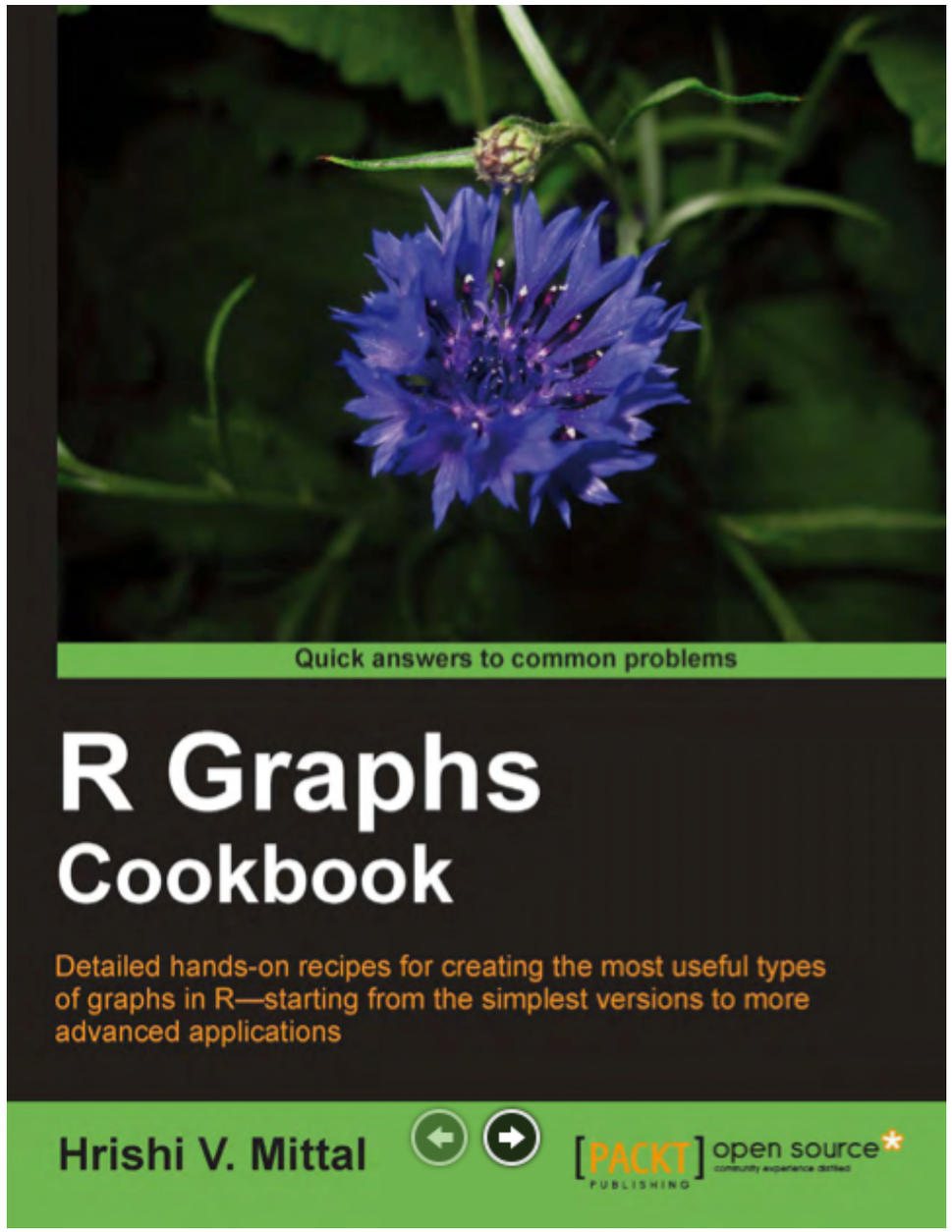
练习

练习 - 0021

第3、6章



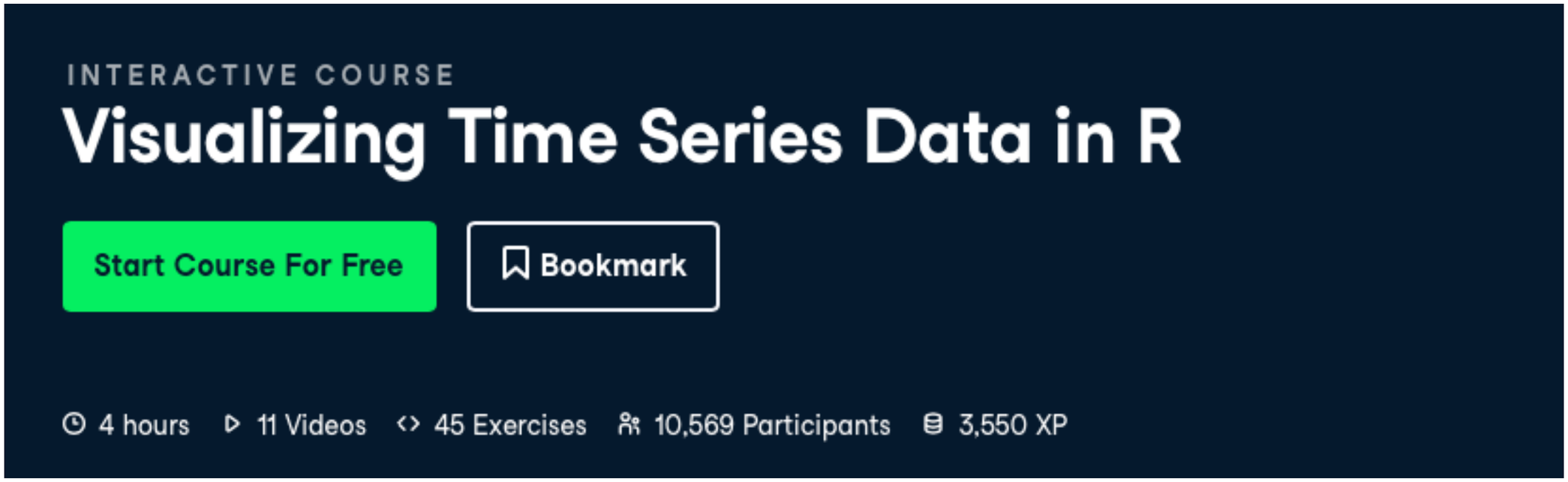
第1－6章：看完！！

练习 – 0022

- gdp_long.txt
- 做折线图（网格、特殊线，图例的不同位置）
- 条形图（正常、堆积、横向、颜色宽度等、显示数字、误差线）

- cityrain.csv
- 做折线图（边界标注，slide，mar和bty的含义）

练习 – 0023



提交方式和上节课一样！

https://www.datacamp.com/courses

谢谢！

孙惠平

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