STK 571
KOMPUTASI STATISTIK

Materi 2 Grafik

PENDAHULUAN

R Menyediakan banyak fungsi grafik

Package standar grafik adalah "`graphics`", tetapi terdapat beberapa package graphics lain seperti: `lattice` dan `grid`

Materi yang diberikan pada mata kuliah ini adalah fungsi-fungsi pada package "`graphics`" yang merupakan base dari grafik

Perintah dasar grafik adalah `plot`

Tempat untuk membuat grafik adalah devices

DEVICES

Untuk menyimpan grafik diperlukan devices

Default :

- X11 di OS Linux berbasis window
- windows di OS MS Windows

Beberapa device:

- postscript, pdf, pictex, png, jpeg, bmp, xfig, bitmap

Melihat daftar device yang sudah dibuat → dev.list()

Melihat device aktif → dev.cur()

DEVICES

Mengganti device aktif → dev.set(i)

Perintah dev.off() menutup device yang aktif

Perintah graphics.off() menutup semua device

Mencopy isi dari device dev.copy()

PERINTAH PLOT

Perintah grafik dasar umumnya adalah plot

- Contoh : plot (x,y) dimana x dan y adalah vektor dengan ukuran sama

Terdapat beberapa opsi:

Opsi type

- “p” –> titik (default)
- “l” –> garis
- “b” –> keduanya (garis dan titik)
- “o” –> keduanya (garis dan titik) overlaid
- “n” –> nothing
- “s” –> tangga, segmen pertama horisontal
- “S” –> tangga, segmen pertama vertikal
- “h” –> garis vertikal dari sumbu-x ke titik

PERINTAH PLOT

Opsi log mengontrol skala logarithmic

- Default adalah sumbu standar
- Nilai : “x”, “y”, “xy”

Opsi pch mengganti karakter plot

- pch=“char”
- pch=*angka*

Opsi lty mengganti tipe garis

- 1=solid, 2=small breaks , dll

PERINTAH PLOT

Opsi lwd melakukan setting ketebalan garis

Opsi axes=F → tanpa sumbu x dan y

Opsi xlim dan ylim → membatasi sumbu

Opsi col → mengganti warna titik/garis

Label di plot

- main
- sub
- xlab
- ylab

PERINTAH LAIN

Menambahkan item di grafik yang sudah ada:

- points(x,y)
- lines(x,y)
- abline (a,b), abline(h=y),abline(v=x)
- segments(x1,y1,x2,y2)
- arrows(x1,y1,x2,y2)
- polygon(x,y)
- text(x,y,teks)
- mtext → berguna untuk label judul dan garis sumbu

PERINTAH LAIN

Perintah berikut berguna apabila sebelumnya membuat plot tanpa garis sumbu:

- axis menambah titik-titik sumbu
  - axis(1,c(1,2,5,10))
  - axis(2,c(2,10,20))
- box membuat kotak
- title membuat label untuk main, sub, xlab, ylab

Perintah par(ask=T) akan mengkonfirmasi setiap penghapusan grafik

BEBERAPA GRAFIK

barplot

contour

dotchart

stars → untuk multivariate

hist, boxplot

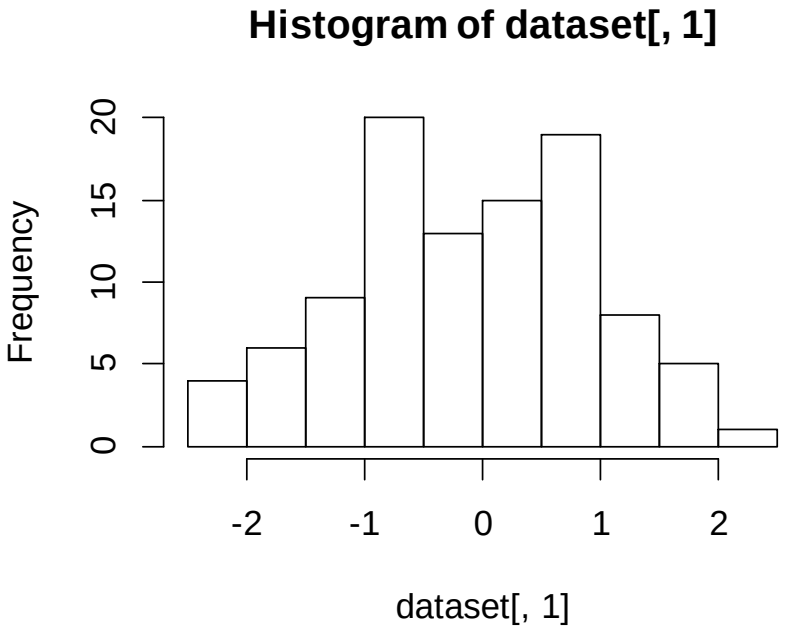
image

pairs

pie

qqplot, qqnorm

GRAFIK DASAR

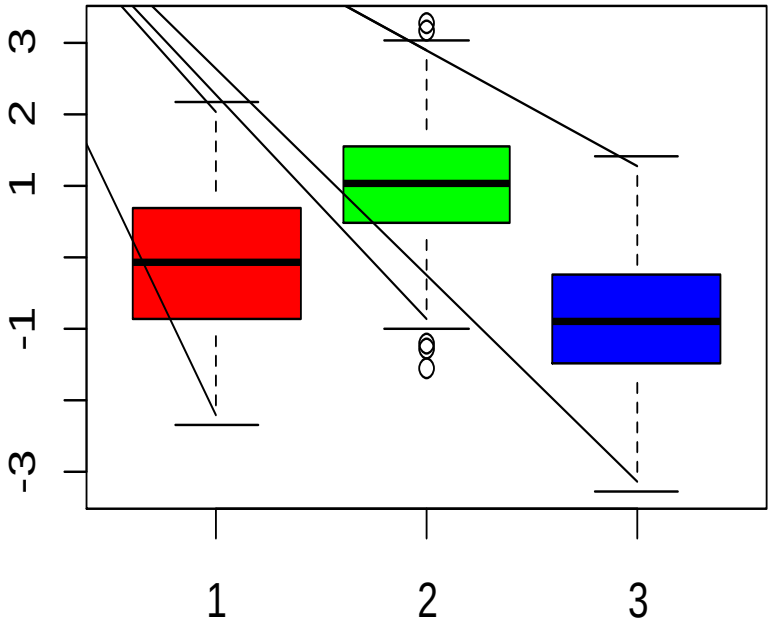


Histogram

- Dibangkitkan menggunakan fungsi hist()
- Parameter breaks digunakan:
  - Banyaknya kategori
  - Menentukan titik break setiap kategori
- Pilihan xlab, ylab, xlim, ylim dapat digunakan

```
dataset <- cbind(rnorm(100),rnorm(100,1),rnorm(100,-1))
hist(dataset[,1])
```

GRAFIK DASAR

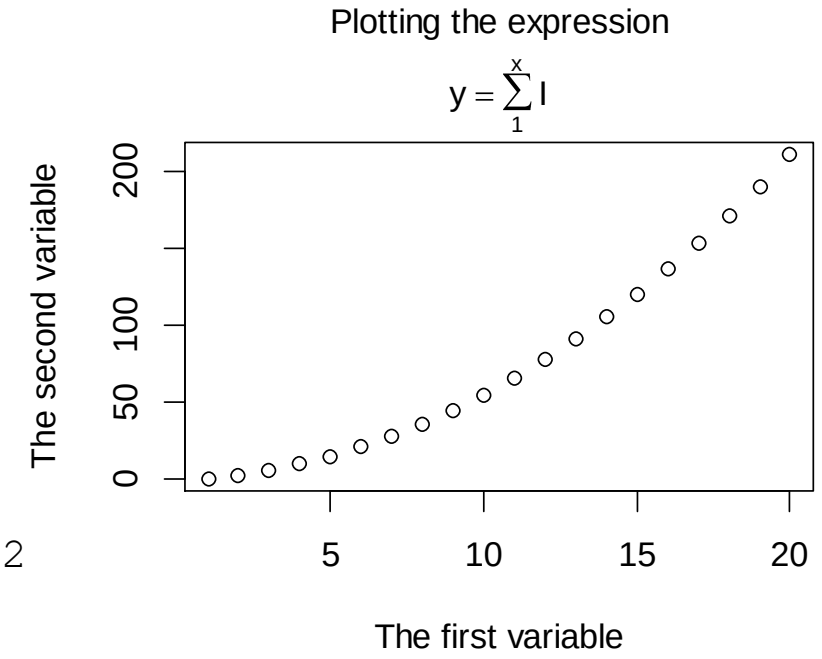


Boxplot

- Dibangkitkan menggunakan fungsi boxplot()
- Plot meringkas
  - Median
  - Quartiles (Q1, Q3)
  - Outliers

```
dataset <-
 cbind(rnorm(100),rnorm(100,1),rnorm(100,-1))
boxplot(dataset, col = rainbow(3))
```

GRAFIK DASAR



Memberikan symbol ekspresi

```
f <- function(x) x * (x + 1) / 2
x <- 1:20
y <- f(x)
plot(x, y, xlab = "", ylab = "")
mtext("Plotting the expression", side = 3, line = 2.5)
mtext(expression(y == sum(I,1,x,i)), side = 3, line = 0)
mtext("The first variable", side = 1, line = 3)
mtext("The second variable", side = 2, line = 3)
```

GRAFIK

Symbol

Big Operators	
sum(x[i], i = 1, n)	$\sum_{1}^{n} x_i$
prod(plain(P)(X == x), x)	$\prod_{x} P(X = x)$
integral(f(x) * dx, a, b)	$\int_{a}^{b} f(x)dx$
union(A[i], i == 1, n)	$\bigcup_{i=1}^{n} A_i$
intersect(A[i], i == 1, n)	$\bigcap_{i=1}^{n} A_i$
lim(f(x), x %->% 0)	$\lim_{x \to 0} f(x)$
min(g(x), x >= 0)	$\min_{x \geq 0} g(x)$
inf(S)	$\inf S$
sup(S)	$\sup S$

SETTING PARAMETER GRAFIK

Menggunakan fungsi par

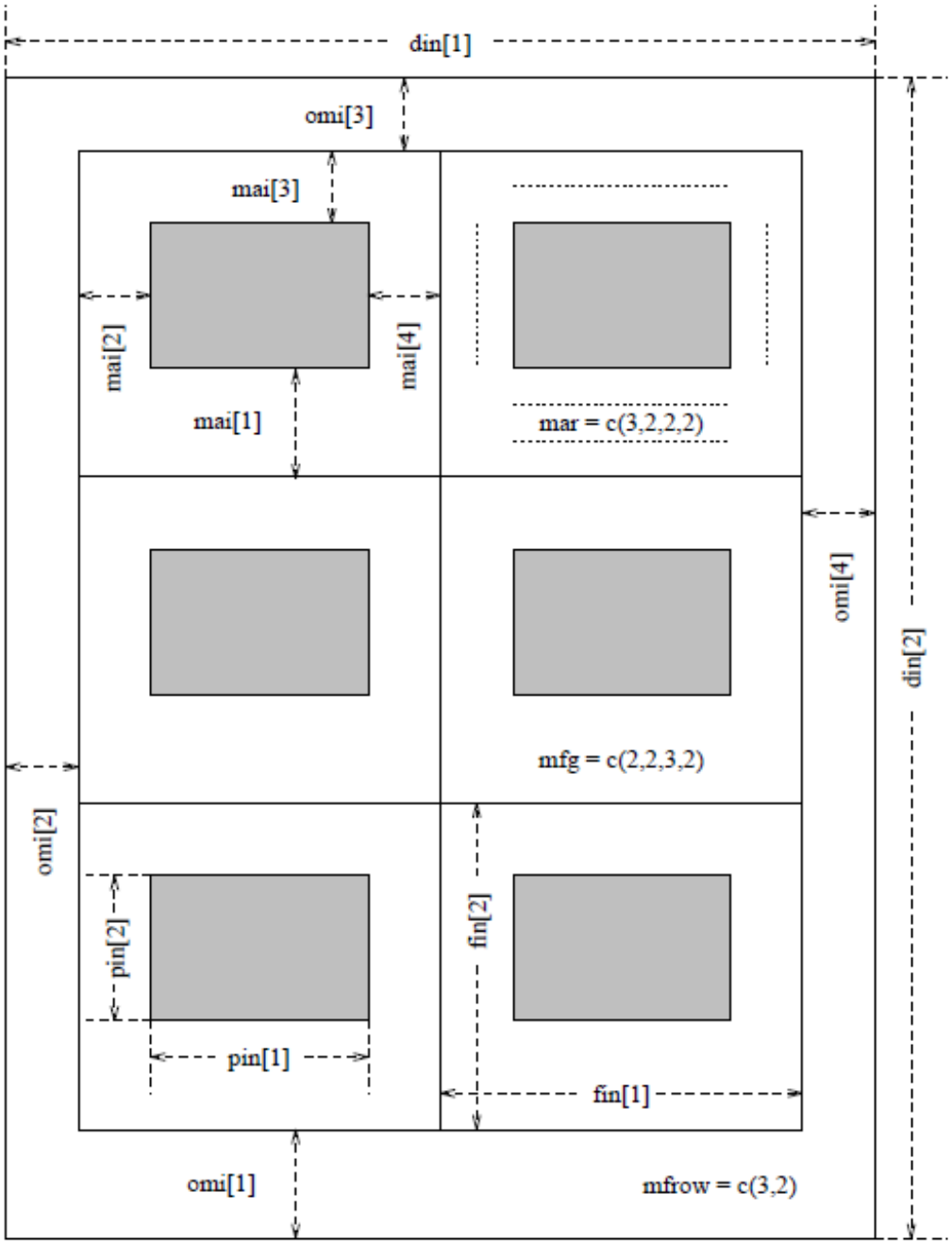
Melakukan setting secara global dan lokal

Opsi yang dikontrol oleh par:

- **text and symbols:** *adj, ann, cex, crt, exp, font, mex, mkh, pch, ps, smo, srt*
- **plot area:** *bty, new, pin, plt, pty, uin, usr, xpd*
- **axes and tickmarks:** *exp, lab, las, mgp, tck, xaxp, xaxs, xaxt, yaxp, yaxs, yaxt*

SETTING PARAMETER GRAFIK

- **margins:** mai, mar, mex, oma, omd, omi
- **figure and page areas:** fig, fin, fty, mfg, mfcol, mfrow, oma, omd, omi
- **color:** *bg, col, fg, gamma*
- **misc:** *ask, col, err, lty, lwd*
- **Information:** "1em", acc, cin, cra, csi, cxy, dev, din, frm, omo , rsz, tsp, uin


din[1]
omi[3]
mai[3]
mai[2]
mai[4]
mai[1]
mar = c(3,2,2,2)
omi[4]
din[2]
mfg = c(2,2,3,2)
omi[2]
pin[2]
fin[2]
pin[1]
fin[1]
omi[1]
mfrow = c(3,2)

MULTIPLE GRAPH

Menggunakan mfrow atau mfcol

- par(mfrow=c(2,3))
- Gunakan mar untuk meningkatkan/menurunkan ruang sekeliling plot dan oma untuk meningkatkan/menurunkan ruang antara matriks plot
- par(mfrow=c(1,1)) mengembalikan ke layout default

MULTIPLE GRAPH

Alternatif lain menggunakan perintah split.screen

- split.screen(c(2,2)) # seperti par(mfrow=c(2,2))
- Berpindah antar area plot → screen(i)
- Perintah close.screen(all=T) mengembalikan ke default

DIAGNOSTIK PLOT SEBARAN PEUBAH KONTINU TUNGGAL

INTRODUCTION

checking whether the data follow an assumed distribution

more efficient than the EDF → the reference distribution is presented on either plot by a straight line

INTRODUCTION

The Quantile-Quantile Plot

The Probability Plot

THE QUANTILE-QUANTILE PLOT

QQ plot ; quantile plot

proposed by Wilk and Gnanadesikan

the plot of two inverse distribution (or quantile) functions, Q1(p) and Q2(p), for $0 < p < 1$

The points {(Q1(pk),Q2(pk))} are plotted in the Cartesian coordinate plane corresponding to selected values of {pk} determined from an ordered random sample

Potential values for pk:

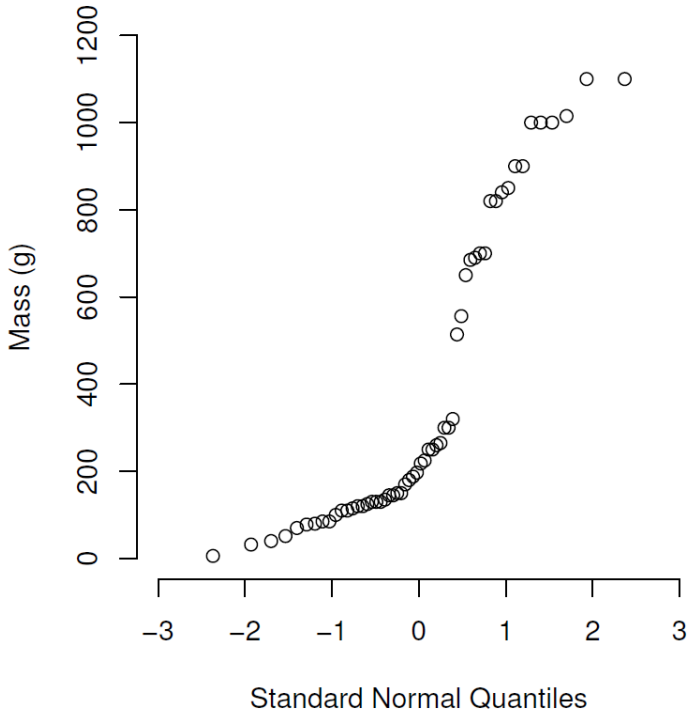
$$p_k = \frac{k - \alpha}{n - \alpha - \beta + 1}.$$

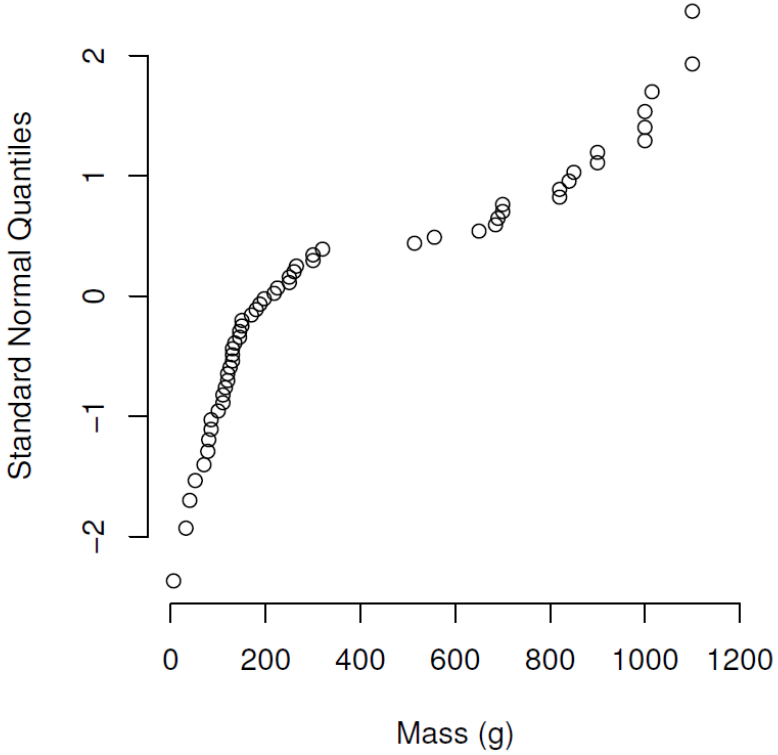
If the distribution corresponding to Q2 is the uniform distribution function given by

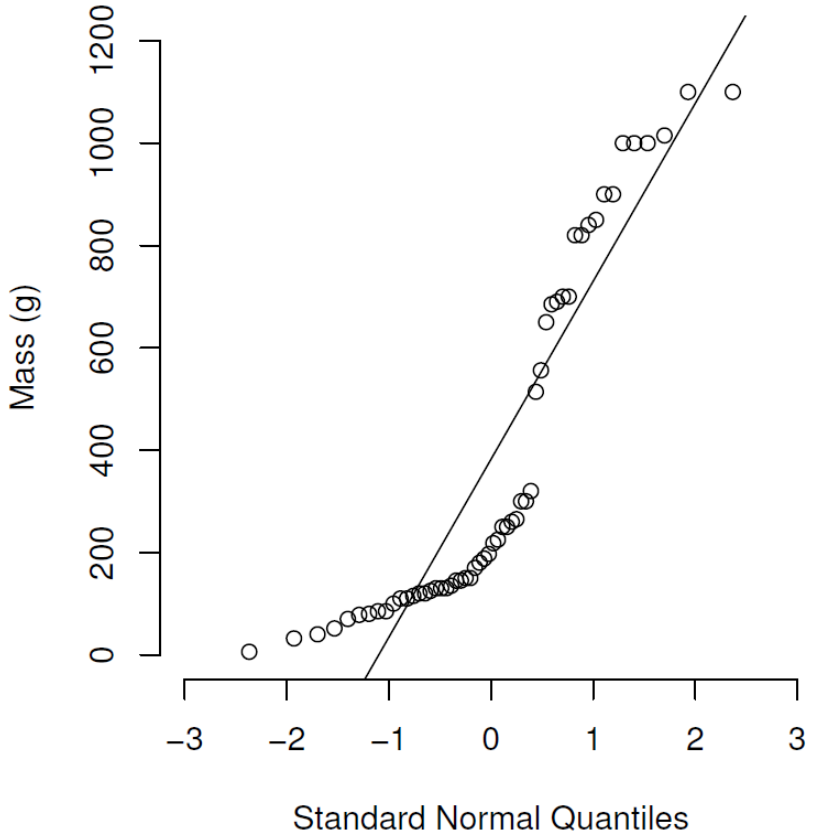
$$P_2(x) = \begin{cases} 1 & \text{if } x > 1, \\ x & \text{if } 0 \leq x \leq 1, \text{ and} \\ 0 & \text{if } x < 0 \end{cases}$$

then the order statistics for the sample are plotted along the vertical axis

The most common choices of values for Q1 are the corresponding quantiles from the standard normal distribution $z_k = \Phi(p_k)$




Standard Normal Quantiles
−2
−1
0
1
2
0
200
400
600
800
1000
1200
Mass (g)


Mass (g)
0
200
400
600
800
1000
1200
−3
−2
−1
0
1
2
3
Standard Normal Quantiles

Fungsi:

- qqplot(); qqnorm(); qqline()
- ppoints()

if the data do follow a normal distribution then the points in the plot should lie nearly along a straight line

standard procedure is to add a reference representing a normal distribution

Normal quantile plots can be used to characterize data beyond simply checking normality:

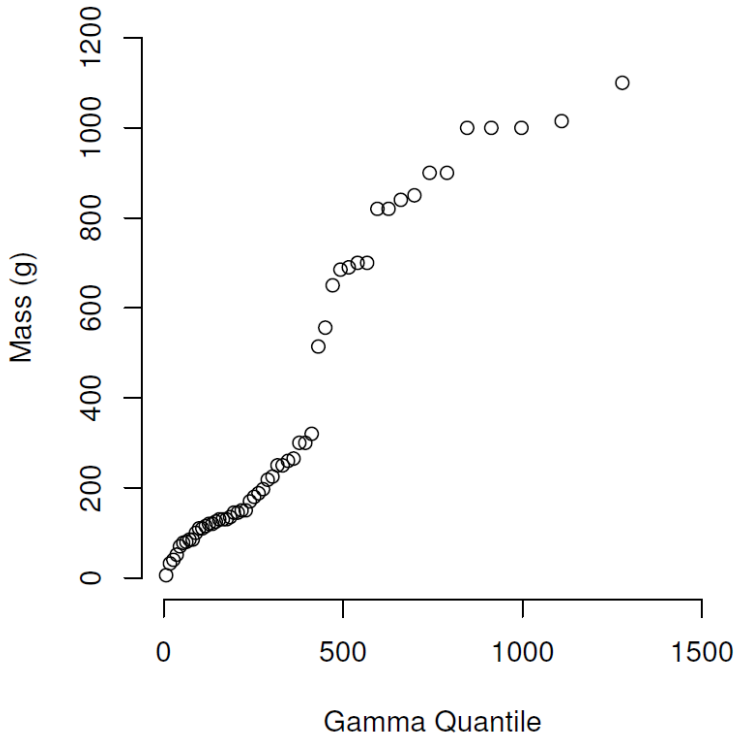
- If all but a few points fall on the normal reference line, then these few points may be outliers
- If the left end of the data is above the line and the right end of the pattern is below the line, then the distribution may have short tails at both ends
- If the left end of the data is below the line and the right end of the pattern is above the line, then the distribution may have long tails at both ends

Normal quantile plots can be used to characterize data beyond simply checking normality (cont.)

- If there is a curved pattern with the slope increasing from left to right, then the data are skewed to the right.
- If there is a curved pattern with the slope decreasing from left to right, then the data are skewed to the left.
- if there is a step-like pattern with plateaus and gaps, then this is an indication that the data have been rounded (or truncated) or are discrete.

Another distributions:

- the gamma distribution; the beta distribution; the Chisquare distribution; and the lognormal

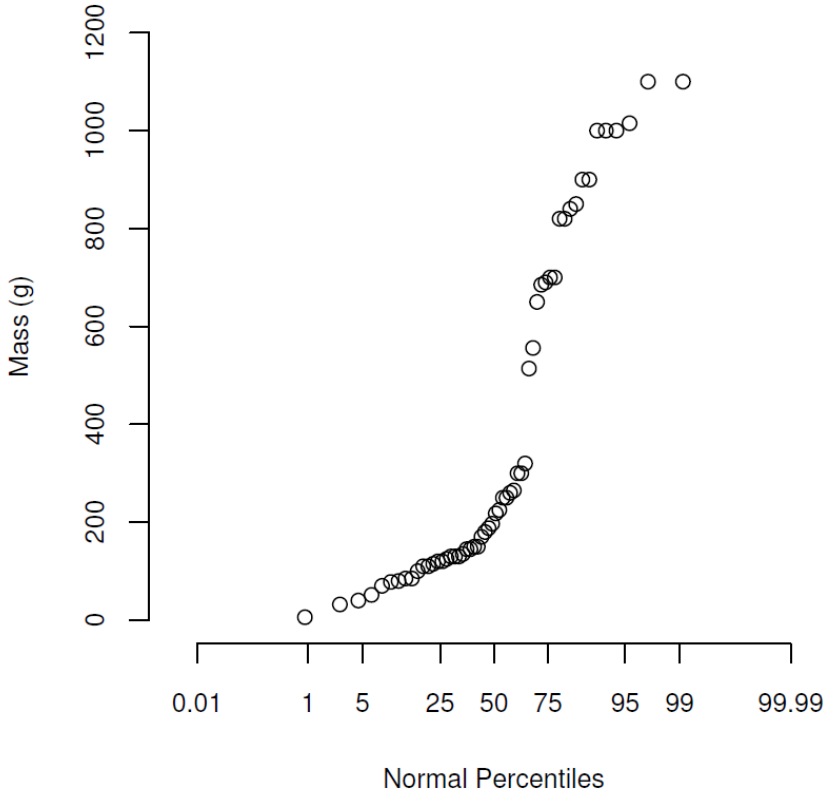


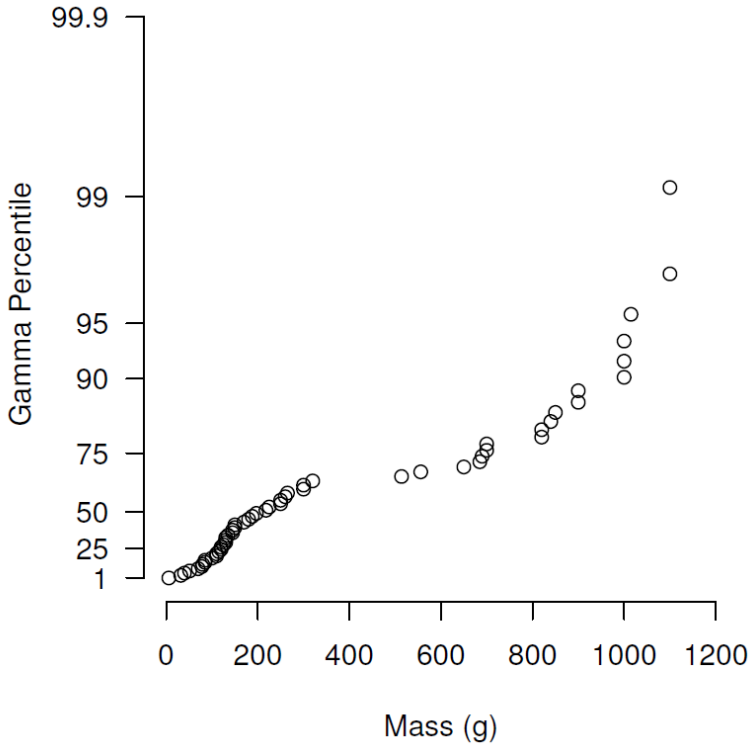
THE PROBABILITY PLOT

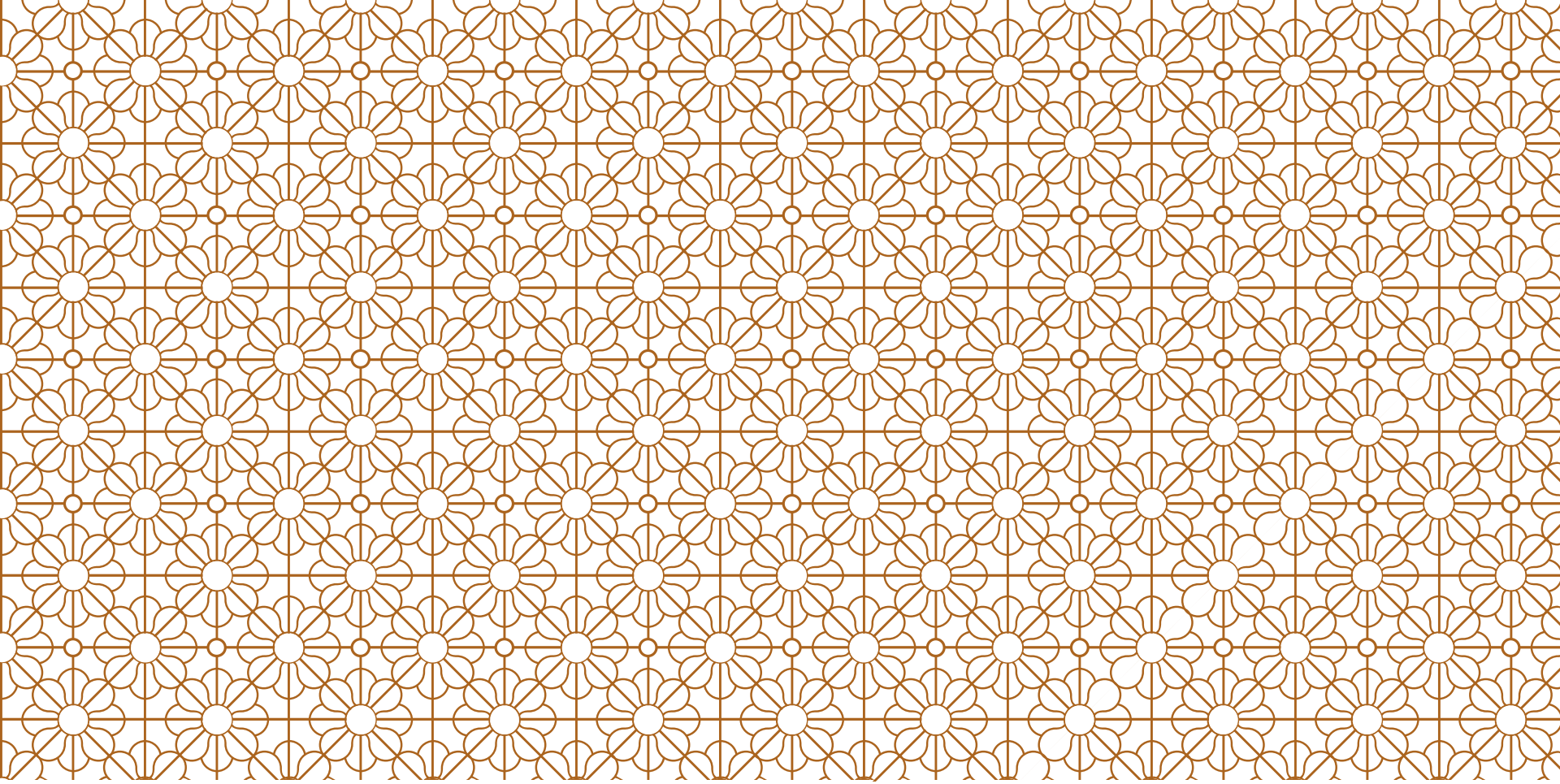
a variation of the quantile-quantile plot

The points plotted are {(Q1(pk),Q2(pk))}

But the choice of scale for the reference distribution is chosen to be cumulative probability instead of quantile values


Mass (g)
0
200
400
600
800
1000
1200
0.01
1
5
25
50
75
95
99
99.99
Normal Percentiles


Gamma Percentile
99.9
99
95
90
75
50
25
1
0
200
400
600
800
1000
1200
Mass (g)



SELESAI