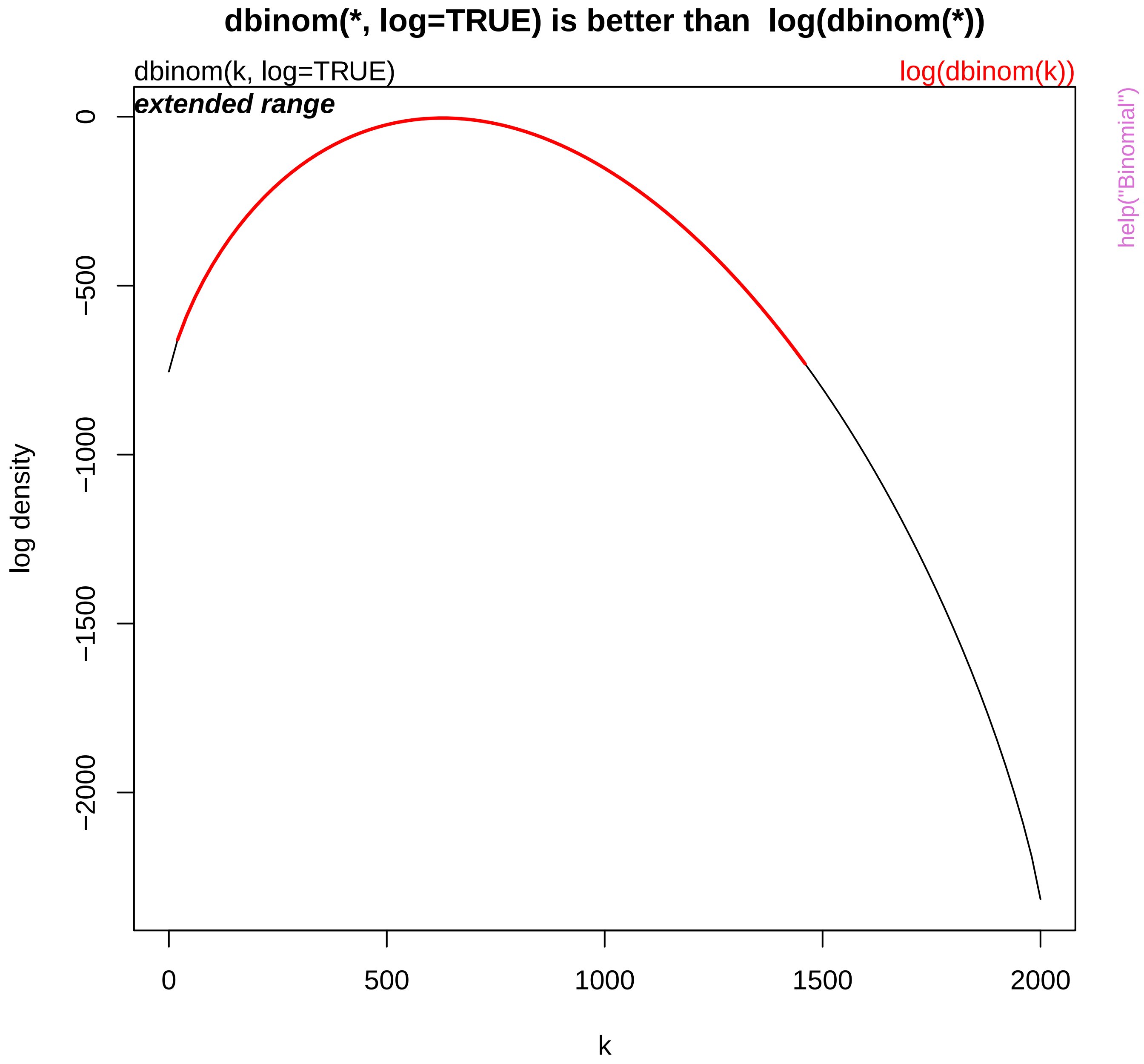
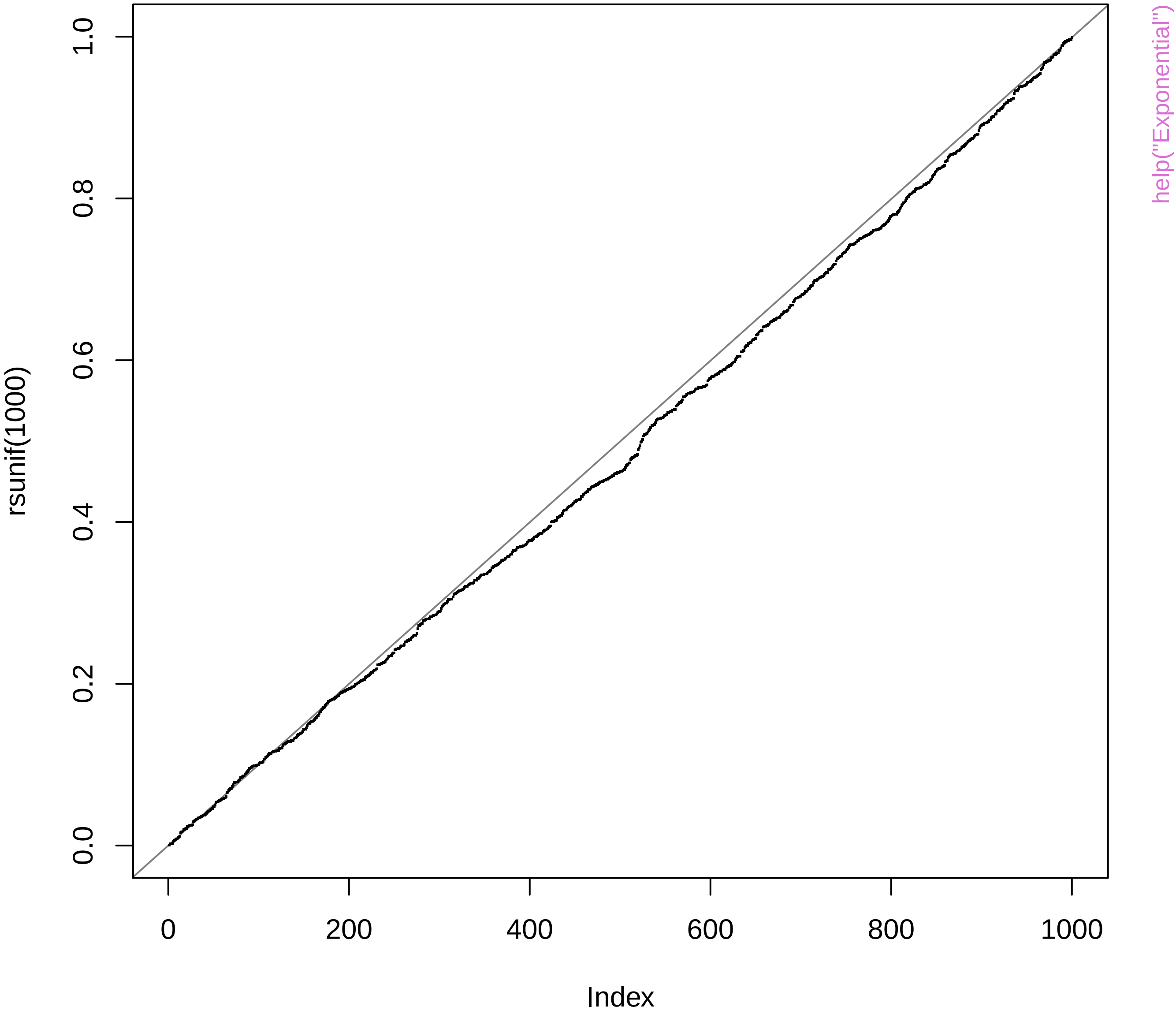
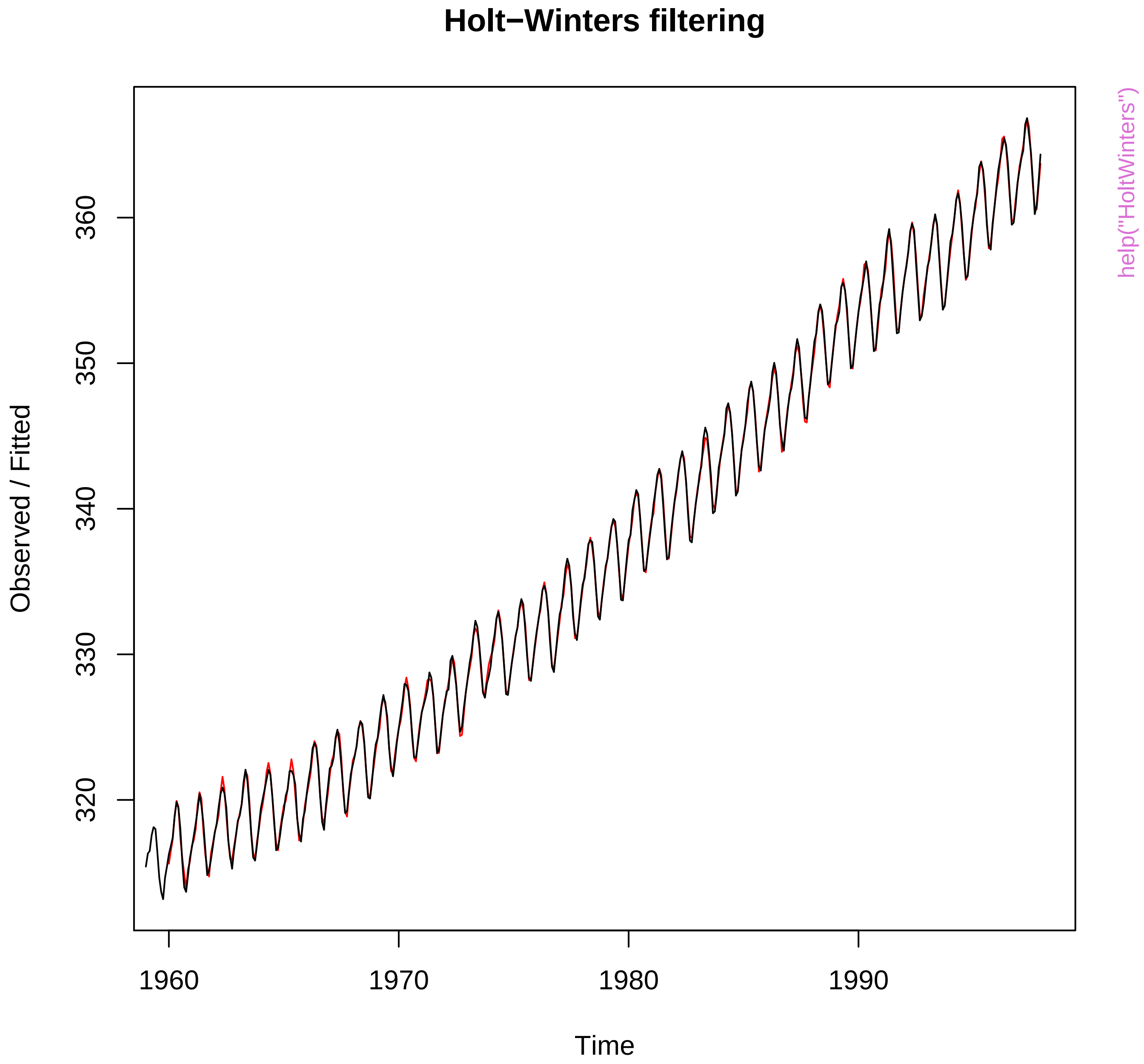
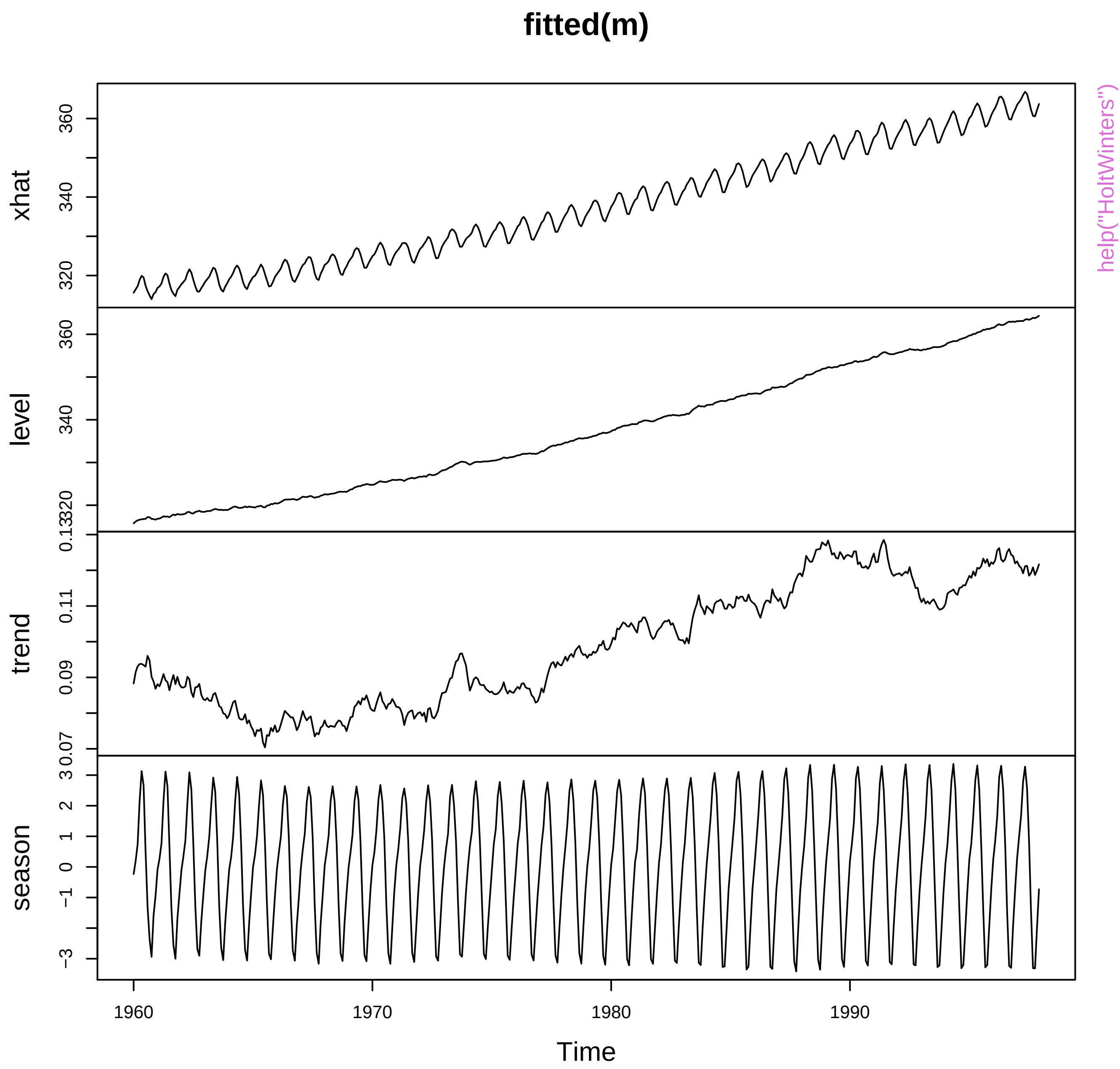

dbinom(*, log=TRUE) is better than log(dbinom(*))
dbinom(k, log=TRUE)
log(dbinom(k))
extended range
log density
0
−500
−1000
−1500
−2000
0
500
1000
1500
2000
k
help("Binomial")



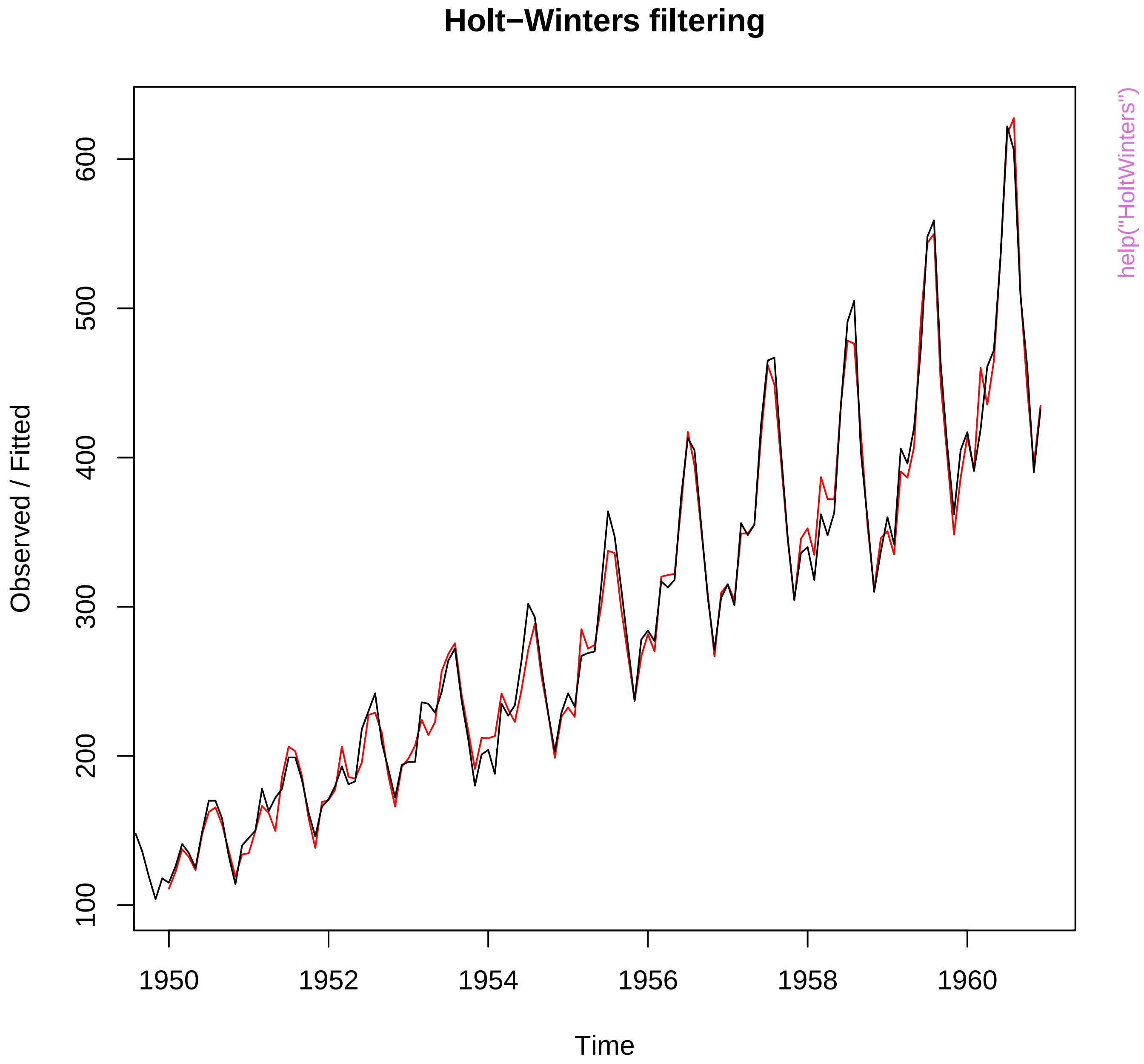
rsunif(1000)
0.0
0.2
0.4
0.6
0.8
1.0
0
200
400
600
800
1000
Index
help("Exponential")

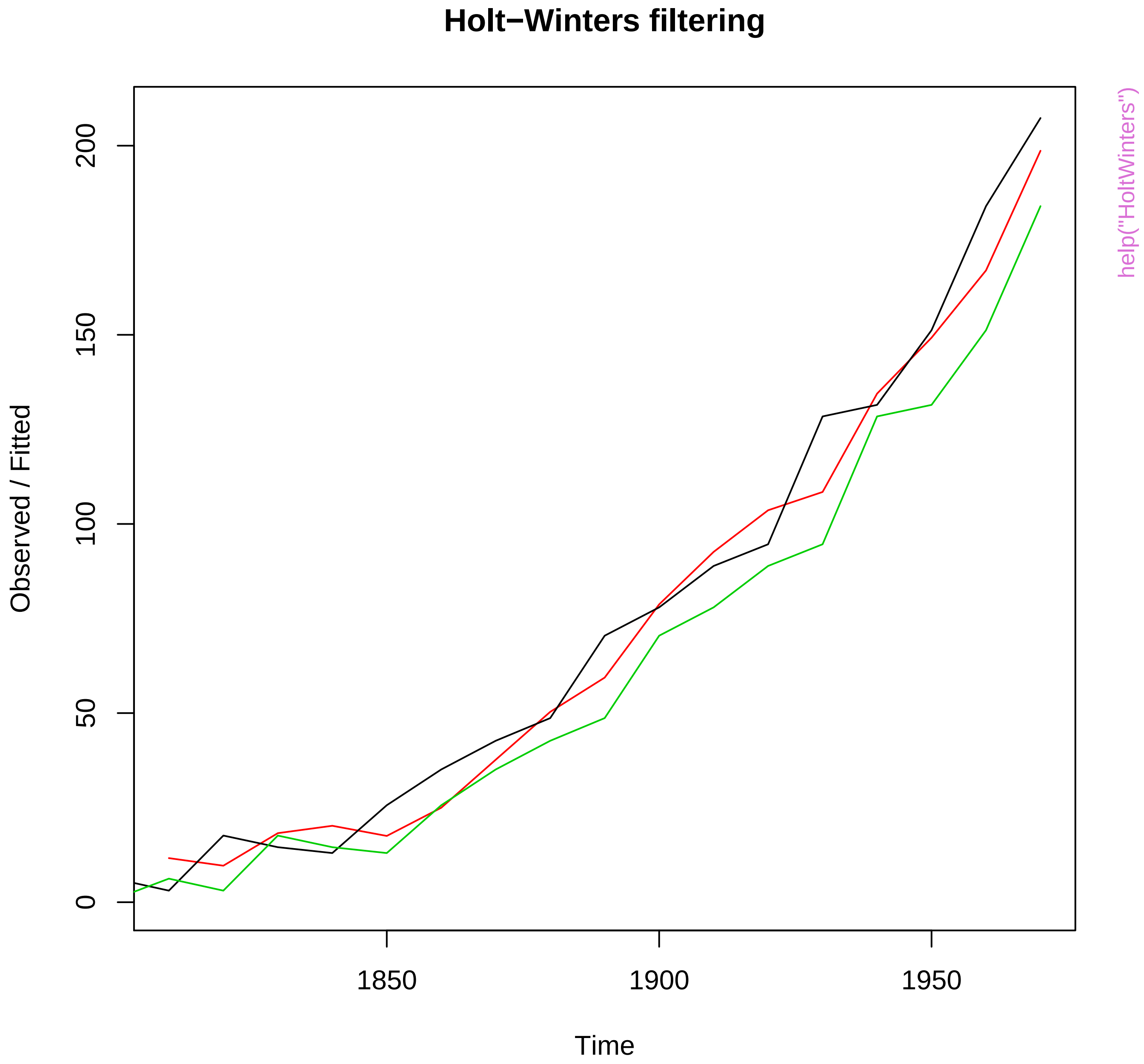


Holt−Winters filtering
Observed / Fitted
360
350
340
330
320
1960
1970
1980
1990
Time
help("HoltWinters")

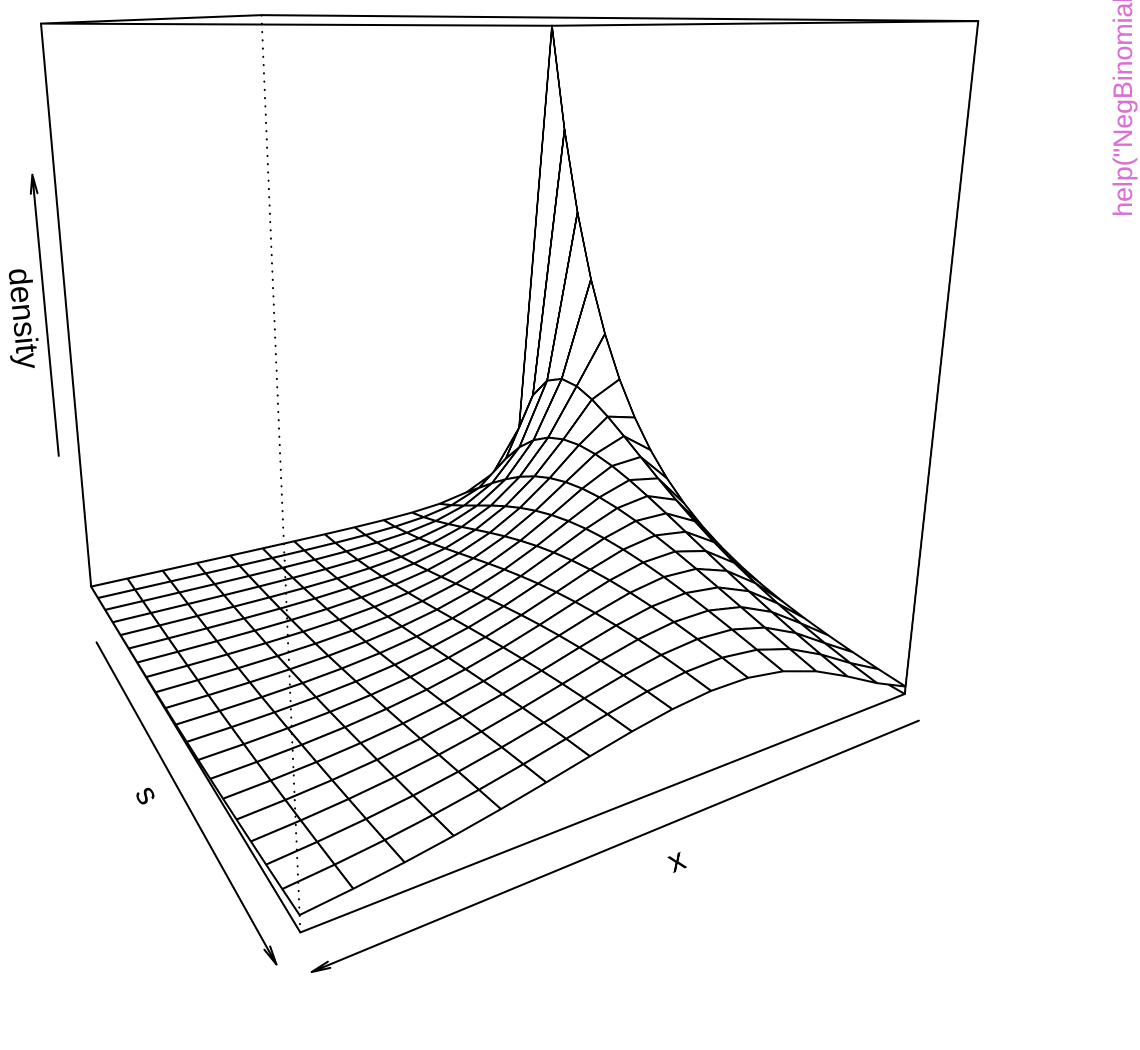


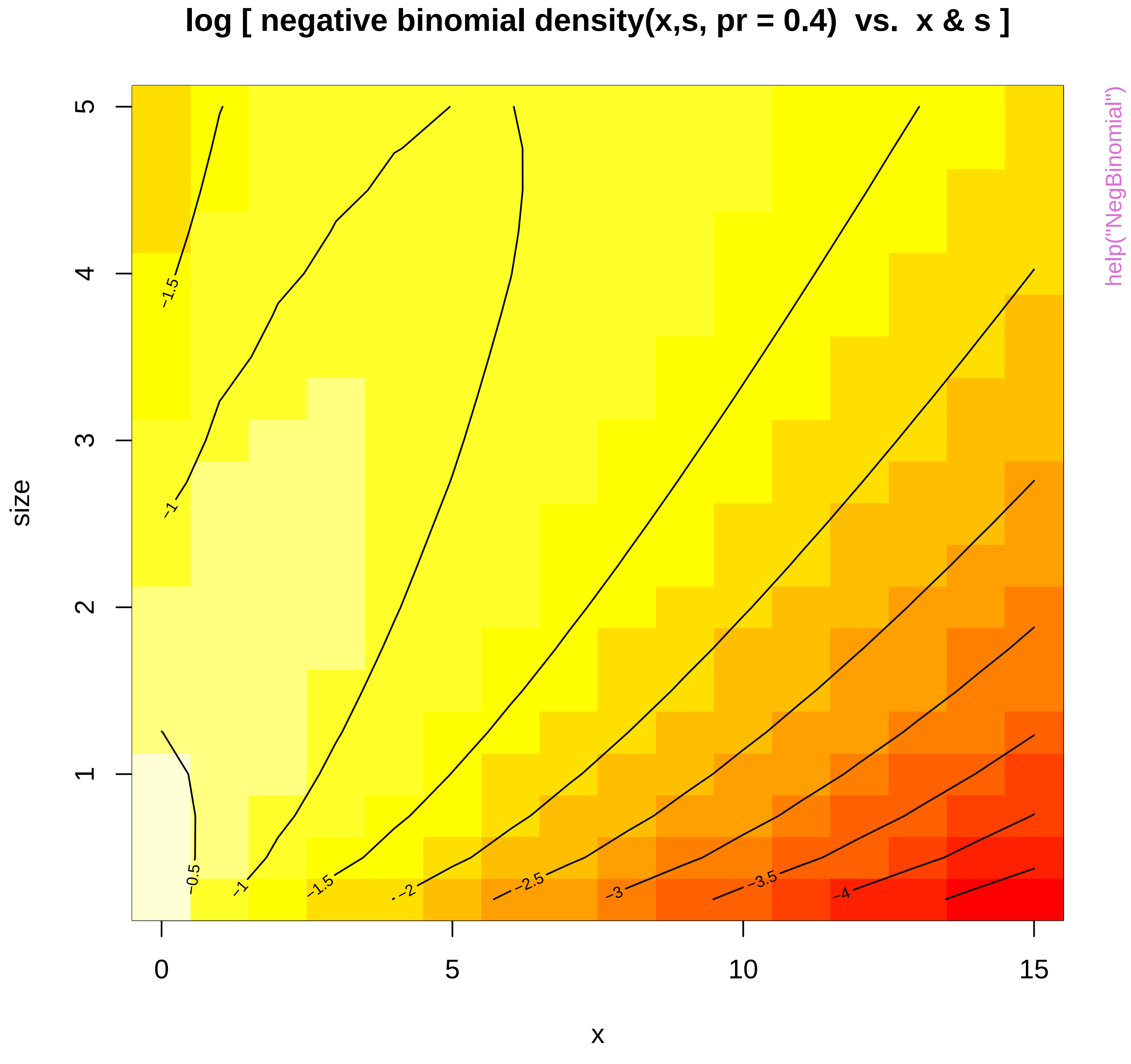
fitted(m)
xhat
level
trend
season
Time
320
340
360
0.07
0.09
0.11
0.13
−3
−1
0
1
2
3
1960
1970
1980
1990
help("HoltWinters")

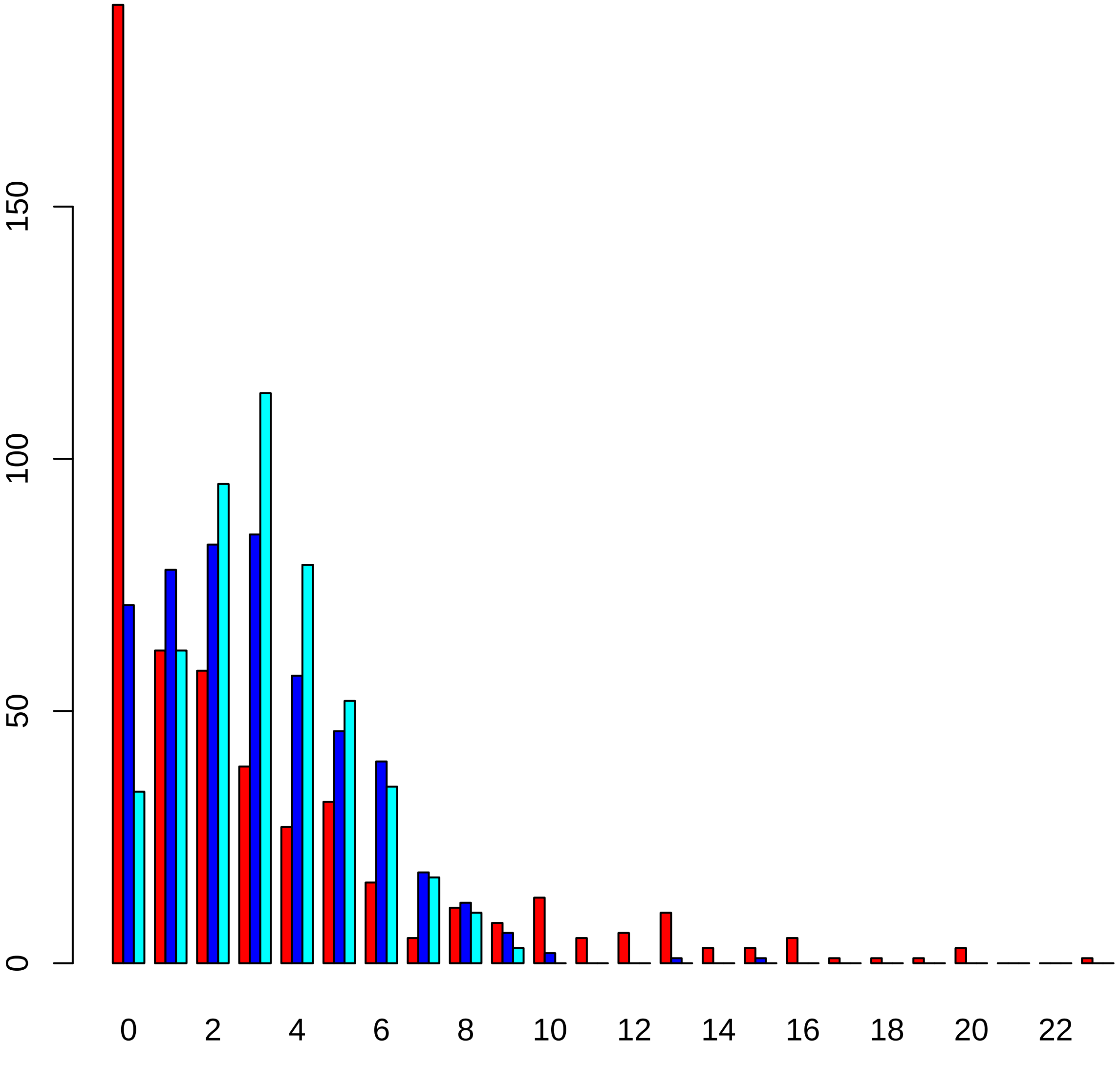

Holt−Winters filtering
Observed / Fitted
Time
100
200
300
400
500
600
1950
1952
1954
1956
1958
1960
help("HoltWinters")


Holt−Winters filtering
Observed / Fitted
0
50
100
150
200
1850
1900
1950
Time
help("HoltWinters")

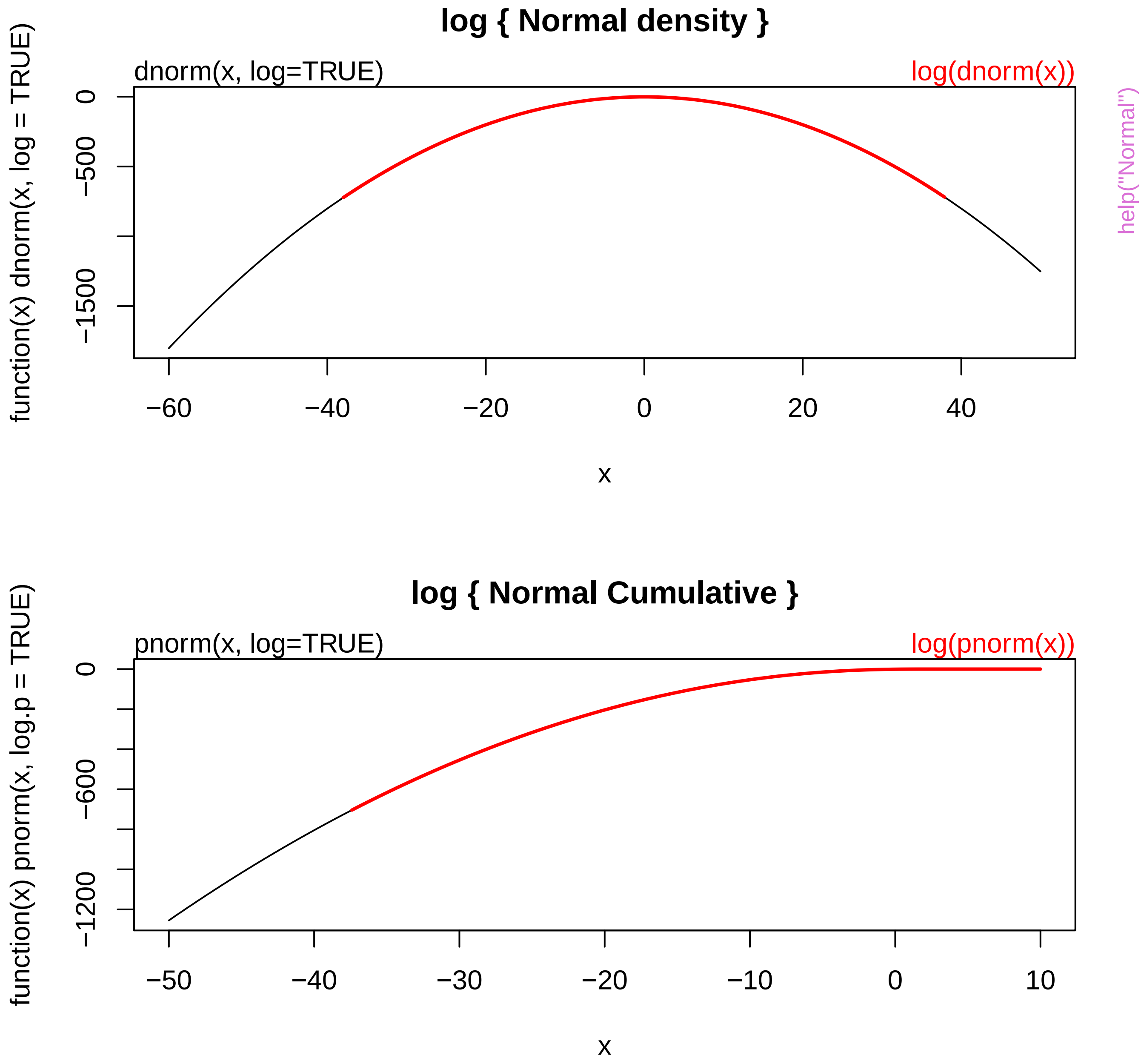
negative binomial density(x,s, pr = 0.4) vs. x & s

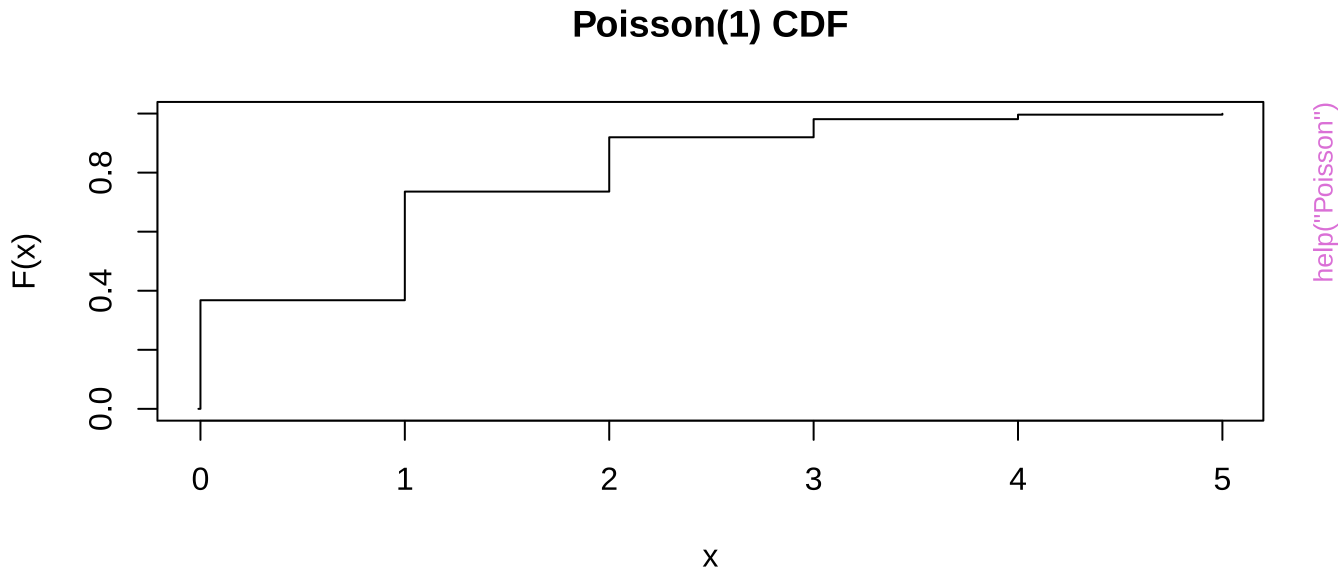


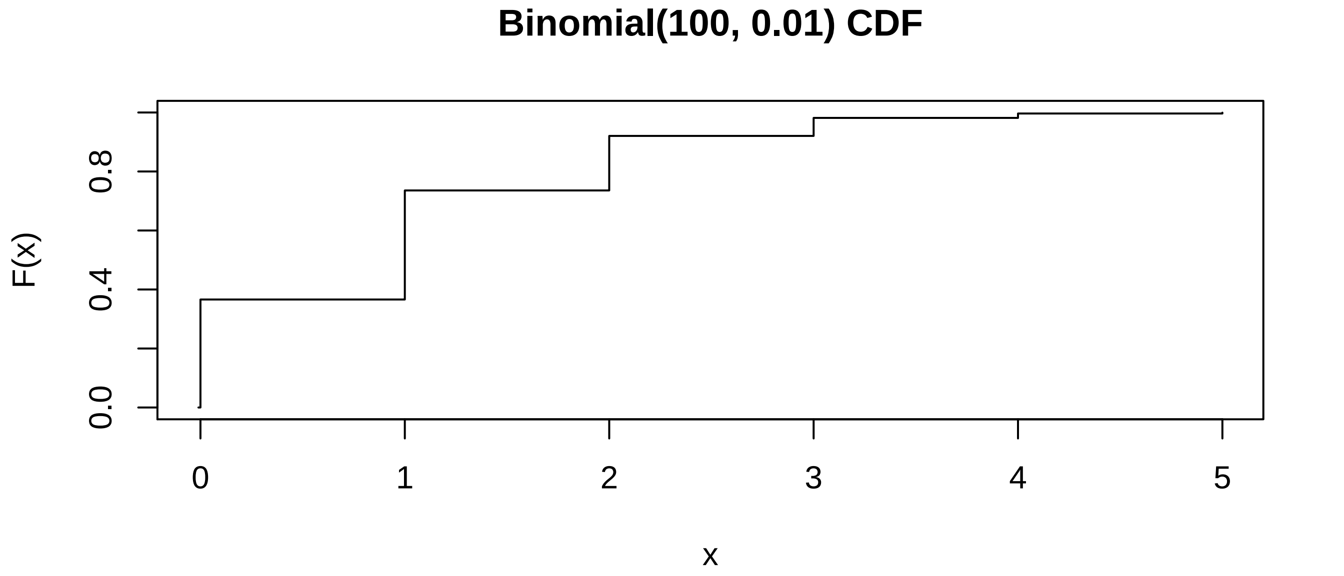

log [negative binomial density(x,s, pr = 0.4) vs. x & s]
help("NegBinomial")
size
x
0
5
10
15
1
2
3
4
5
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4



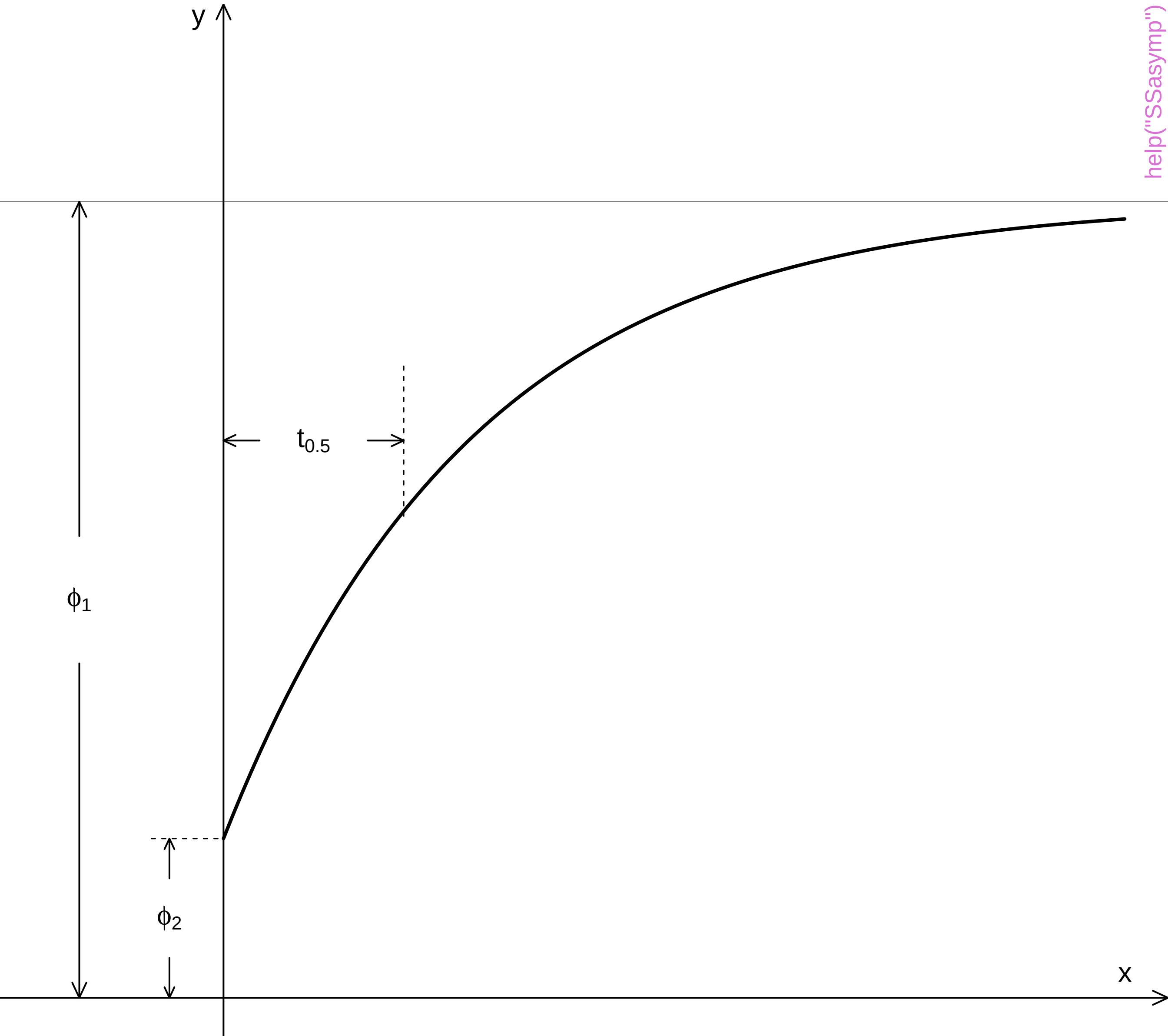
help("NegBinomial")

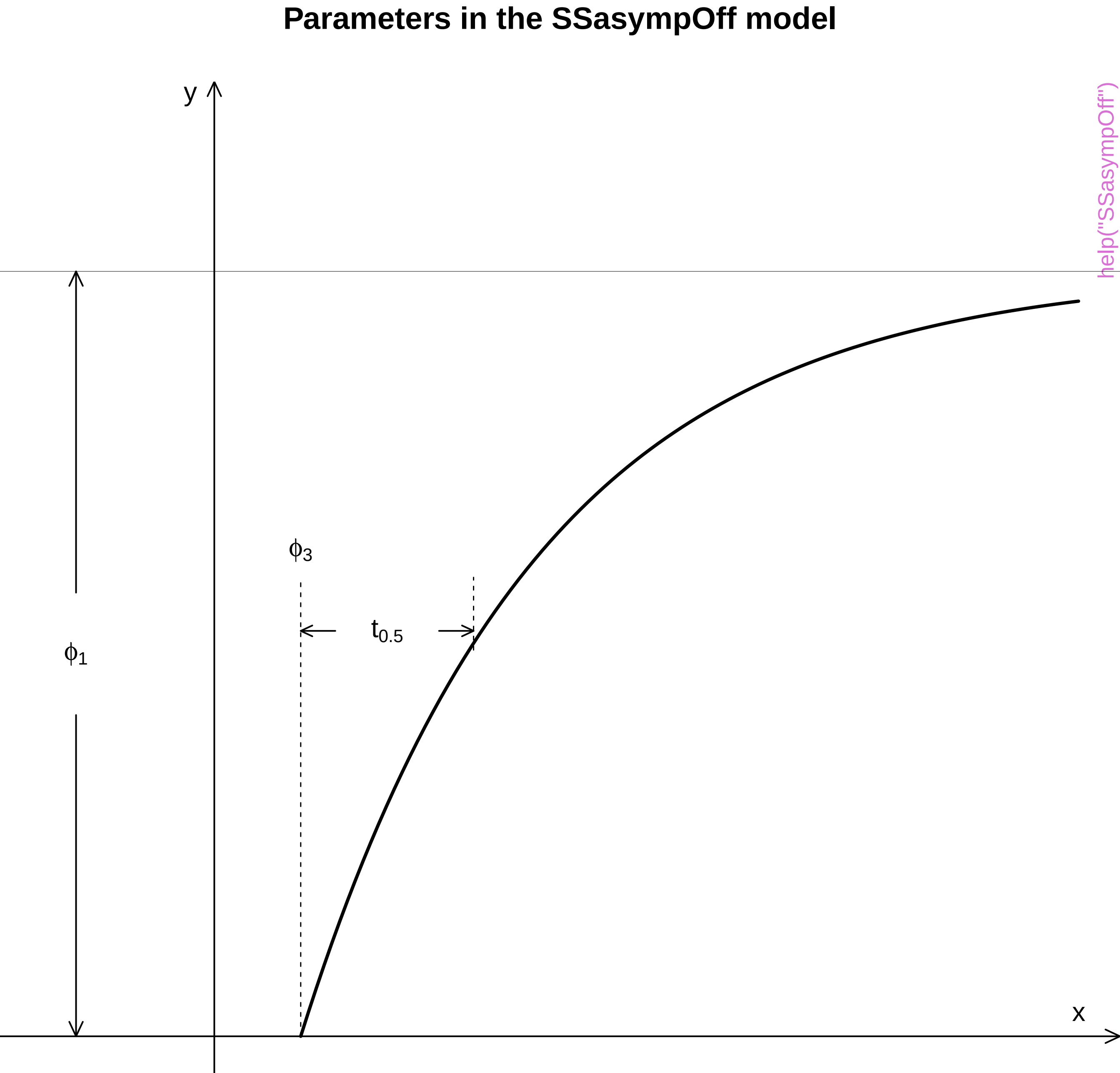

log { Normal density }
dnorm(x, log=TRUE)
log(dnorm(x))
0
−500
−1500
function(x) dnorm(x, log = TRUE)
−60
−40
−20
0
20
40
x
help("Normal")
log { Normal Cumulative }
pnorm(x, log=TRUE)
log(pnorm(x))
0
−600
−1200
function(x) pnorm(x, log.p = TRUE)
−50
−40
−30
−20
−10
0
10
x


Poisson(1) CDF
F(x)
0.0
0.4
0.8
0
1
2
3
4
5
x
help("Poisson")


Binomial(100, 0.01) CDF
F(x)
0.0
0.4
0.8
0
1
2
3
4
5
x

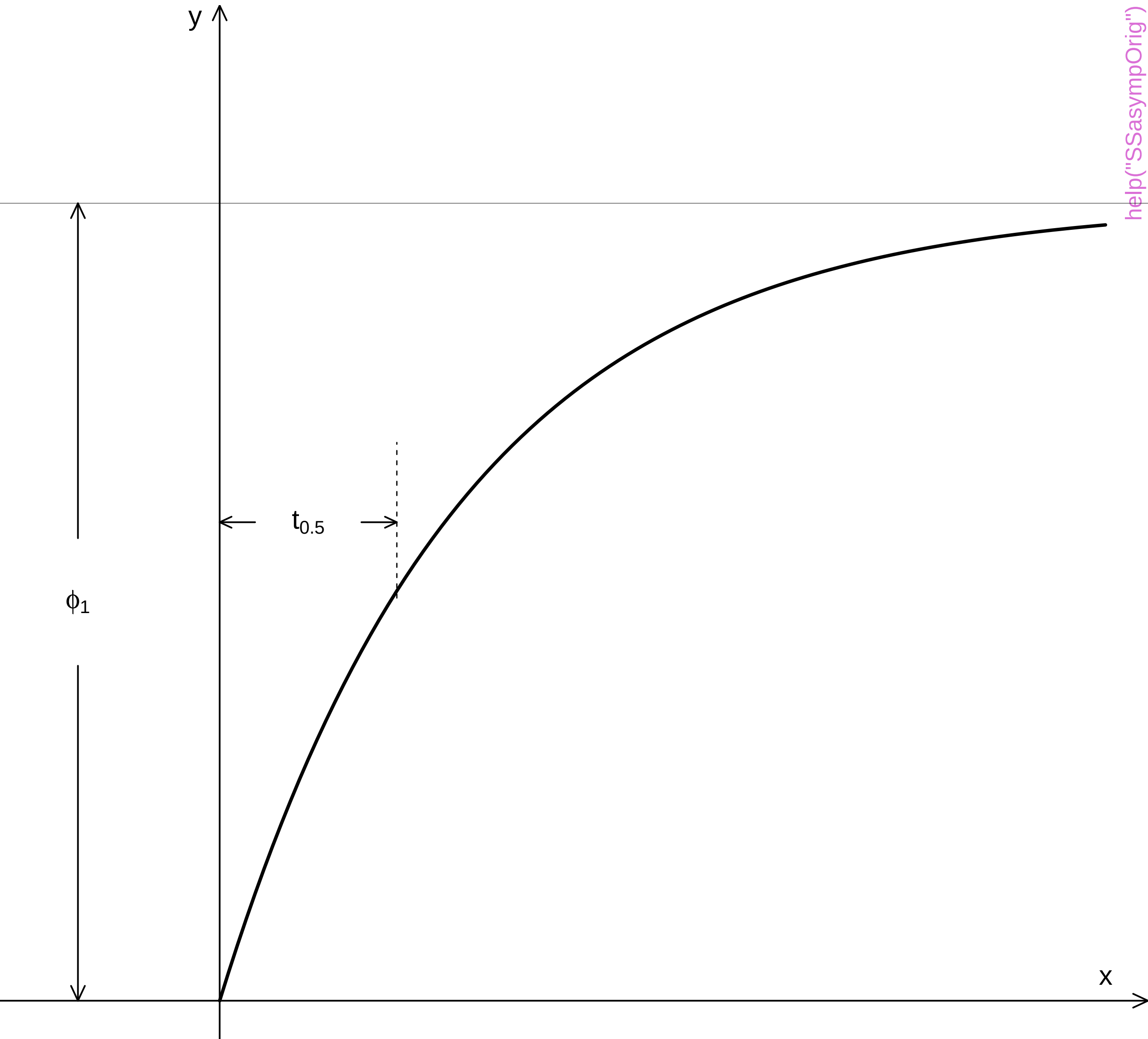
Parameters in the SSasymp model

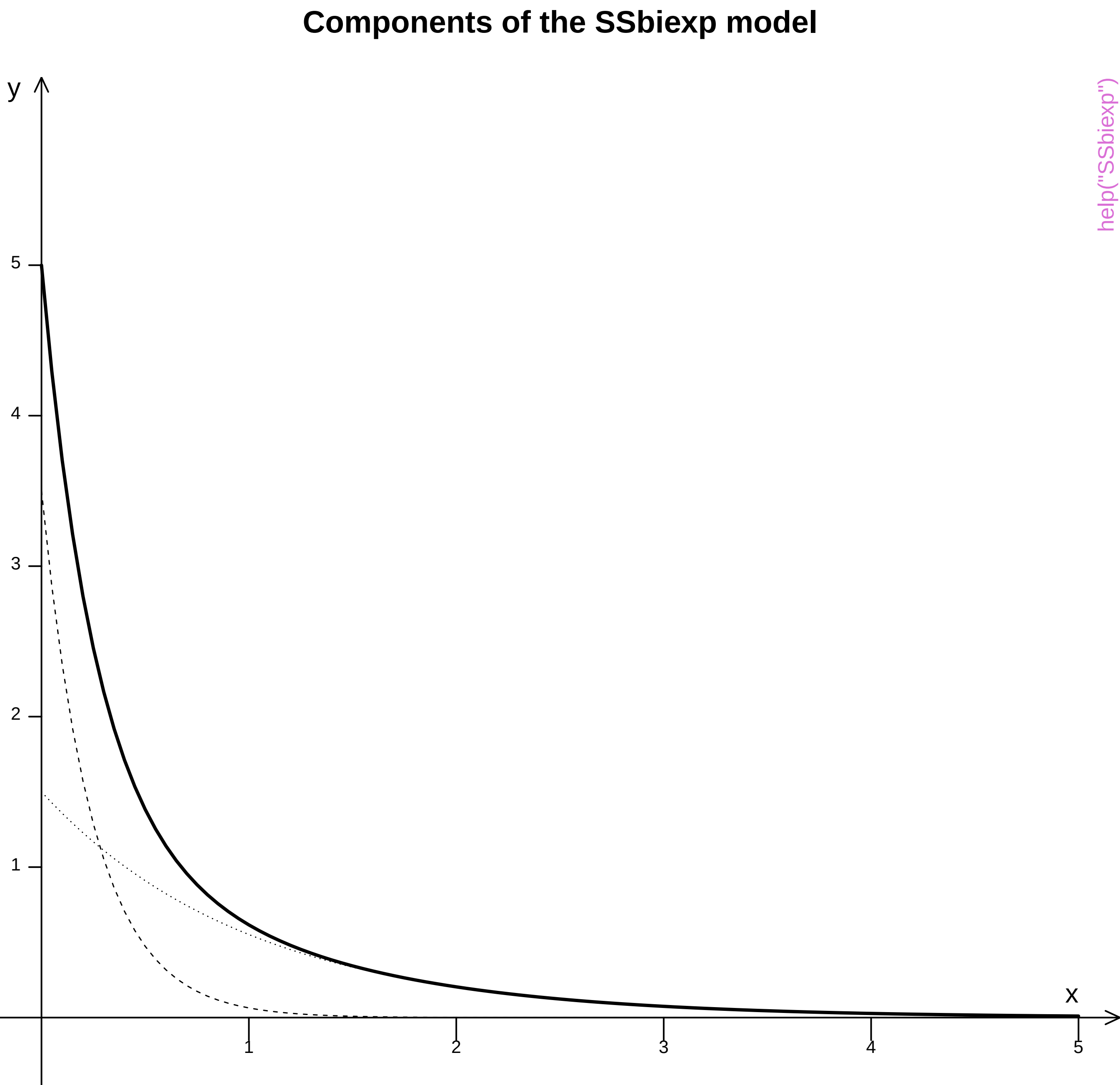




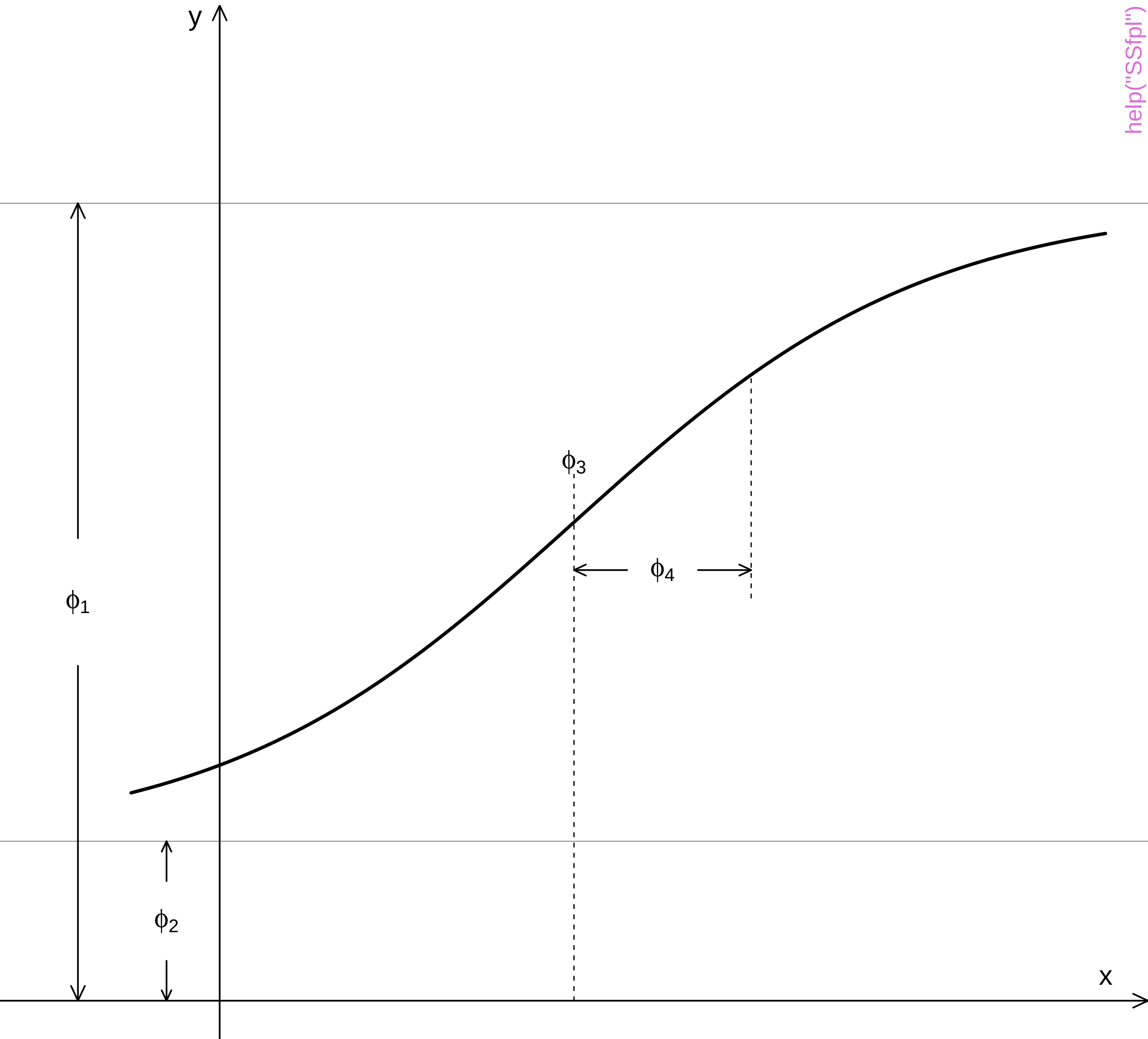
Parameters in the SSasympOff model
y
x
ϕ1
ϕ3
t0.5
help("SSasympOff")

Parameters in the SSasympOrig model

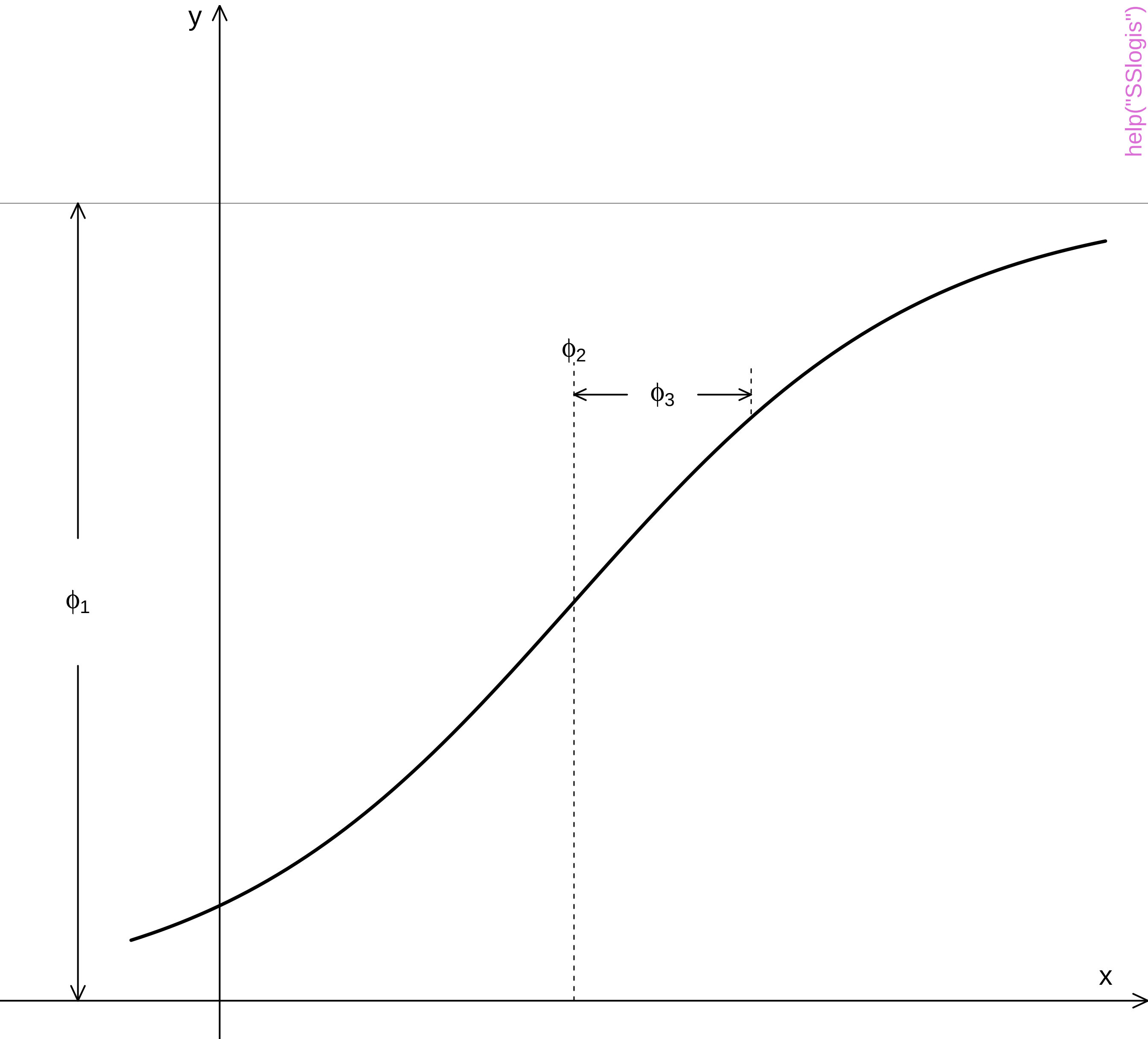


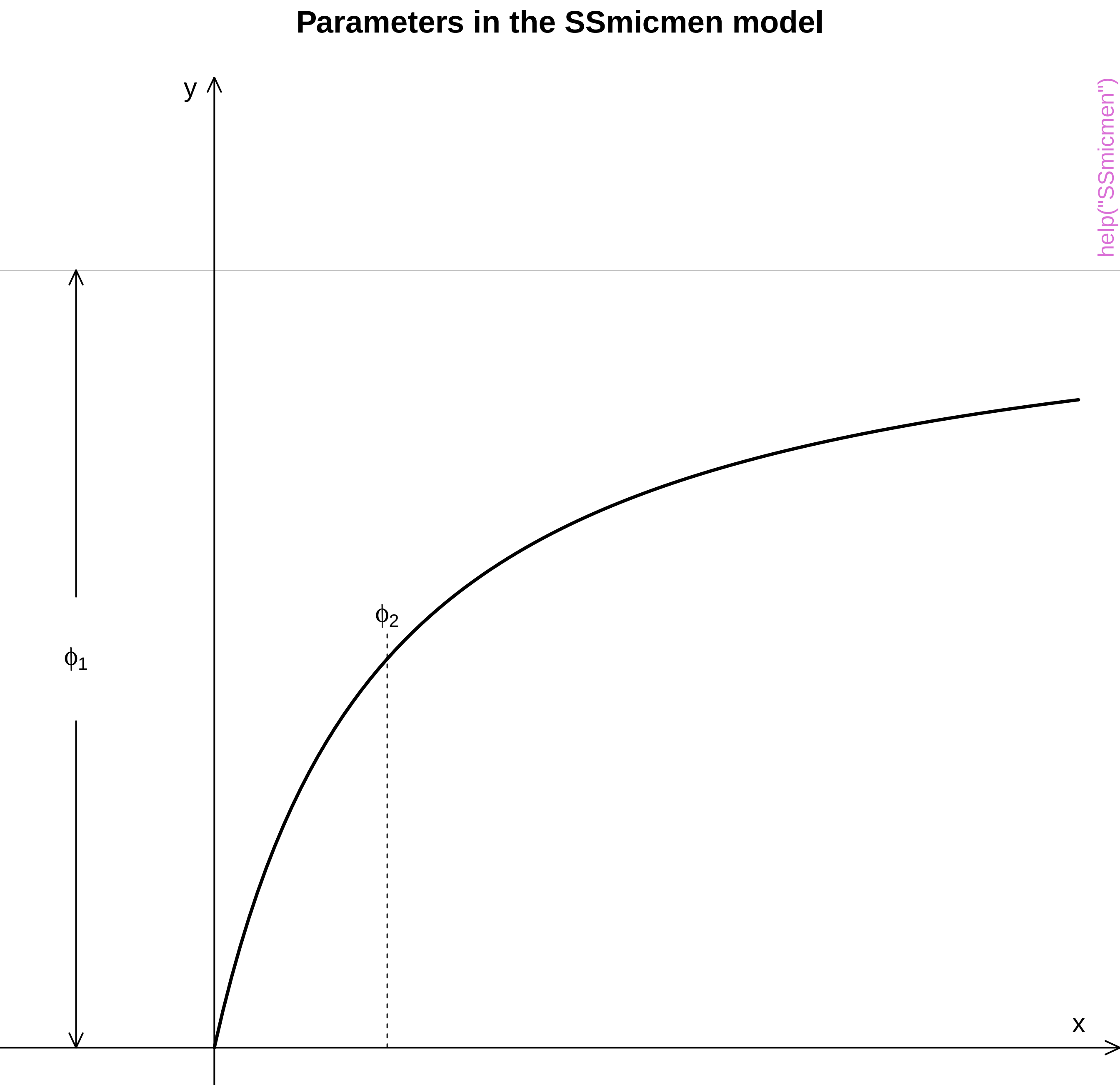

Components of the SSbiexp model
y
x
1
2
3
4
5
1
2
3
4
5
help("SSbiexp")

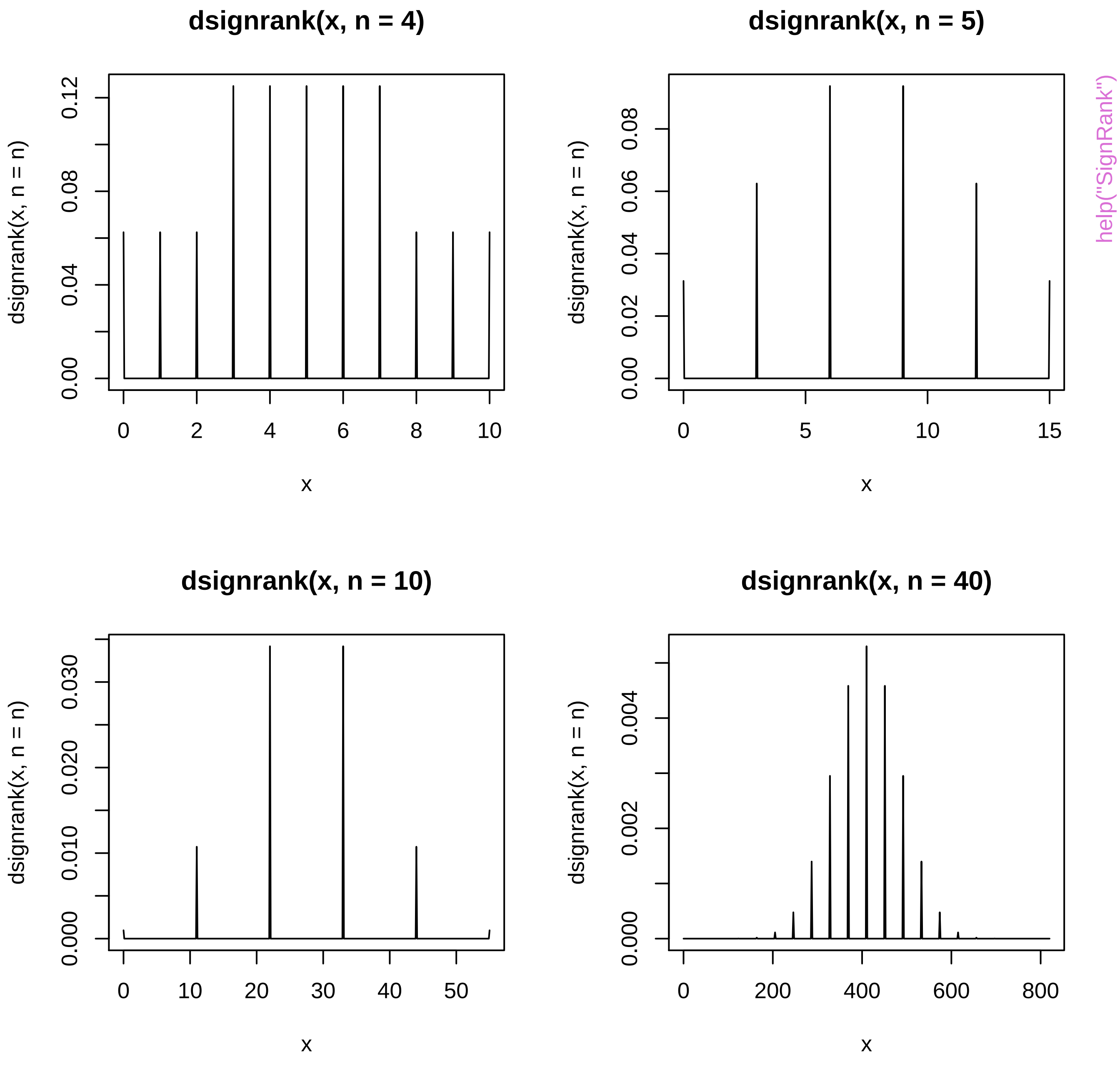
Parameters in the SSfpl model

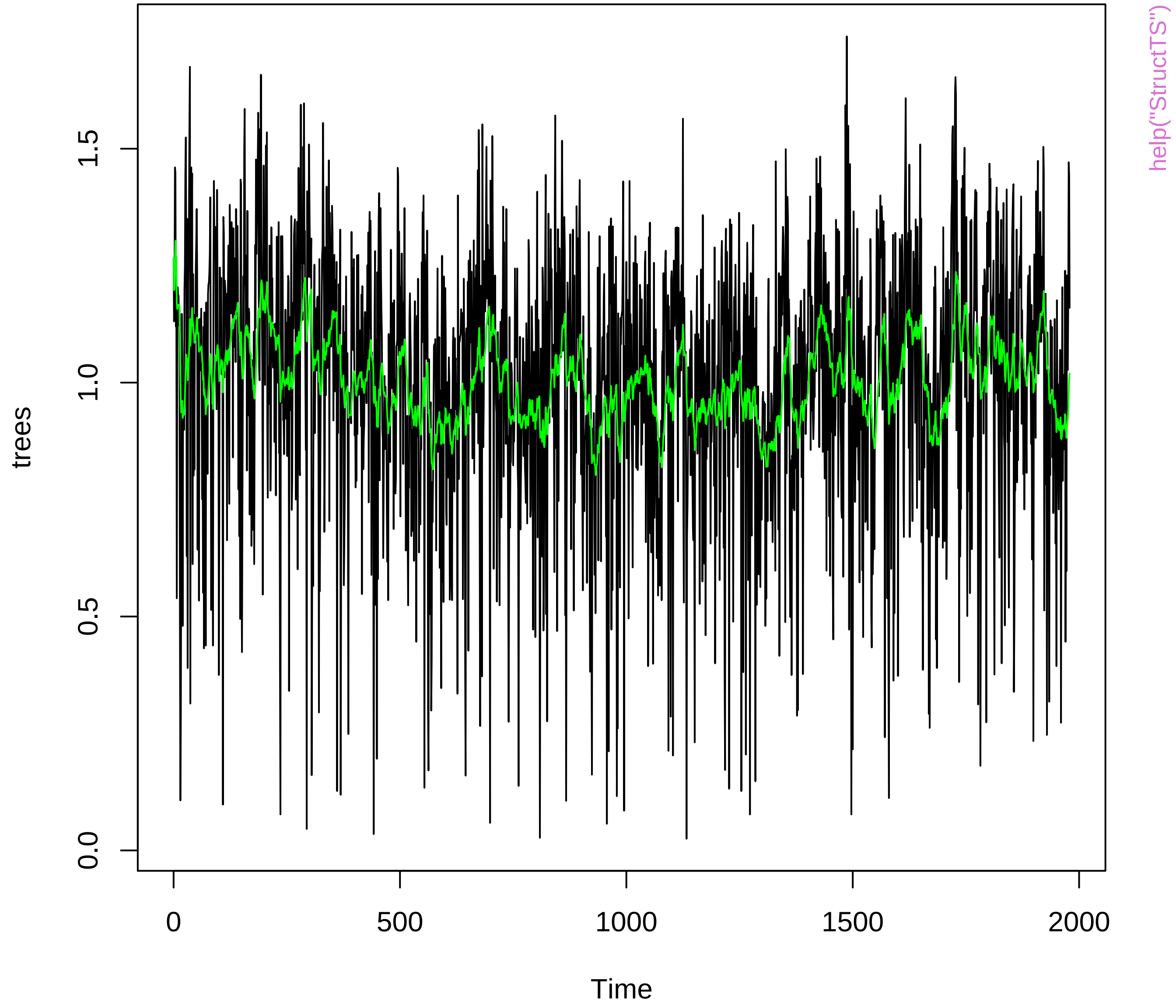


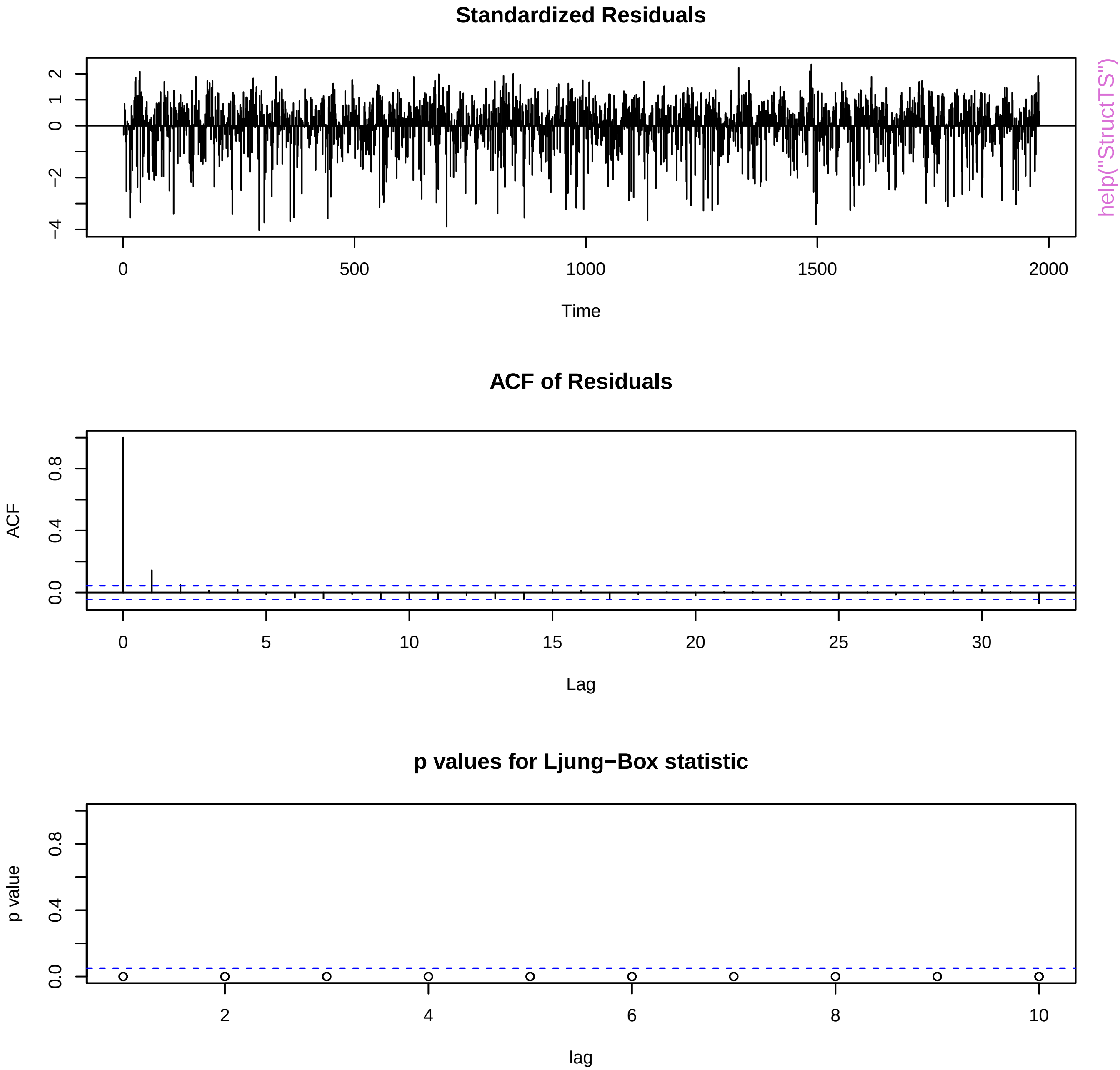
Parameters in the SSlogis model

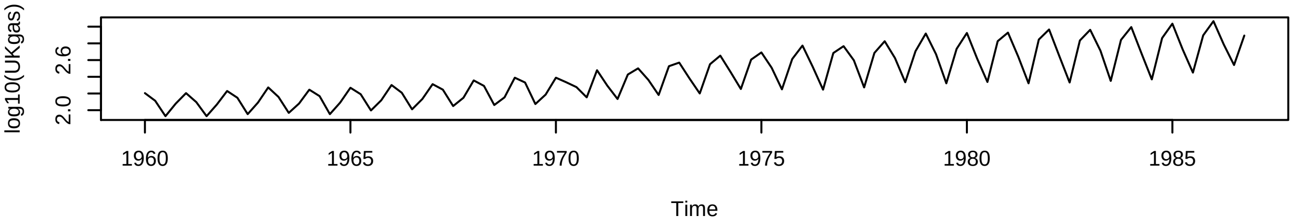



Parameters in the SSmicmen model
y
x
ϕ_1
ϕ_2
help("SSmicmen")

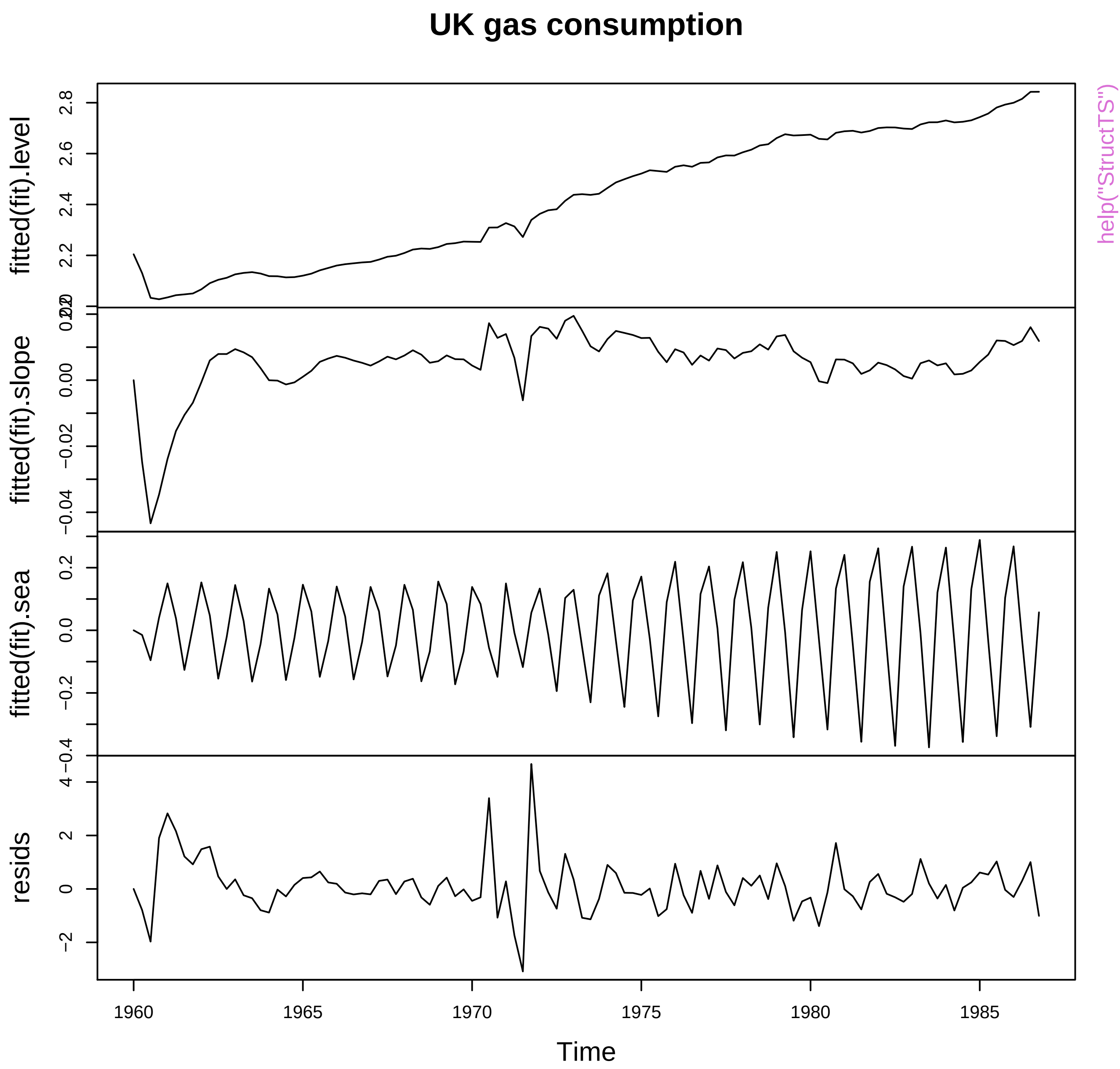

dsignrank(x, n = 4)
dsignrank(x, n = n)
0.00
0.04
0.08
0.12
0
2
4
6
8
10
x
dsignrank(x, n = 5)
0.00
0.02
0.04
0.06
0.08
0
5
10
15
help("SignRank")
dsignrank(x, n = 10)
0.000
0.010
0.020
0.030
0
10
20
30
40
50
dsignrank(x, n = 40)
0.000
0.002
0.004
0
200
400
600
800


trees
Time
0.0
0.5
1.0
1.5
0
500
1000
1500
2000
help("StructTS")

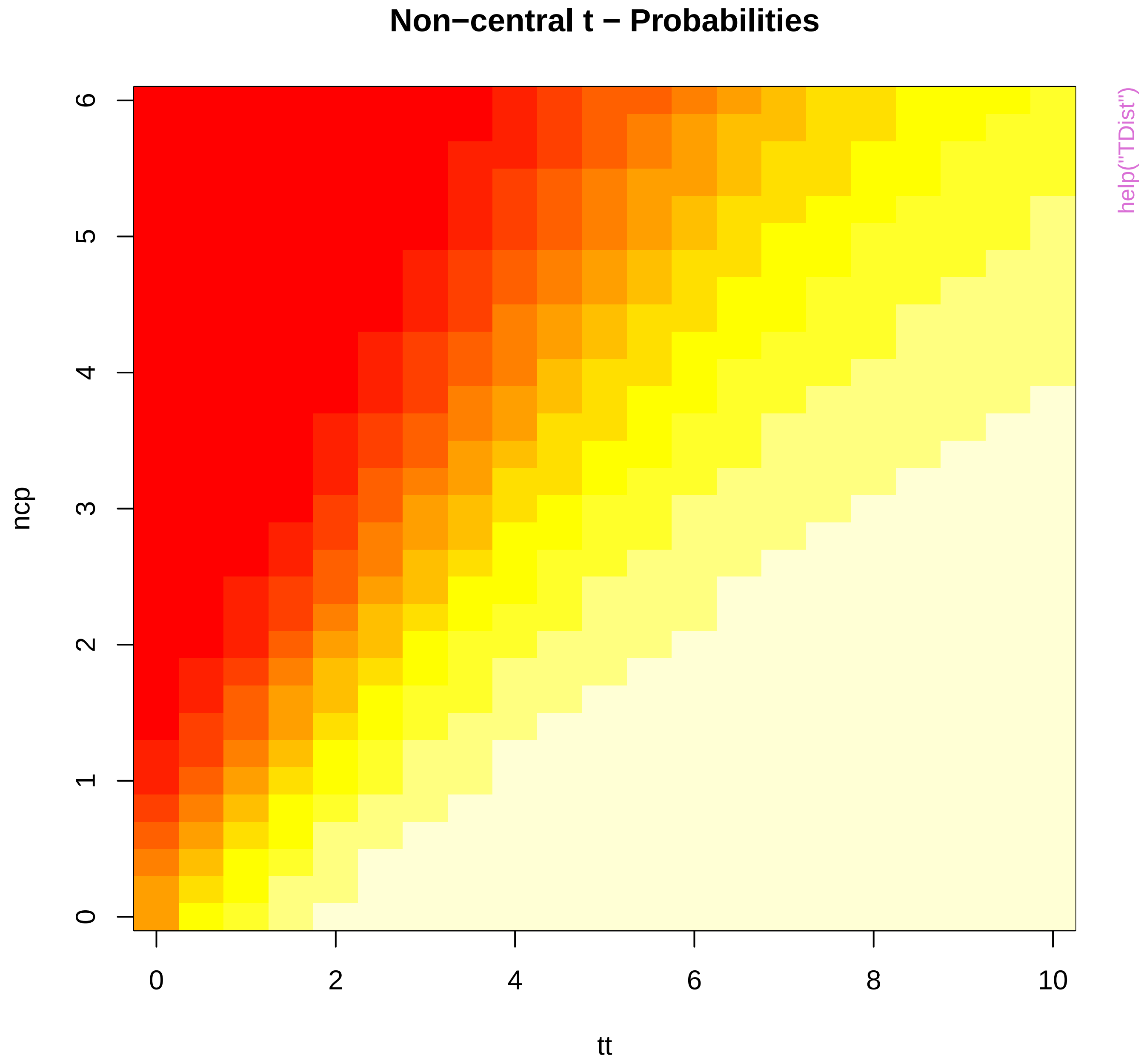

Standardized Residuals
Time
help("StructTS")
ACF of Residuals
ACF
Lag
p values for Ljung−Box statistic
p value
lag



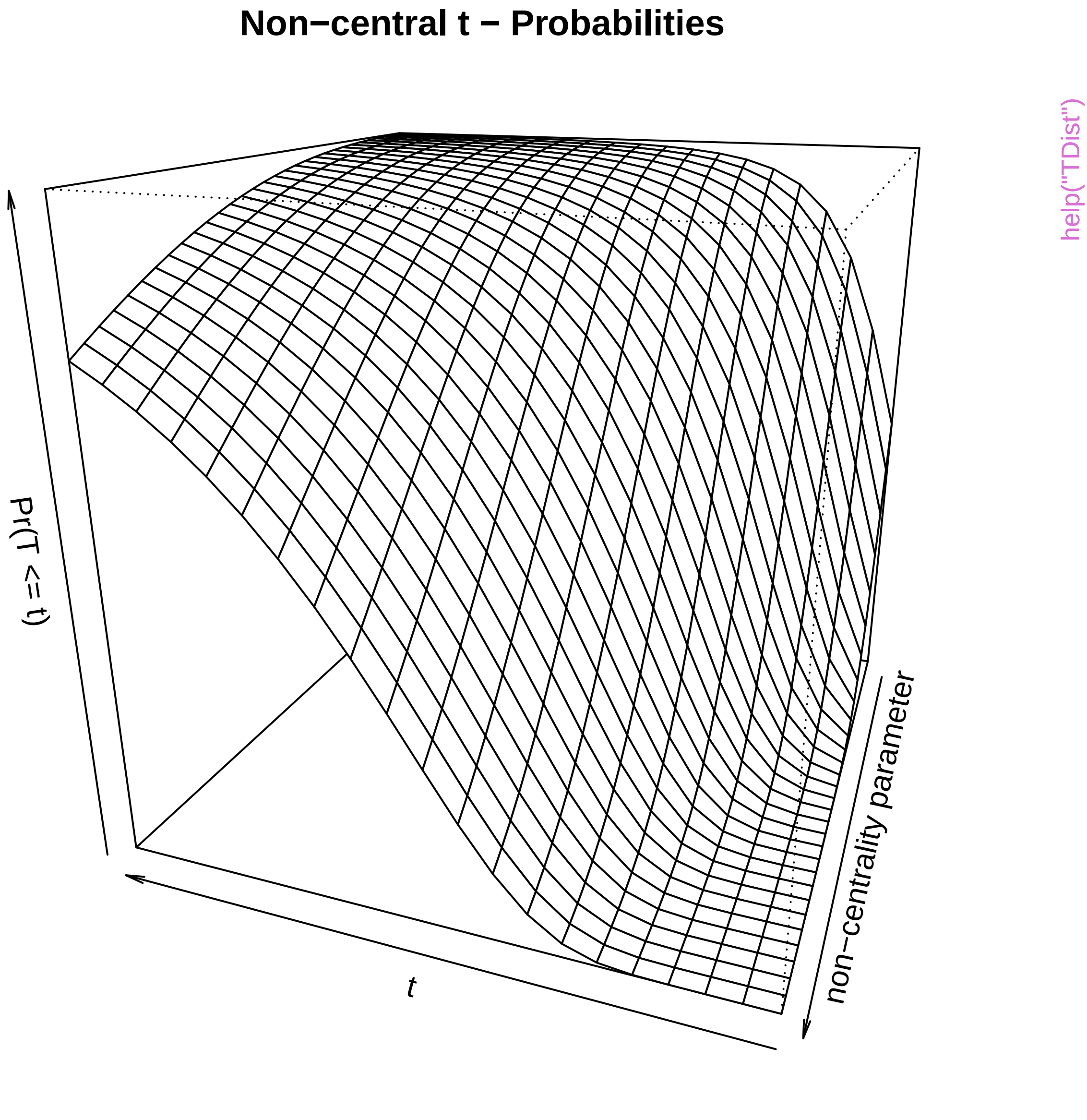
help("StructTS")

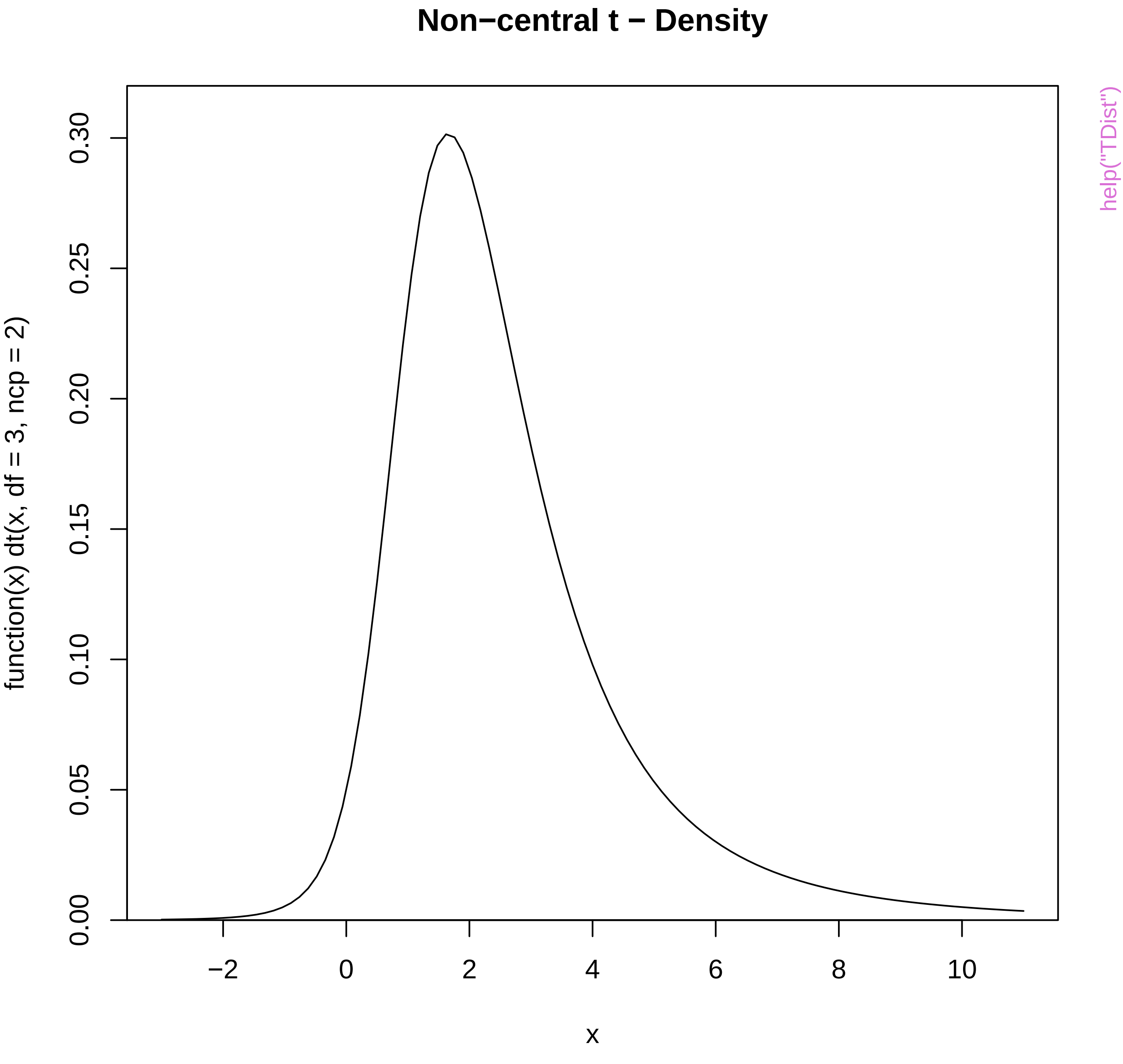


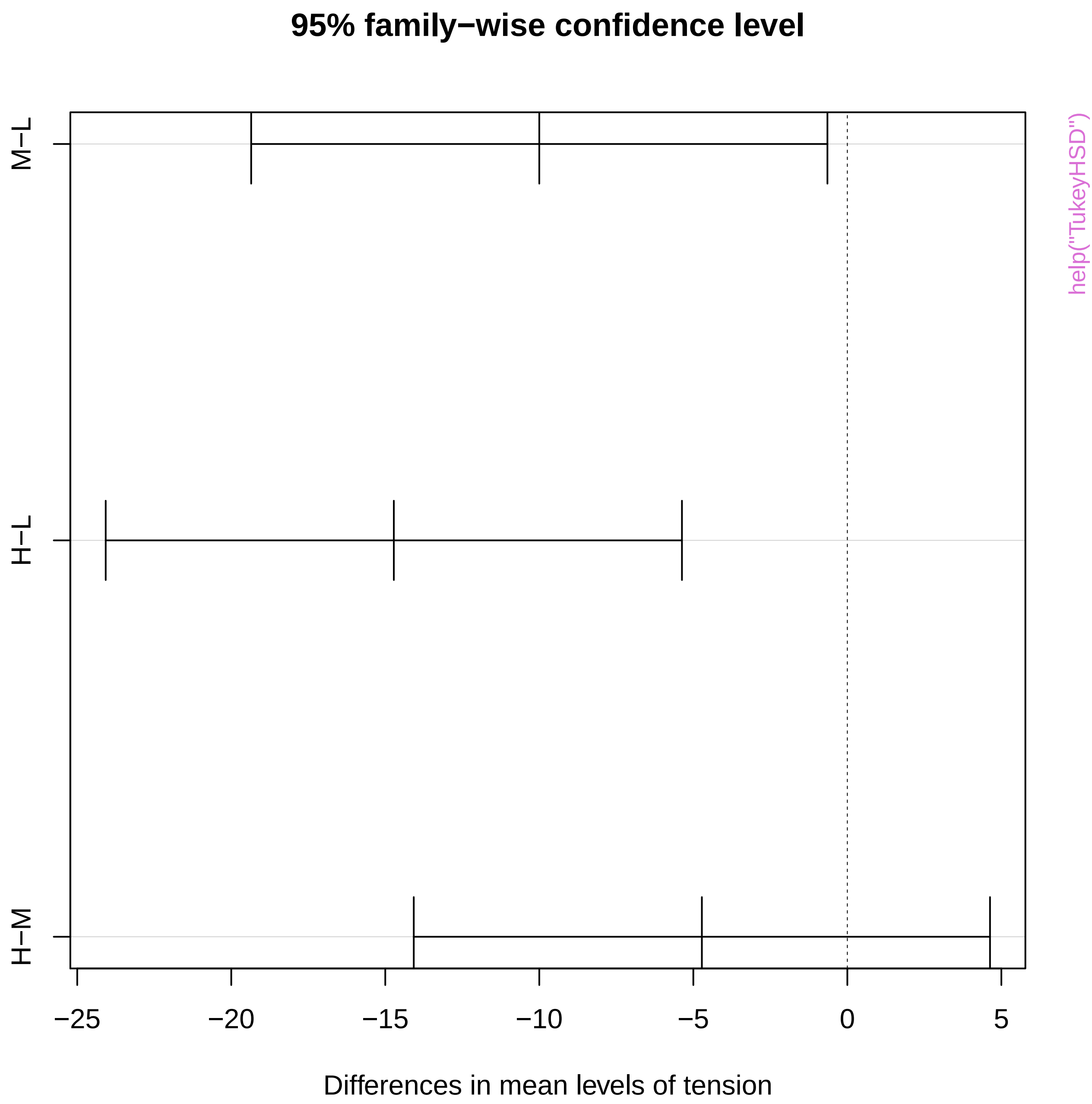
UK gas consumption
fitted(fit).level
fitted(fit).slope
fitted(fit).sea
resids
Time
1960
1965
1970
1975
1980
1985
help("StructTS")



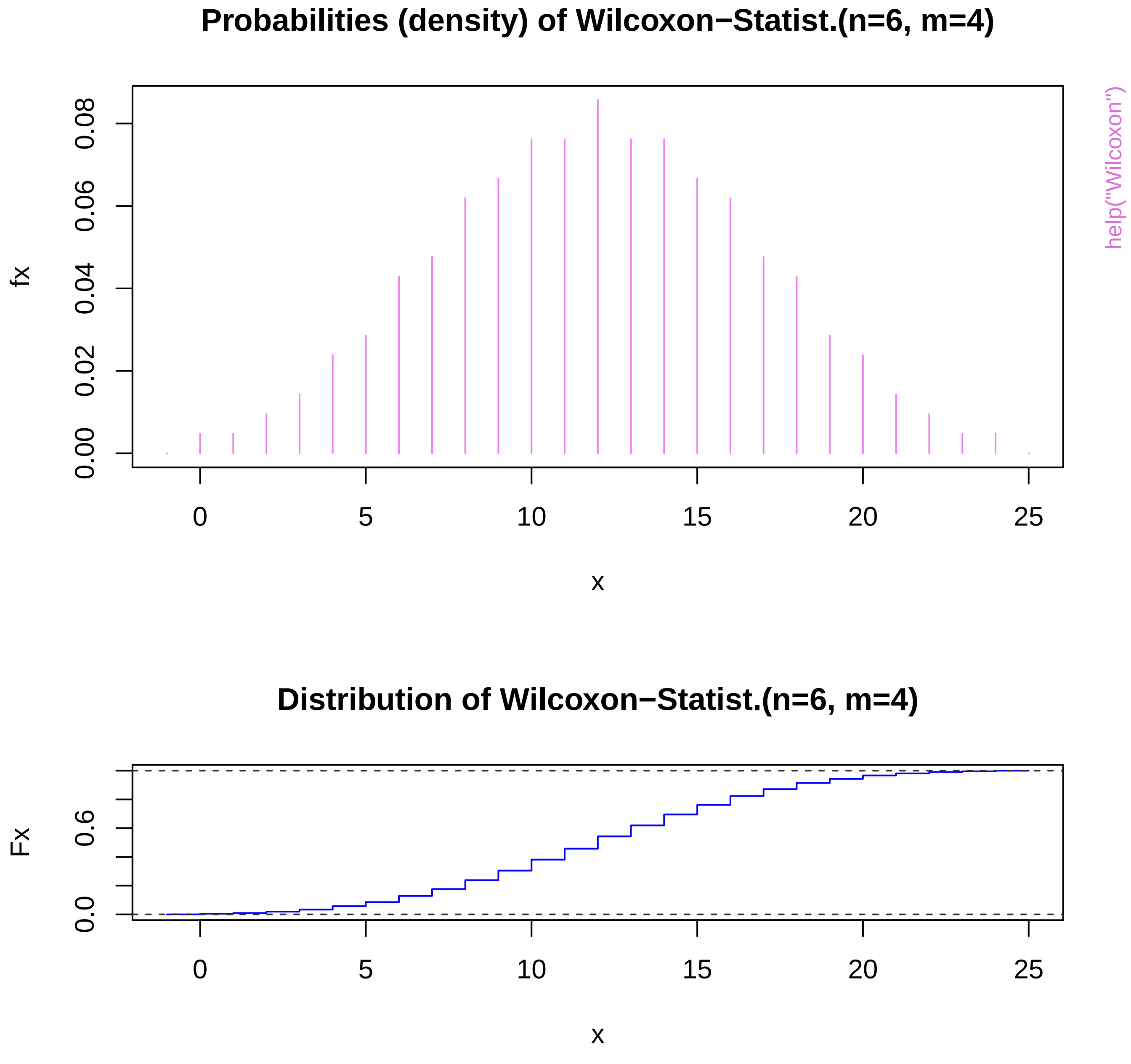
Non−central t − Probabilities
ncp
0
1
2
3
4
5
6
tt
0
2
4
6
8
10
help("TDist")


Non−central t − Probabilities
Pr(T <= t)
t
non−centrality parameter
help("TDist")

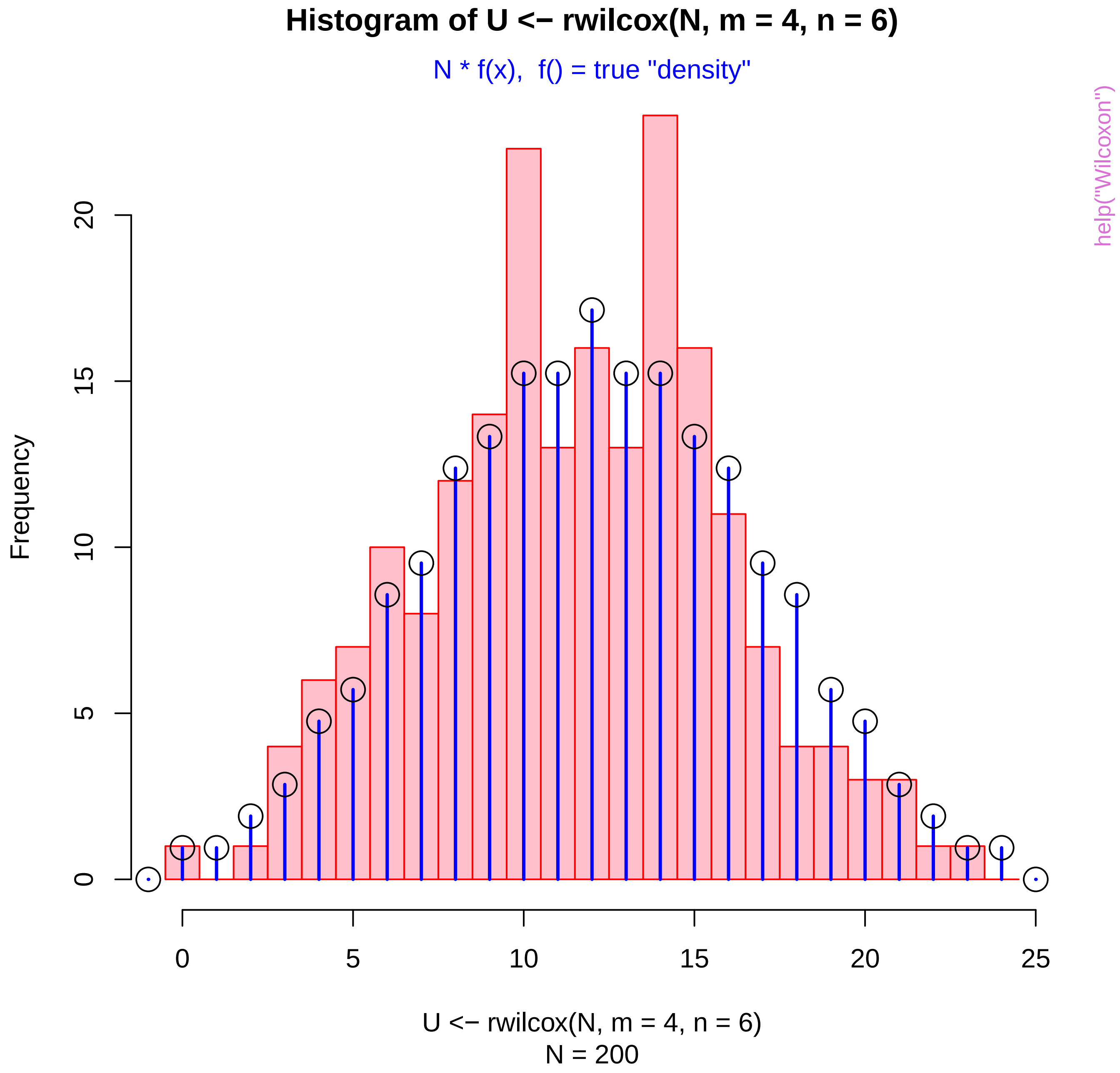

Non−central t − Density
function(x) dt(x, df = 3, ncp = 2)
0.00
0.05
0.10
0.15
0.20
0.25
0.30
−2
0
2
4
6
8
10
x
help("TDist")



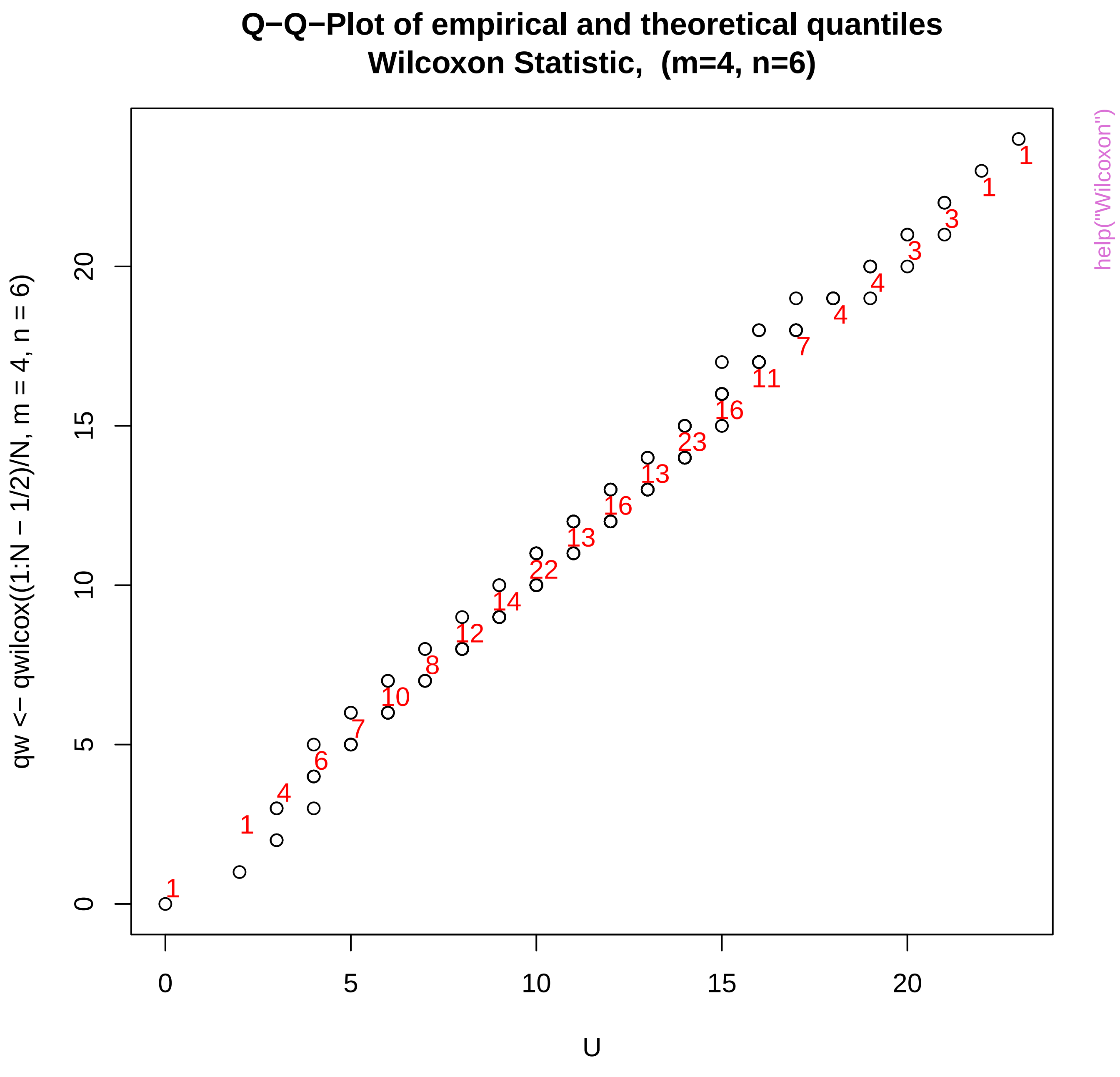
95% family−wise confidence level
M−L
H−L
H−M
−25
−20
−15
−10
−5
0
5
Differences in mean levels of tension
help("TukeyHSD")

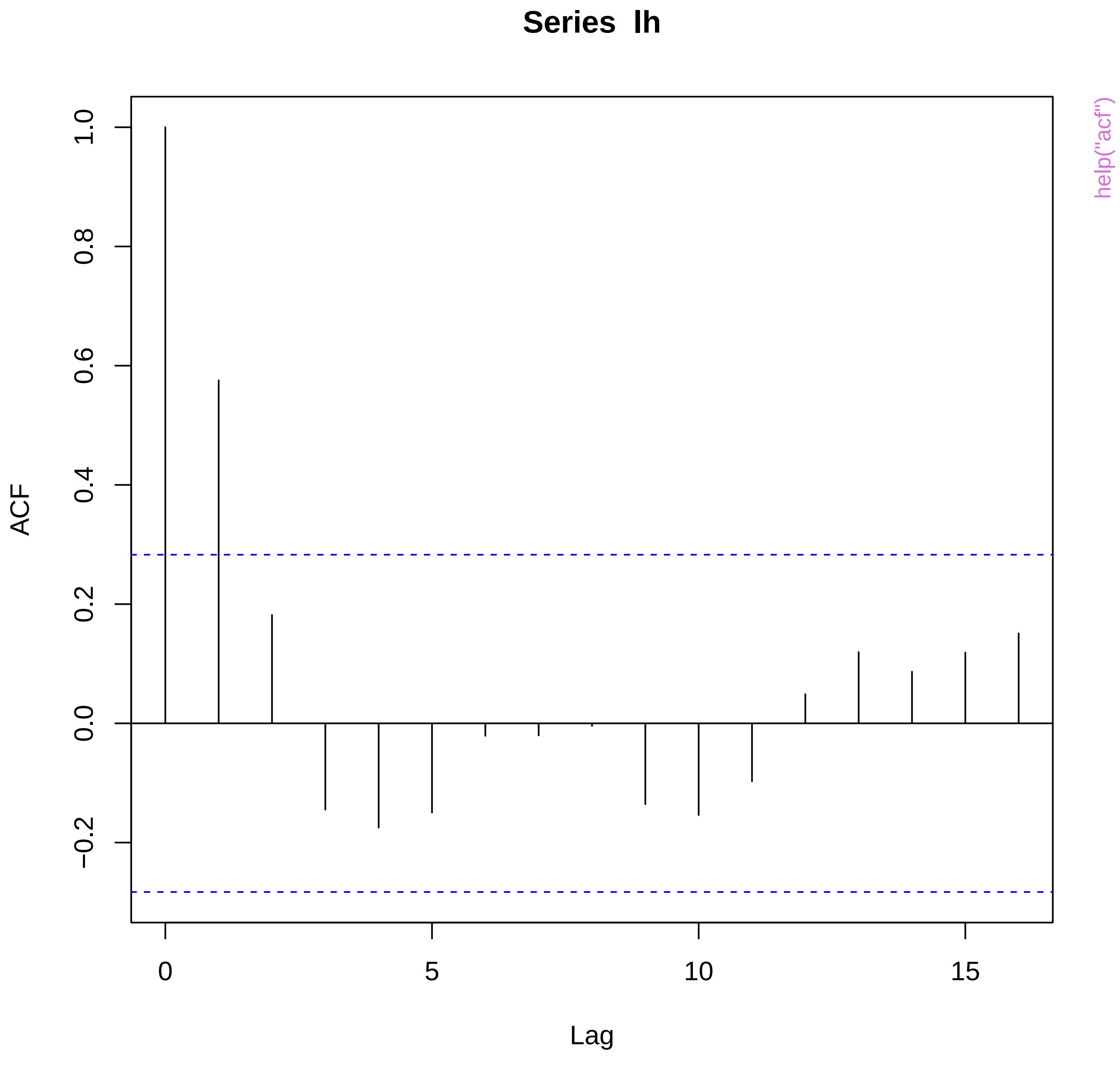


Probabilities (density) of Wilcoxon−Statist.(n=6, m=4)
fx
0.00
0.02
0.04
0.06
0.08
0
5
10
15
20
25
x
help("Wilcoxon")
Distribution of Wilcoxon−Statist.(n=6, m=4)
Fx
0.0
0.6
0
5
10
15
20
25
x

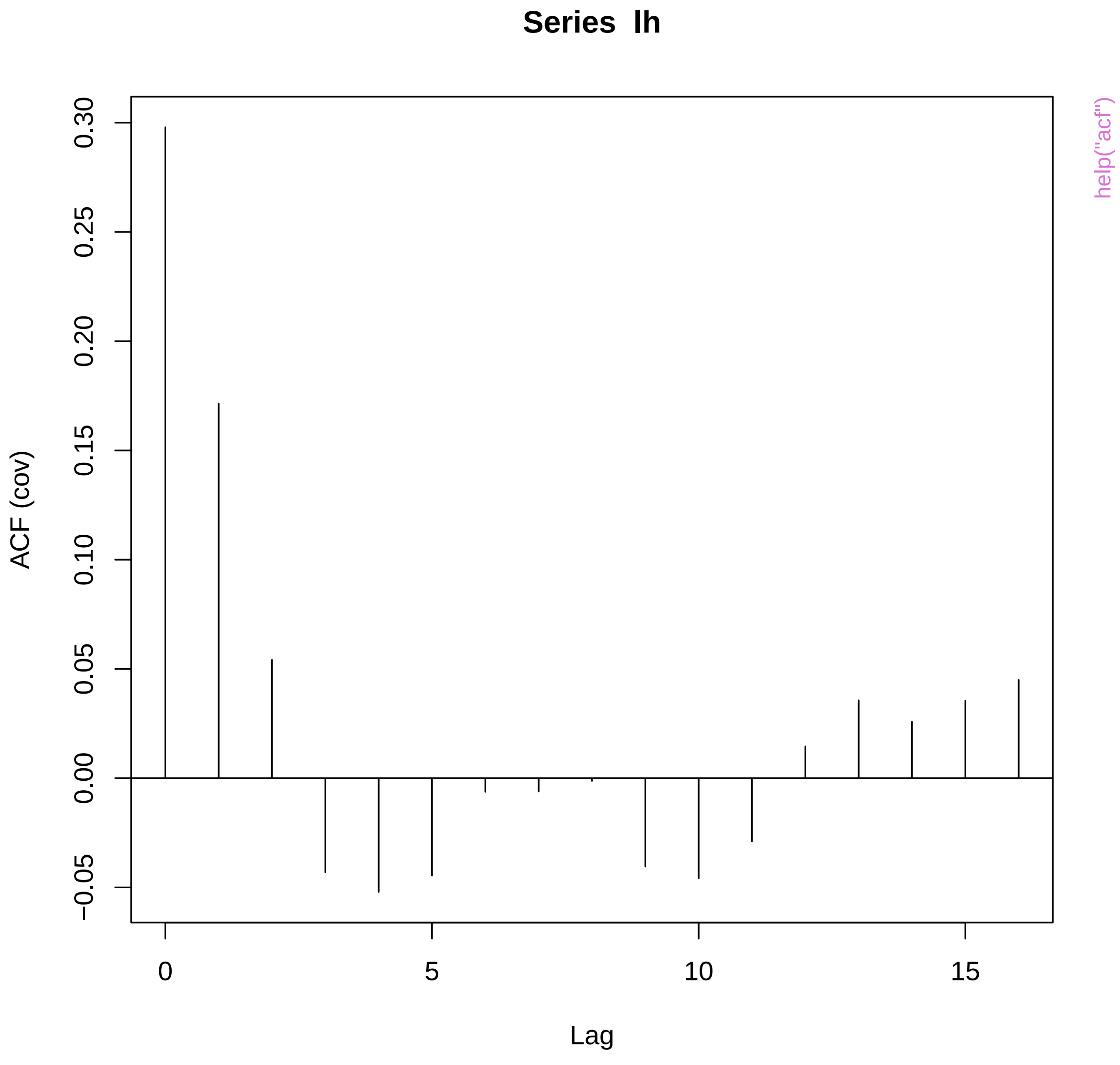


Histogram of U <− rwilcox(N, m = 4, n = 6)
N * f(x), f() = true "density"
help("Wilcoxon")
Frequency
0
5
10
15
20
0
5
10
15
20
25
U <− rwilcox(N, m = 4, n = 6)
N = 200

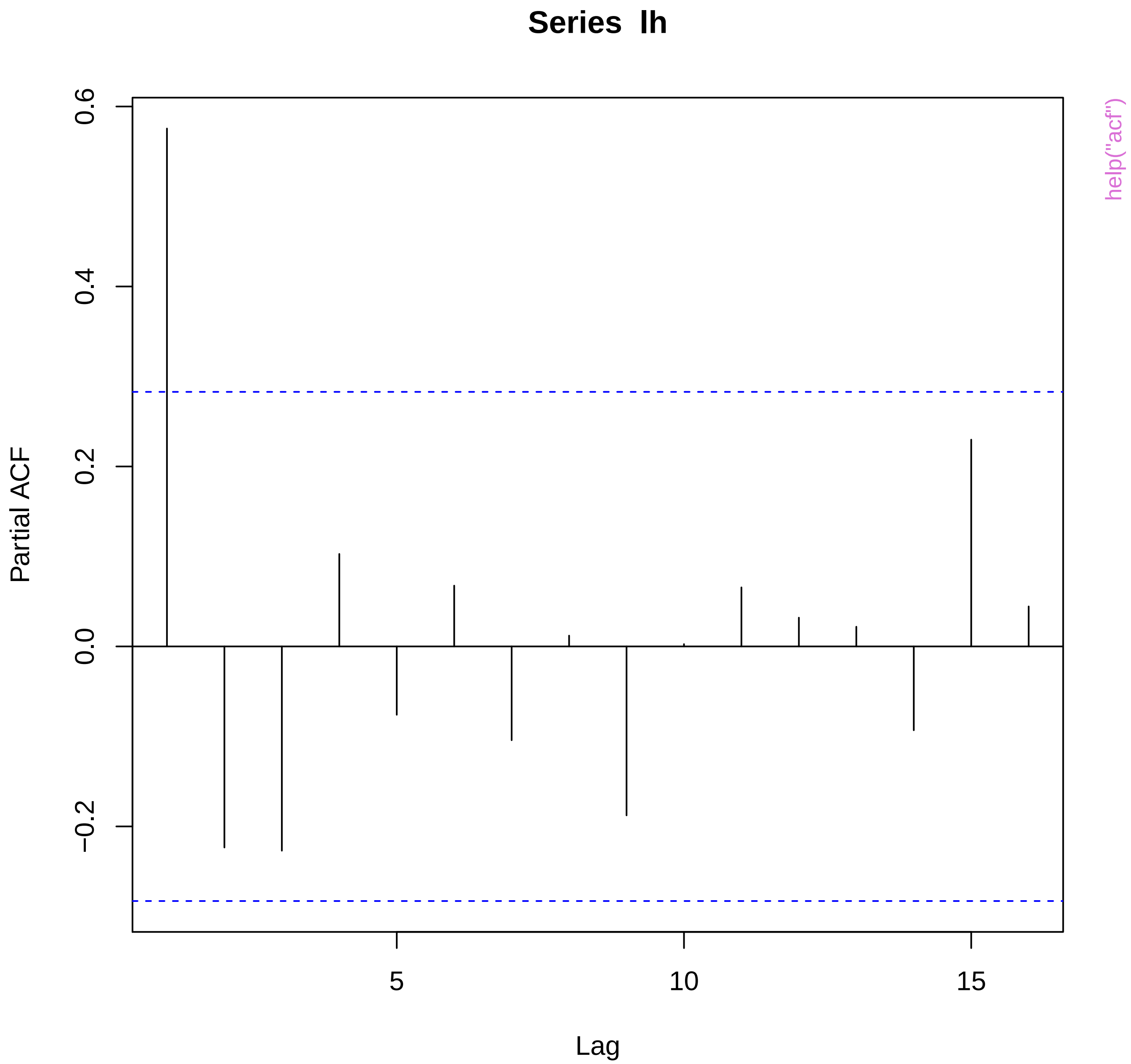

Q−Q−Plot of empirical and theoretical quantiles
Wilcoxon Statistic, (m=4, n=6)
qw <− qwilcox((1:N − 1/2)/N, m = 4, n = 6)
U
help("Wilcoxon")
0
5
10
15
20
1
1
4
6
7
10
8
12
14
22
13
16
13
23
16
11
7
4
4
3
3
1
1

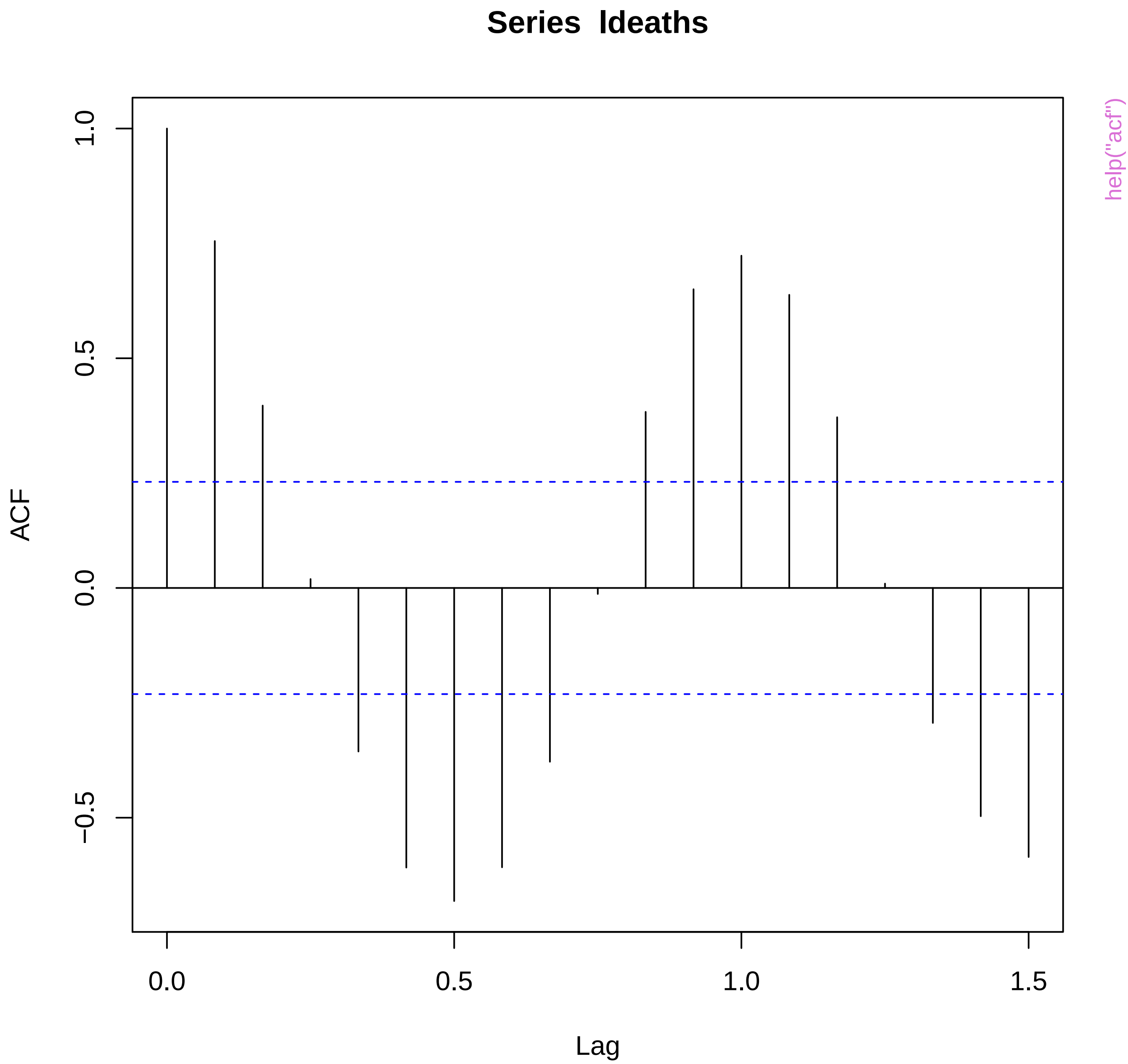


Series lh
ACF
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
0
5
10
15
Lag
help("acf")

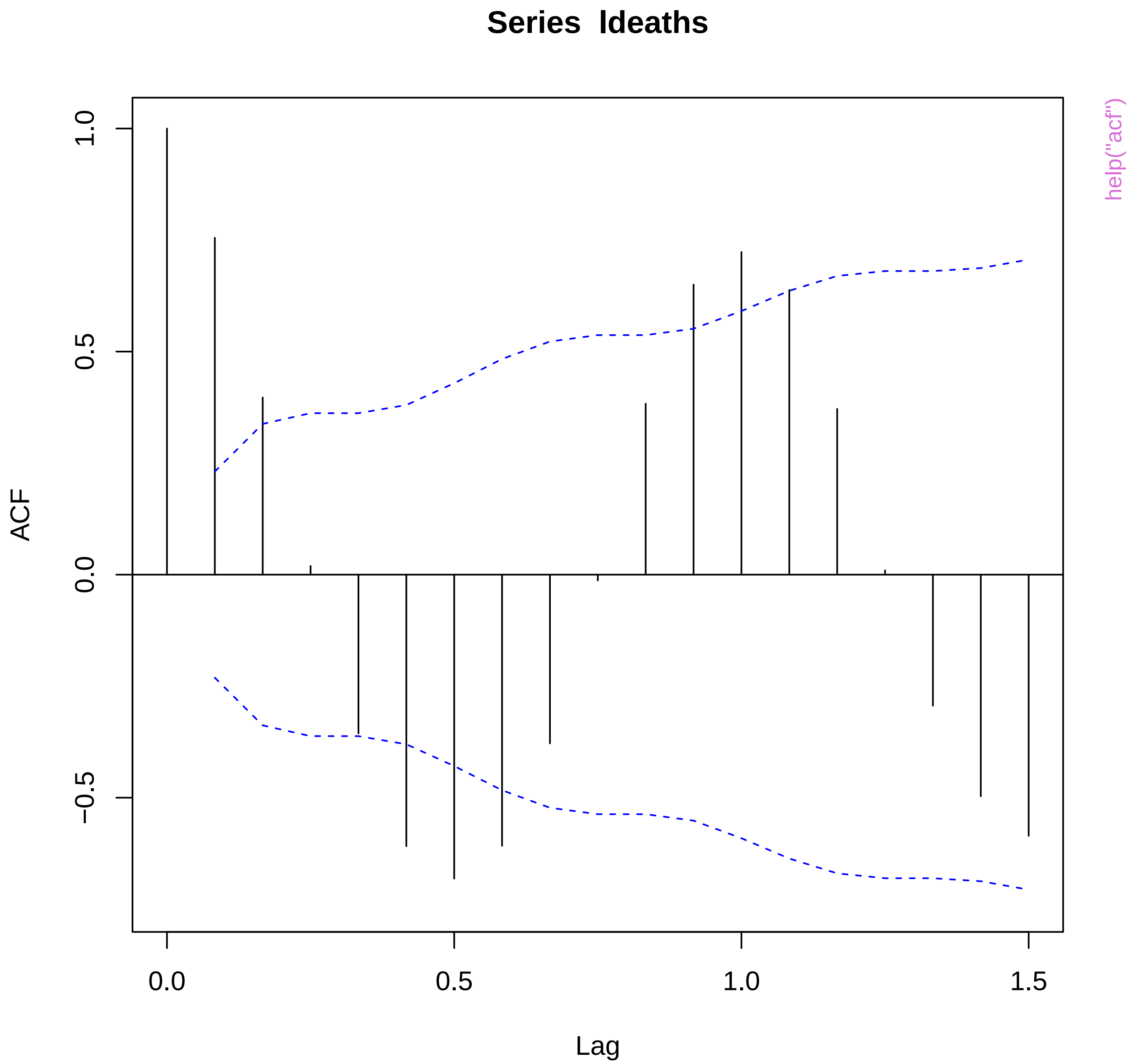


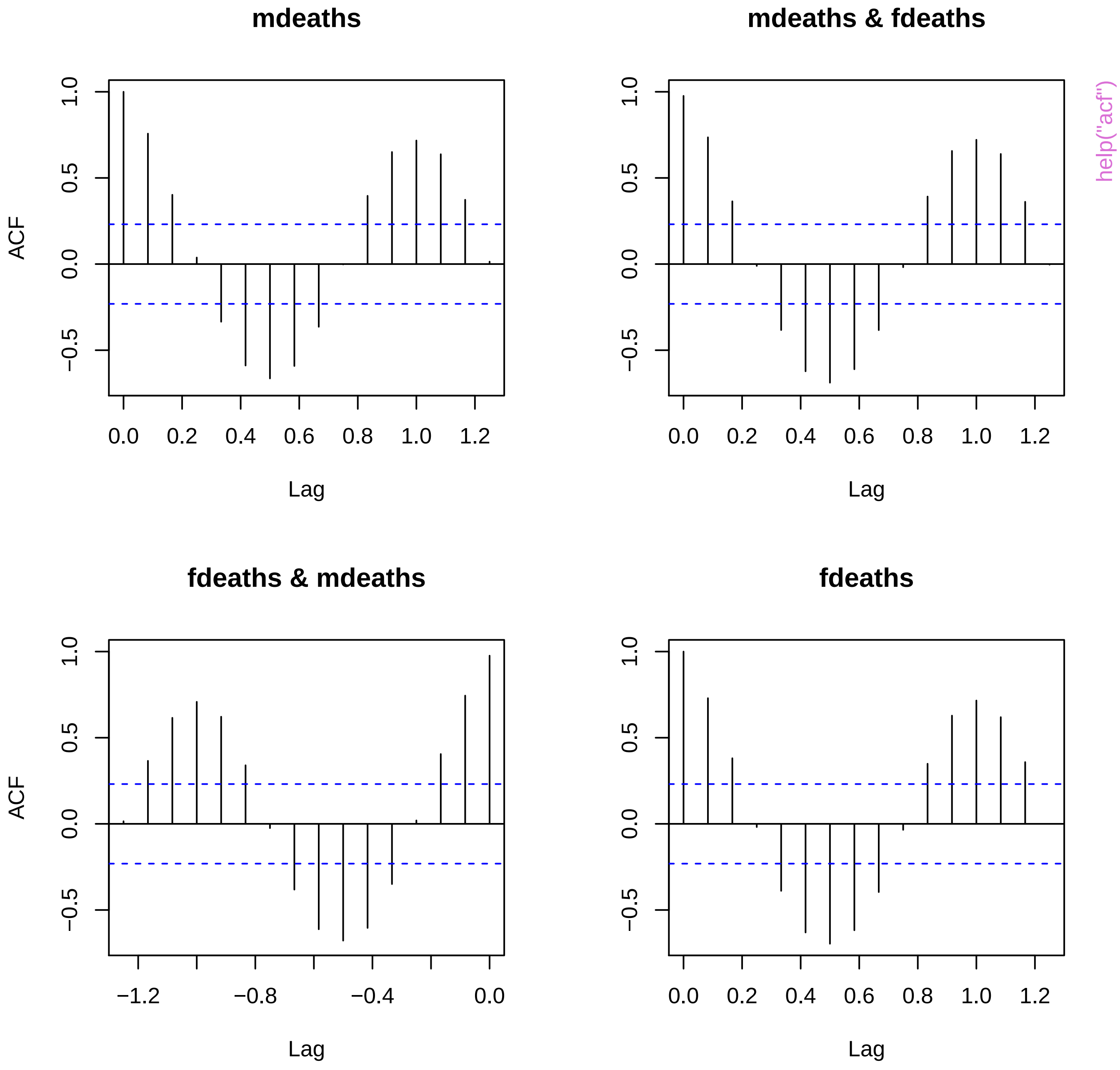
Series lh
ACF (cov)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
−0.05
0
5
10
15
Lag
help("acf")

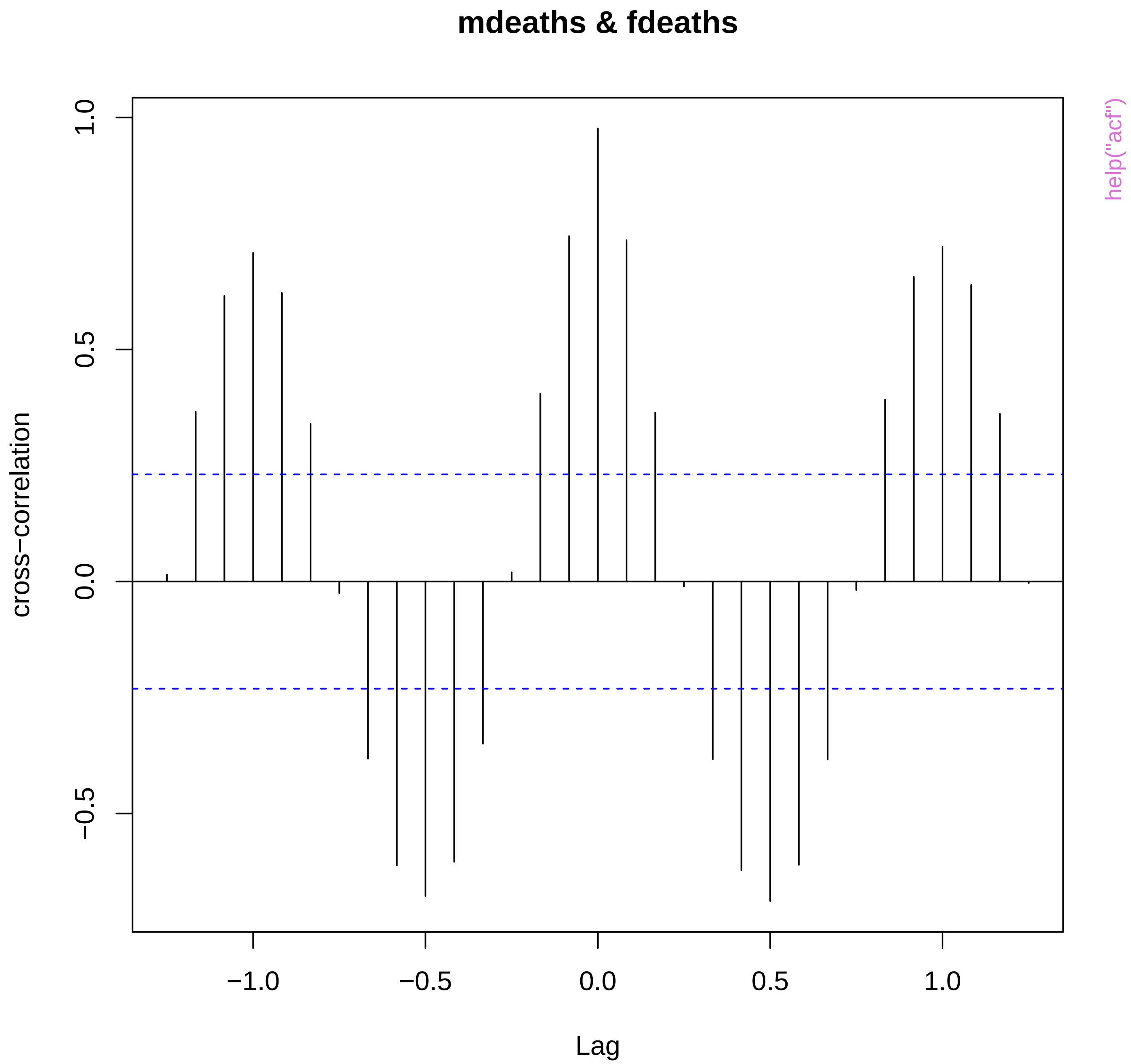

Series lh
Partial ACF
0.6
0.4
0.2
0.0
−0.2
5
10
15
Lag
help("acf")

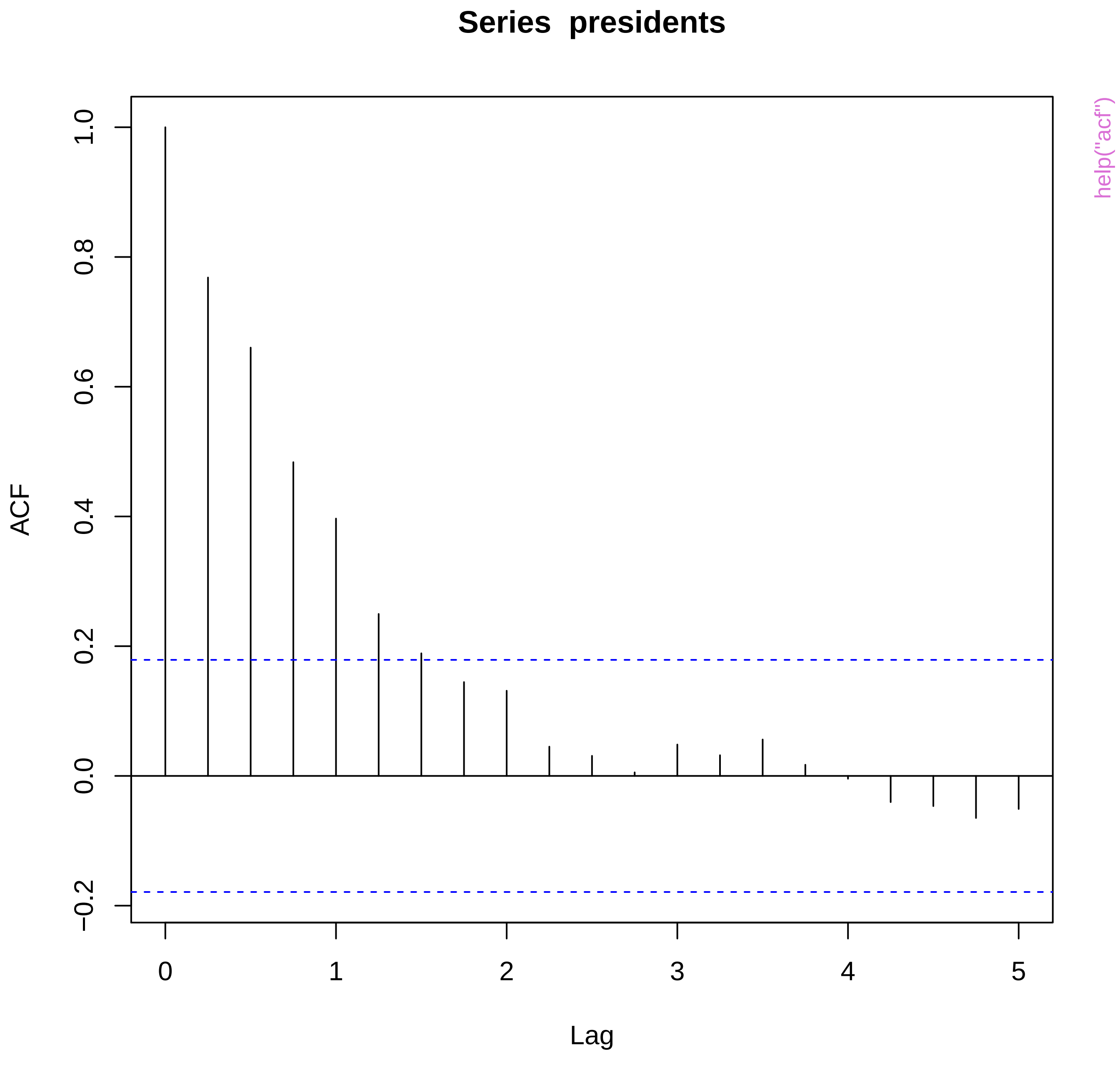


Series ldeaths
ACF
Lag
1.0
0.5
0.0
−0.5
0.0
0.5
1.0
1.5
help("acf")

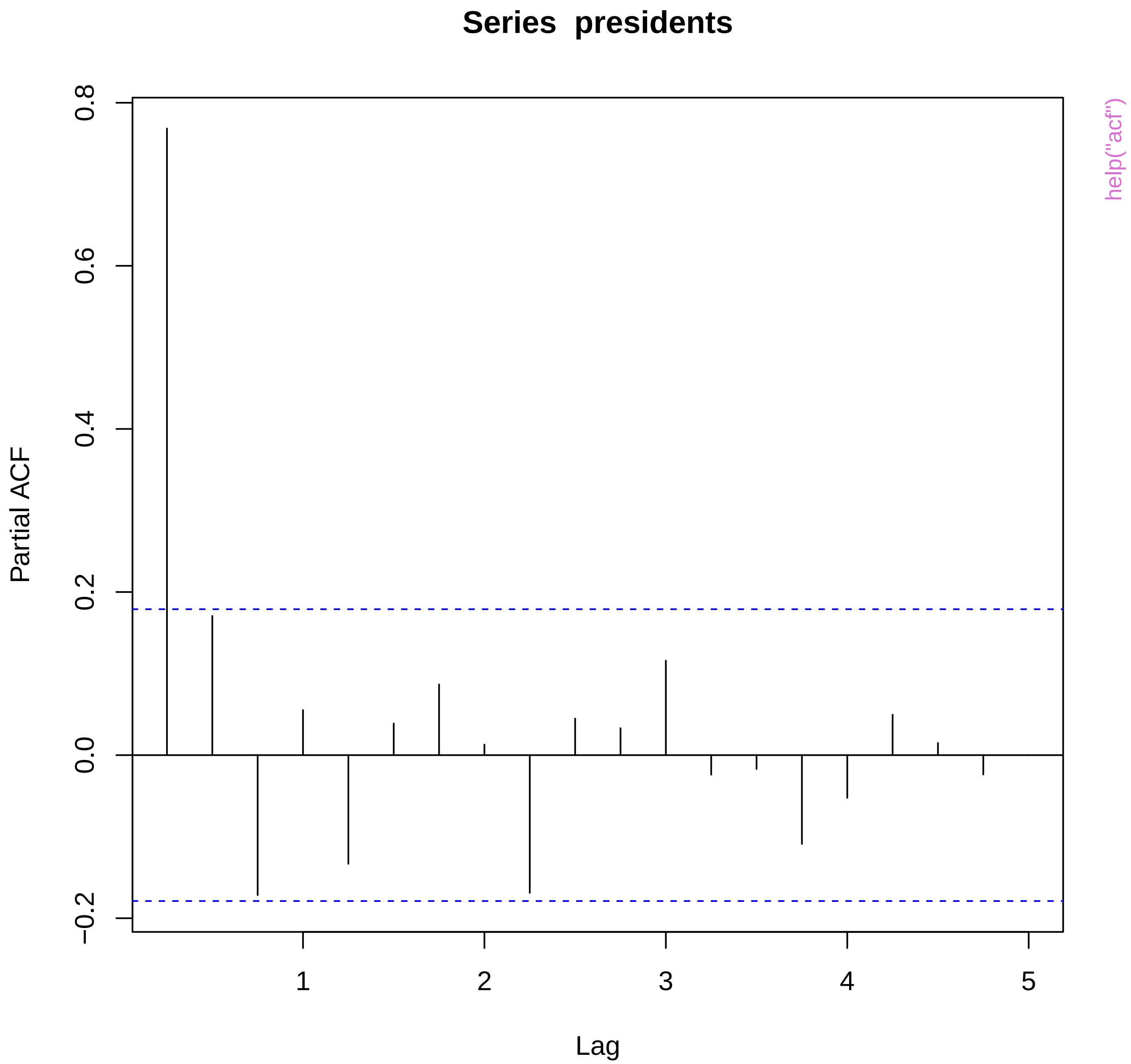

Series ldeaths
ACF
1.0
0.5
0.0
−0.5
0.0
0.5
1.0
1.5
Lag
help("acf")

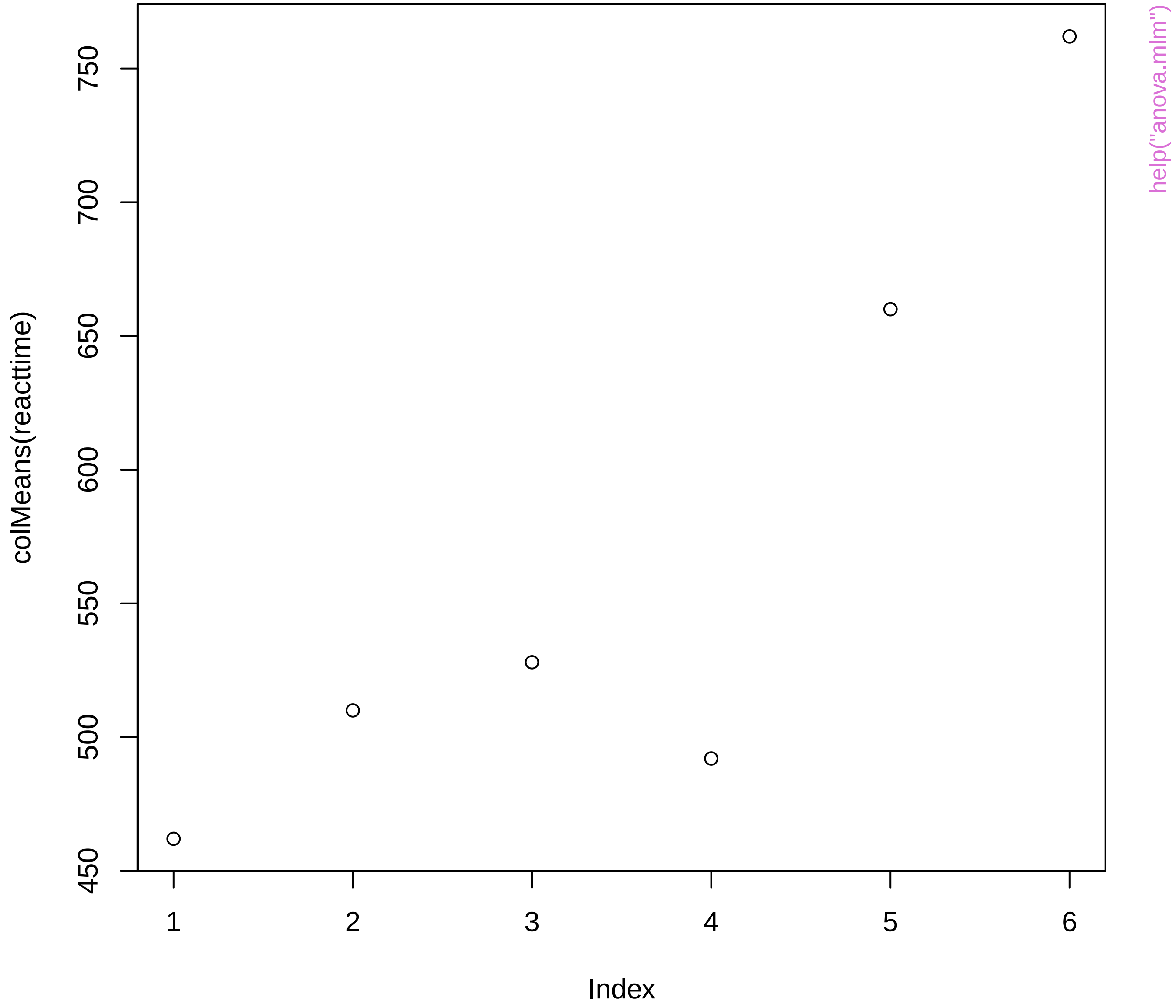

mdeaths
mdeaths & fdeaths
fdeaths & mdeaths
fdeaths
ACF
Lag
help("acf")
1.0
0.5
0.0
−0.5
0.0
0.2
0.4
0.6
0.8
1.0
1.2
−1.2
−0.8
−0.4
0.0

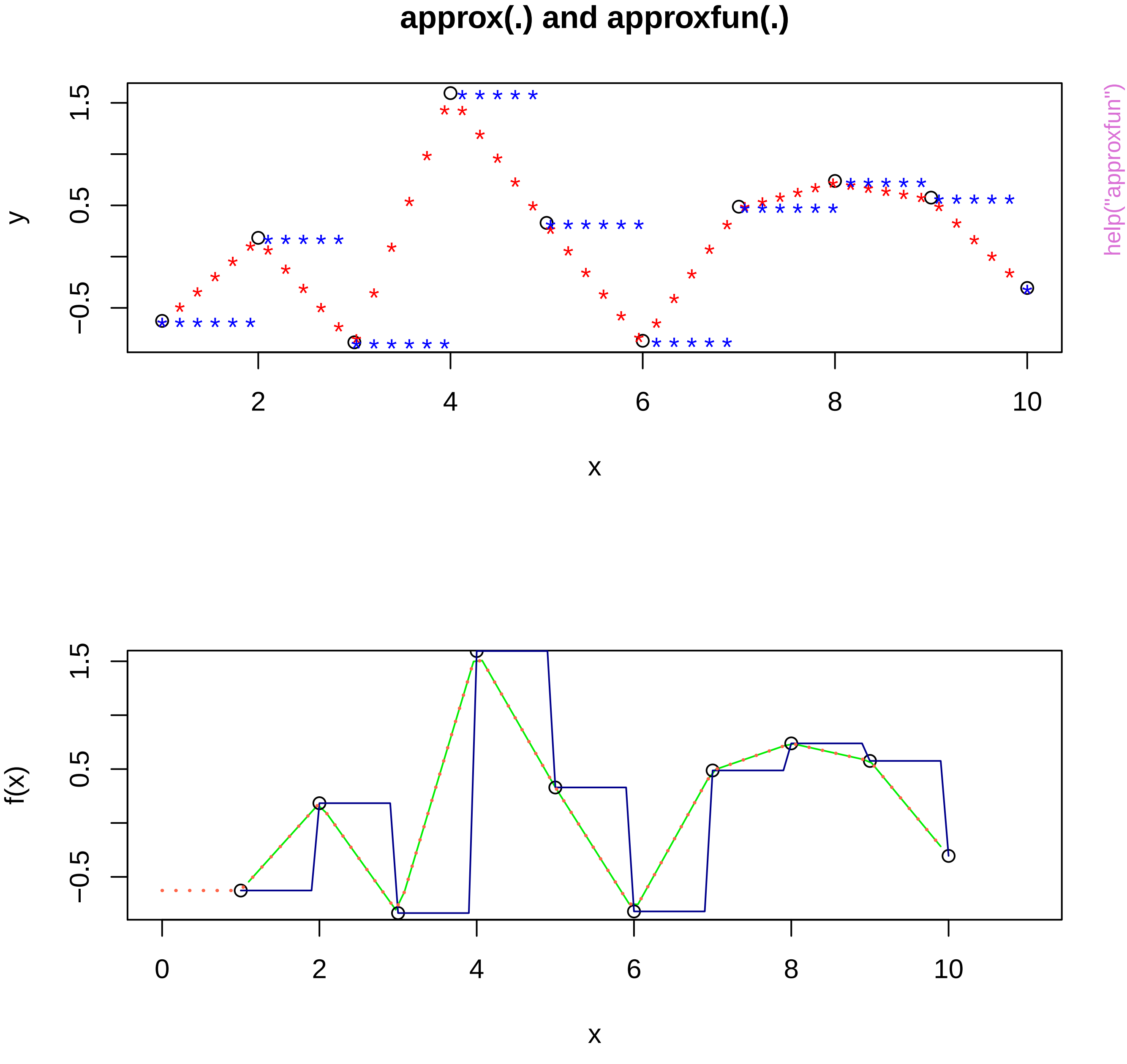

mdeaths & fdeaths
cross−correlation
1.0
0.5
0.0
−0.5
−1.0
−0.5
0.0
0.5
1.0
Lag
help("acf")



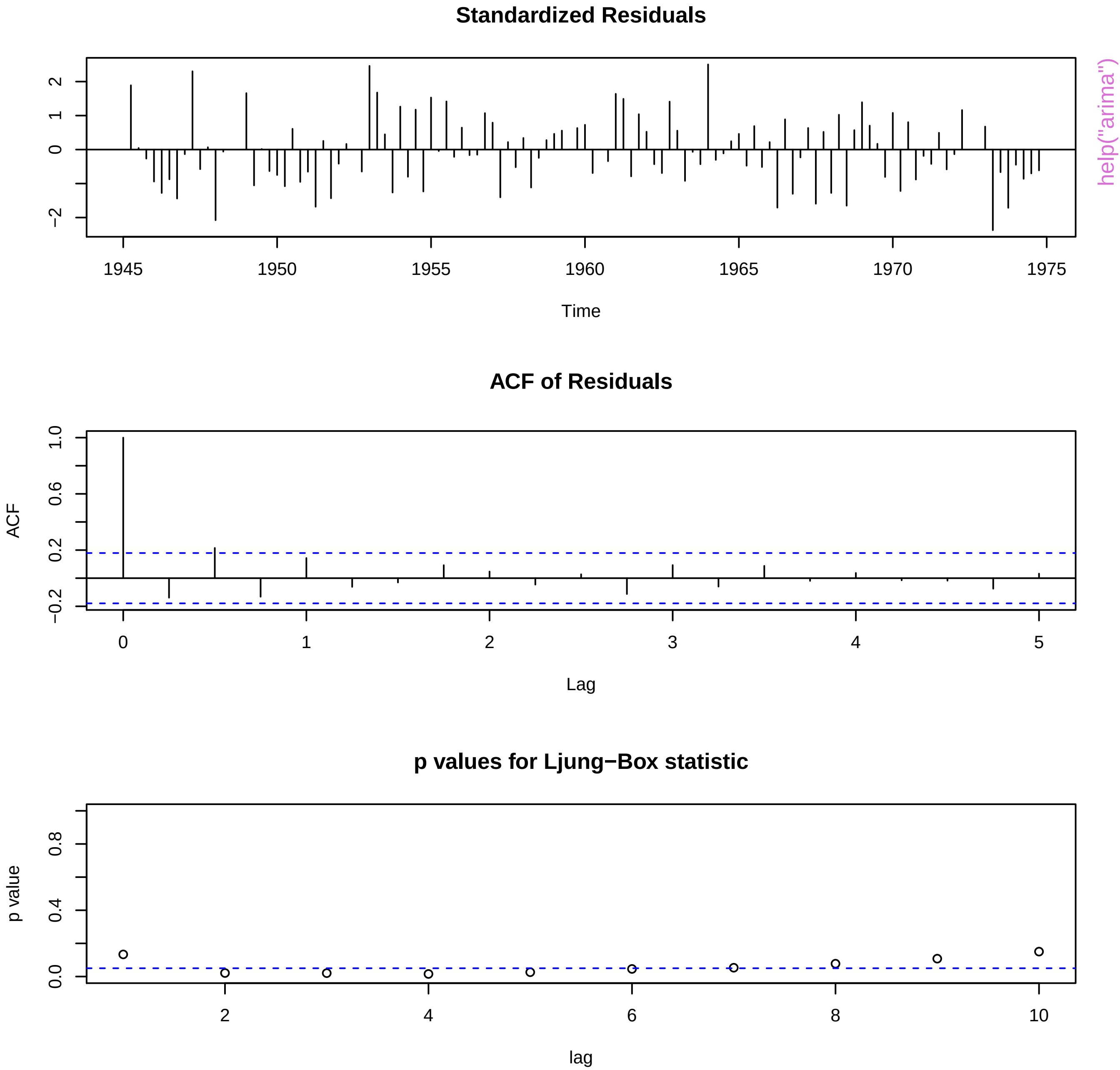
Series presidents
ACF
Lag
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
0
1
2
3
4
5
help("acf")


Series presidents
Partial ACF
Lag
0.8
0.6
0.4
0.2
0.0
−0.2
1
2
3
4
5
help("acf")

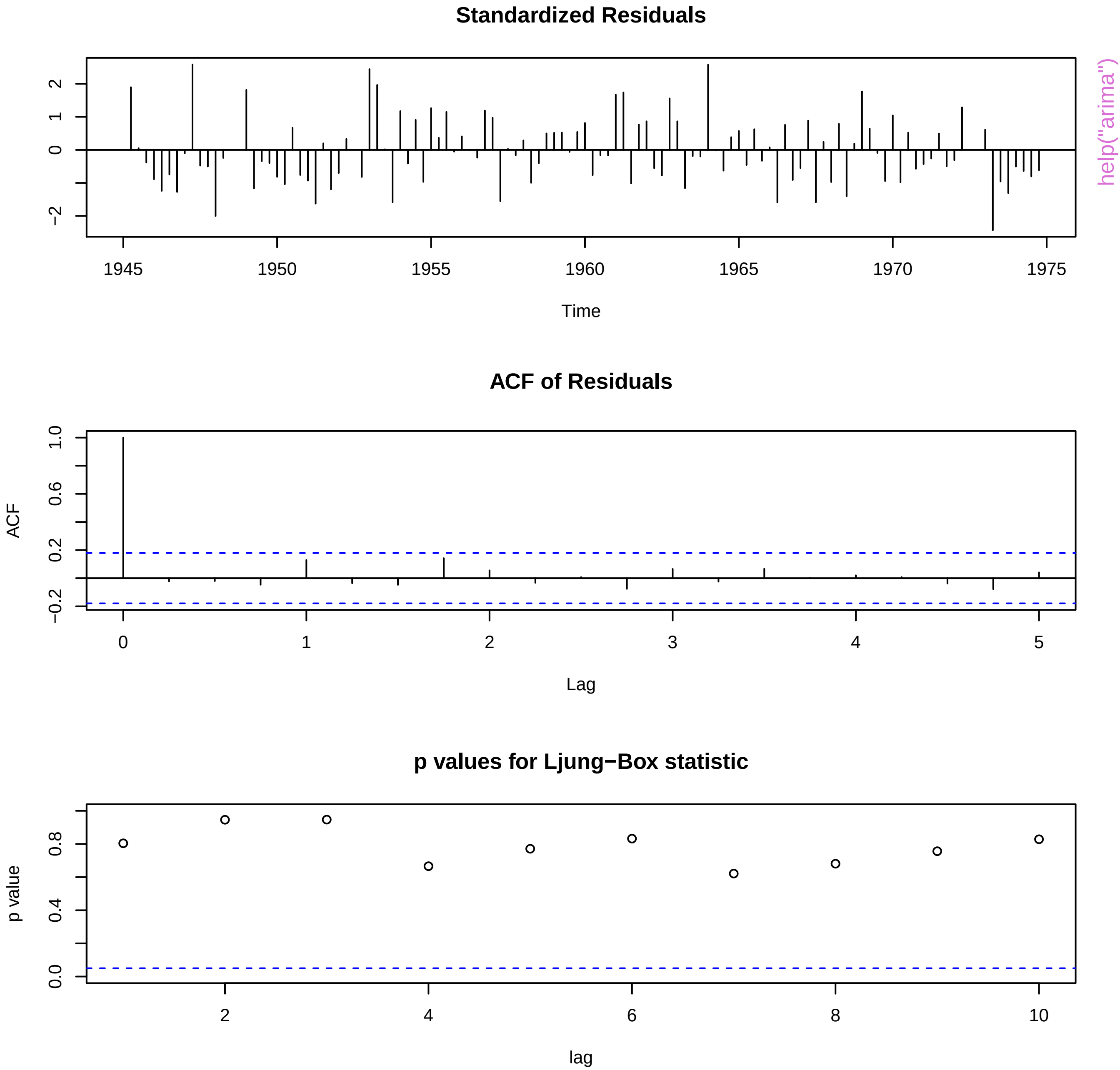

colMeans(reacttime)
450
500
550
600
650
700
750
1
2
3
4
5
6
Index
help("anova.mlm")



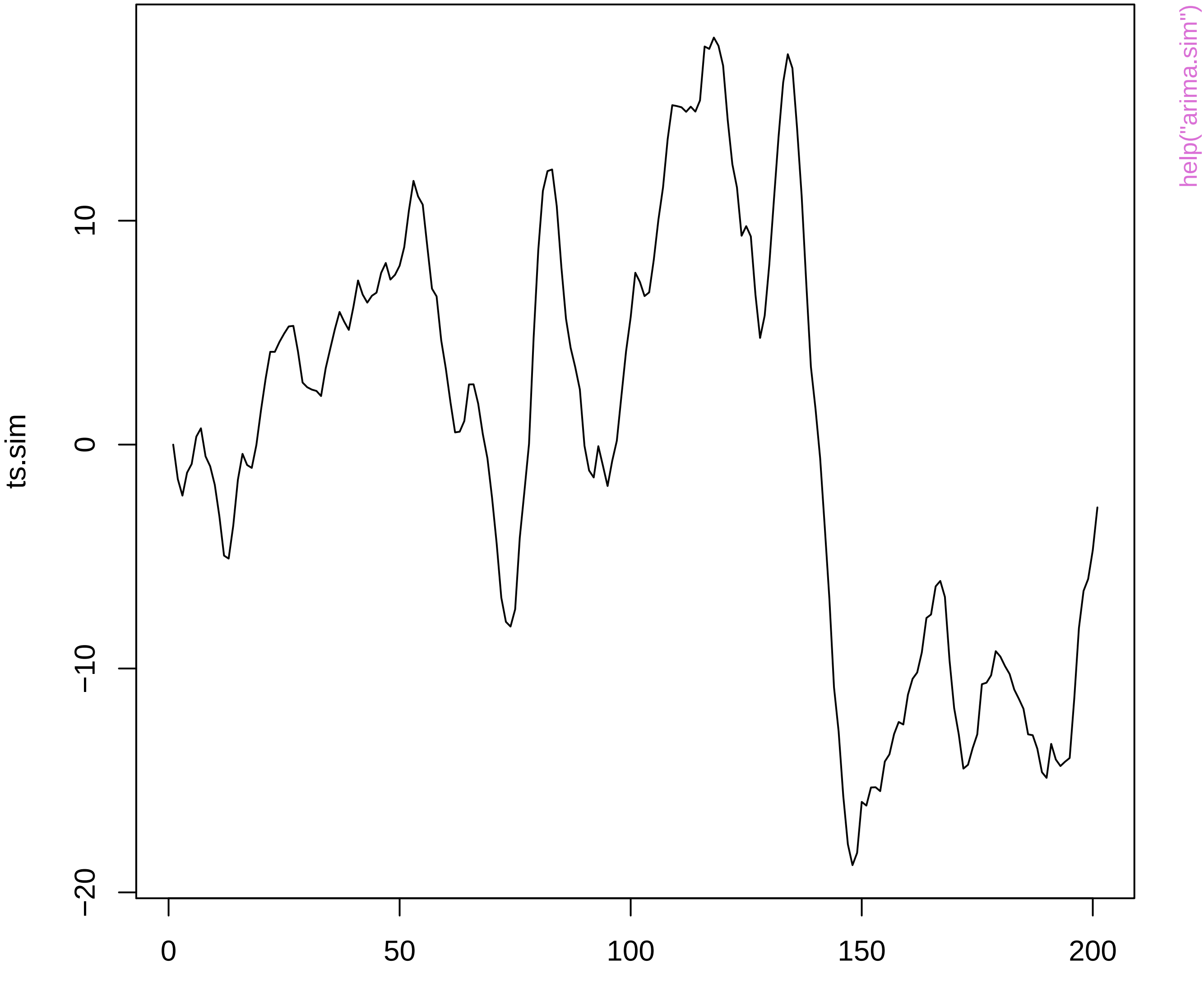
approx(.) and approxfun(.)
y
1.5
0.5
−0.5
2
4
6
8
10
x
help("approxfun")
f(x)
1.5
0.5
−0.5
0
2
4
6
8
10
x



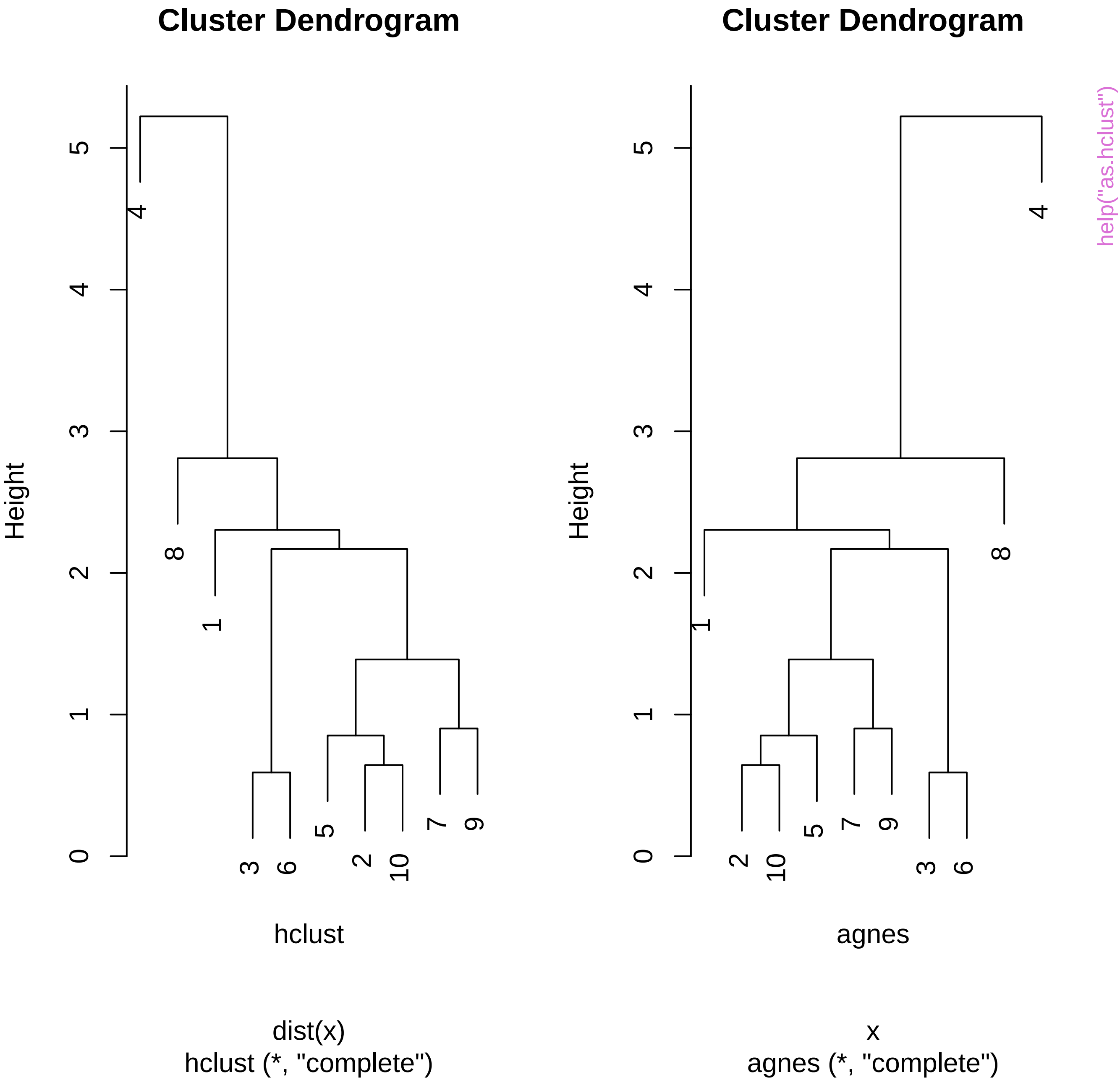
Standardized Residuals
2
1
0
−2
1945
1950
1955
1960
1965
1970
1975
Time
help("arima")
ACF of Residuals
ACF
1.0
0.6
0.2
−0.2
0
1
2
3
4
5
Lag
p values for Ljung−Box statistic
p value
0.8
0.4
0.0
2
4
6
8
10
lag



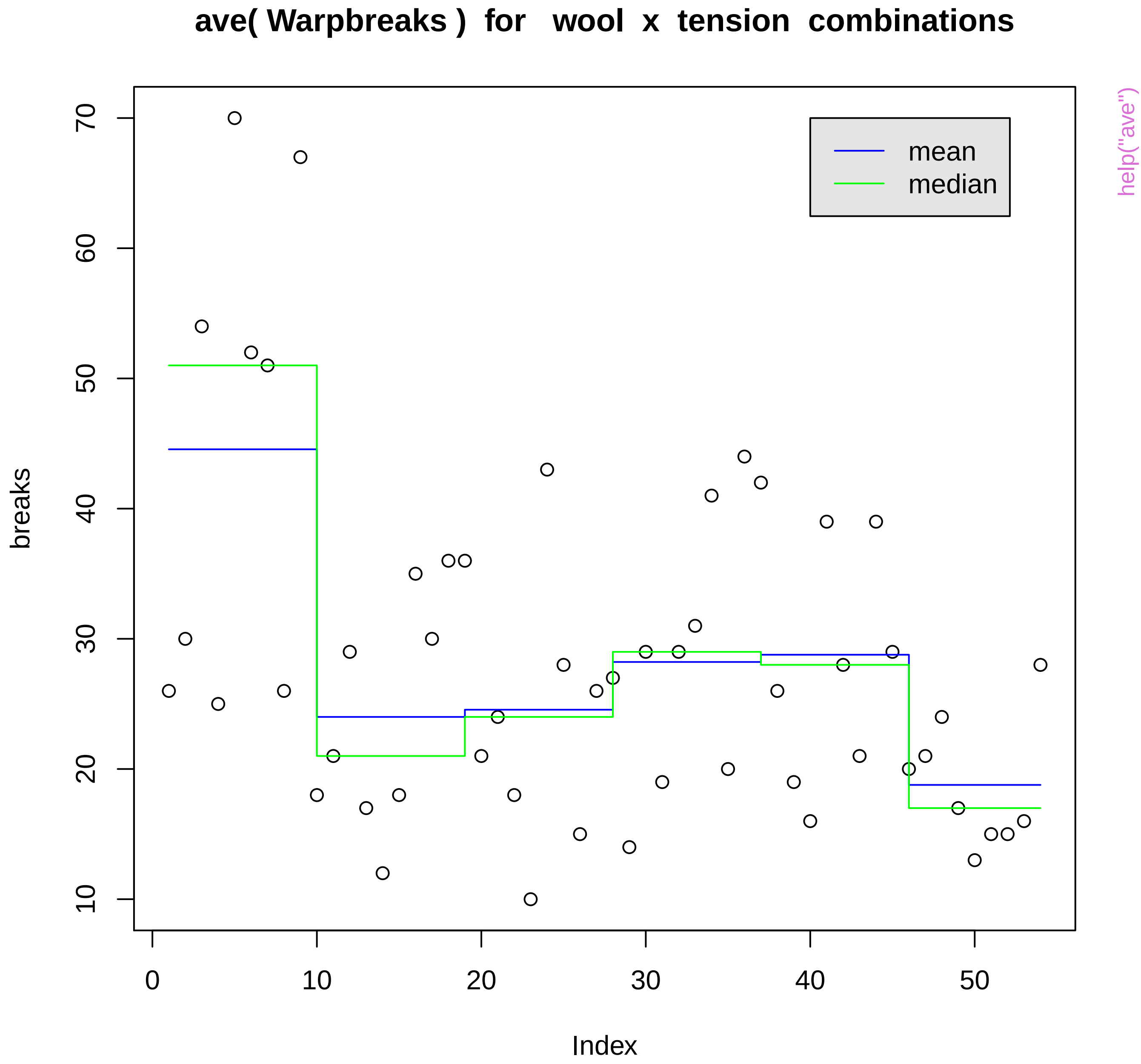
Standardized Residuals
−2
0
1
2
1945
1950
1955
1960
1965
1970
1975
Time
help("arima")
ACF of Residuals
ACF
−0.2
0.2
0.6
1.0
0
1
2
3
4
5
Lag
p values for Ljung−Box statistic
p value
0.0
0.4
0.8
2
4
6
8
10
lag

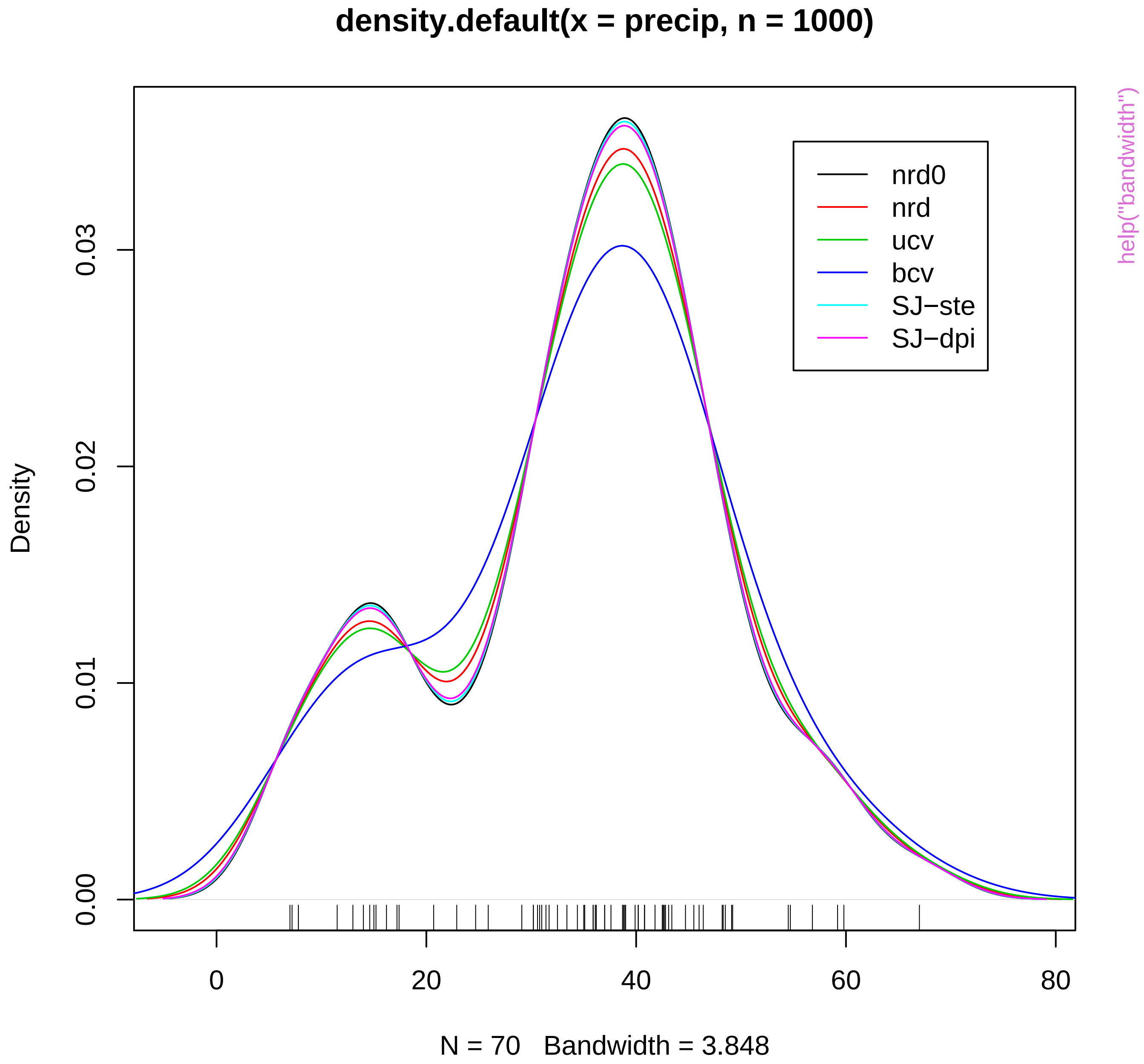


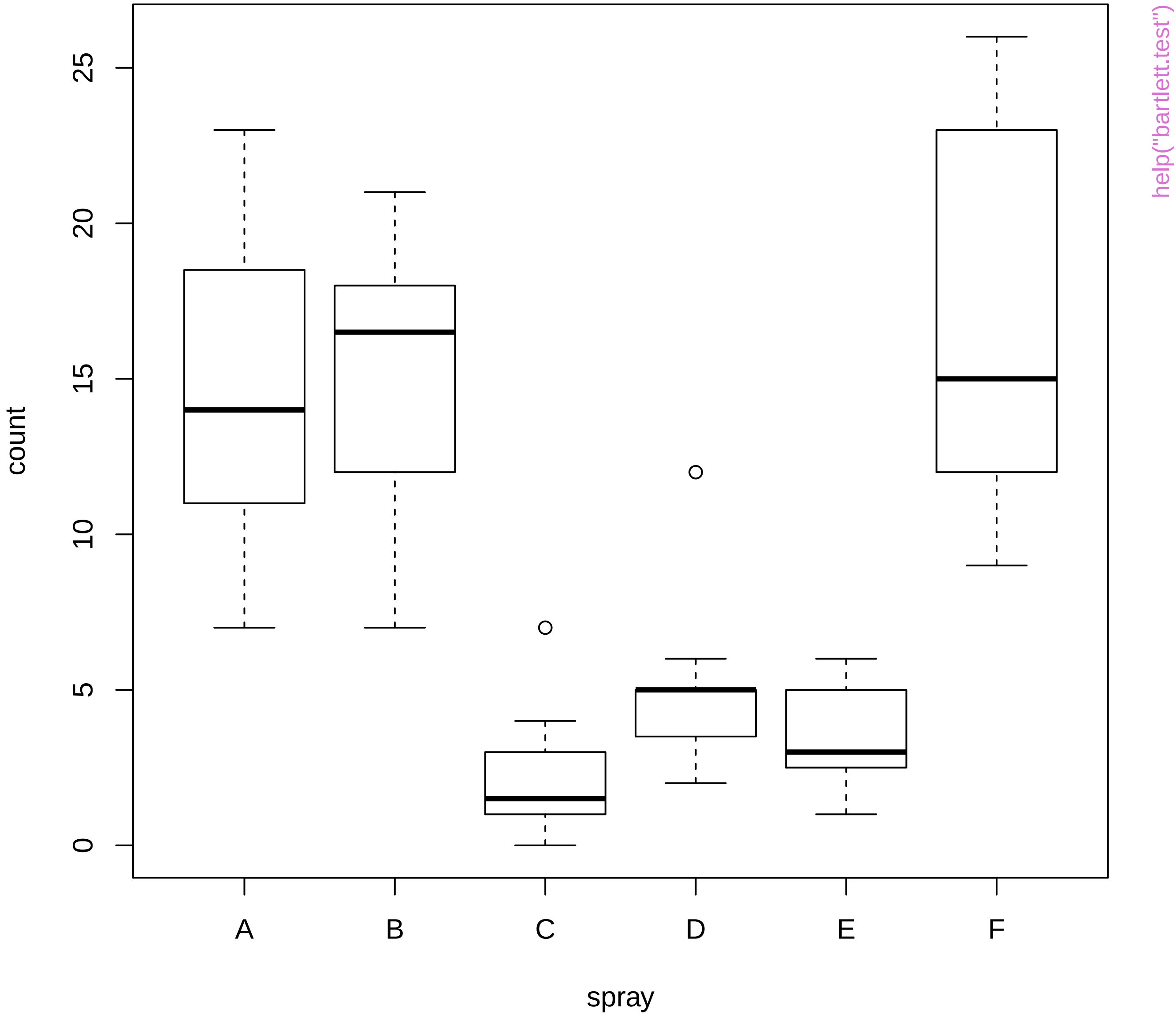
ts.sim
10
0
−10
−20
0
50
100
150
200
Time
help("arima.sim")



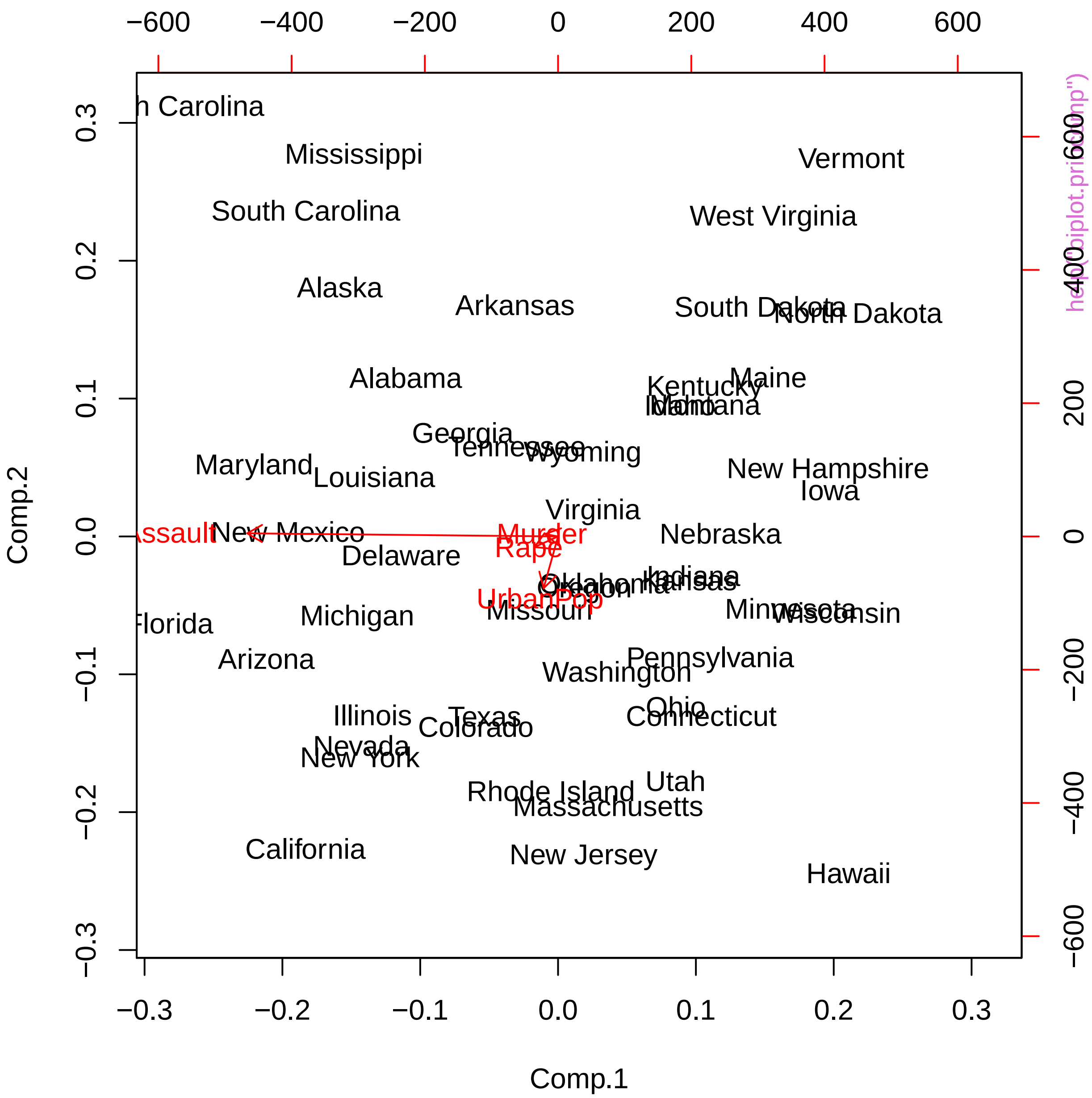
Cluster Dendrogram
Height
0
1
2
3
4
5
4
8
1
3
6
5
2
10
7
9
hclust
dist(x)
hclust (*, "complete")
Cluster Dendrogram
Height
0
1
2
3
4
5
1
2
10
5
7
9
3
6
8
4
agnes
x
agnes (*, "complete")
help("as.hclust")


ave(Warpbreaks) for wool x tension combinations
mean
median
breaks
Index
0
10
20
30
40
50
10
20
30
40
50
60
70
help("ave")

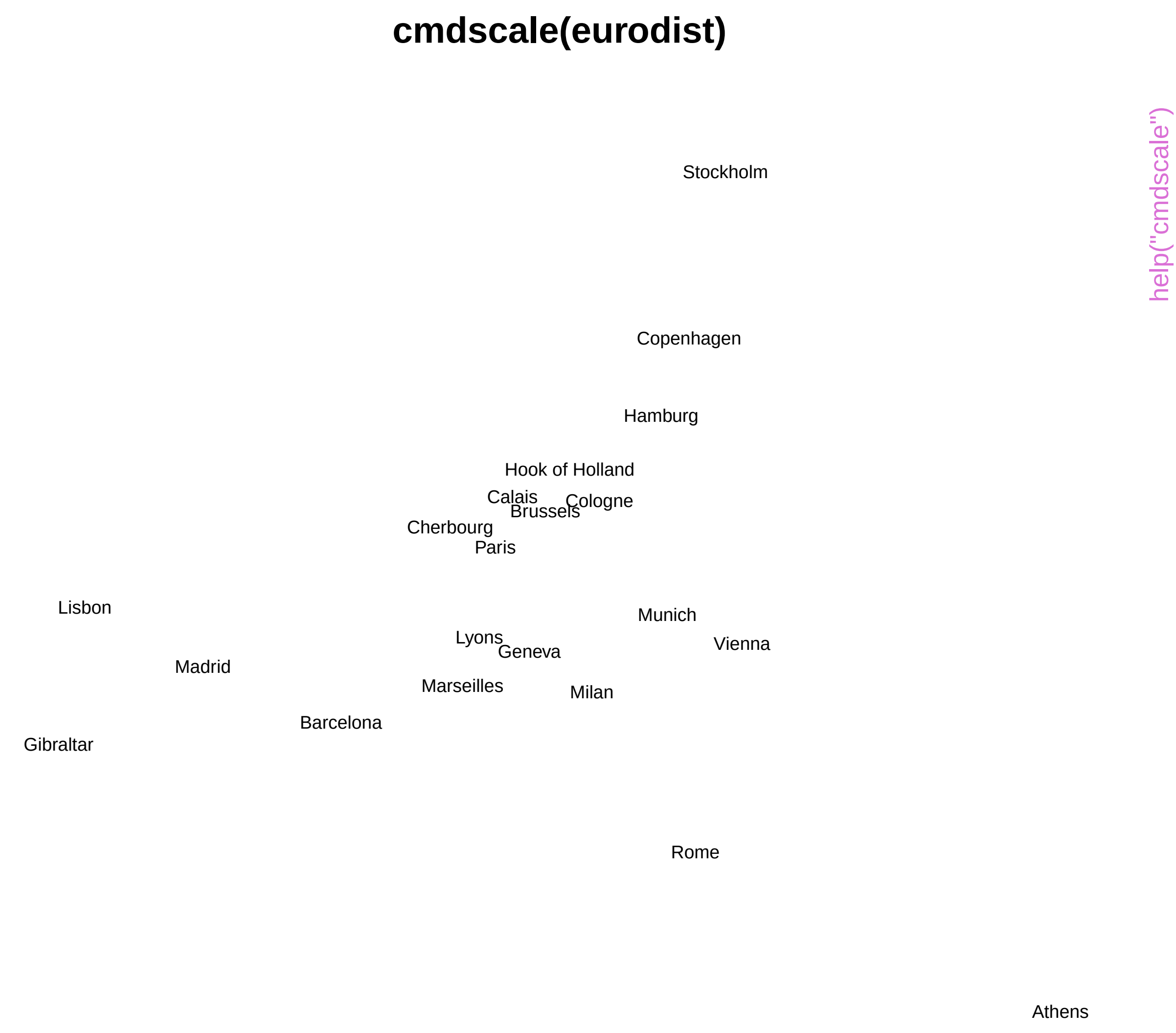

density.default(x = precip, n = 1000)
help("bandwidth")
nrd0
nrd
ucv
bcv
SJ−ste
SJ−dpi
Density
0.00
0.01
0.02
0.03
0
20
40
60
80
N = 70   Bandwidth = 3.848



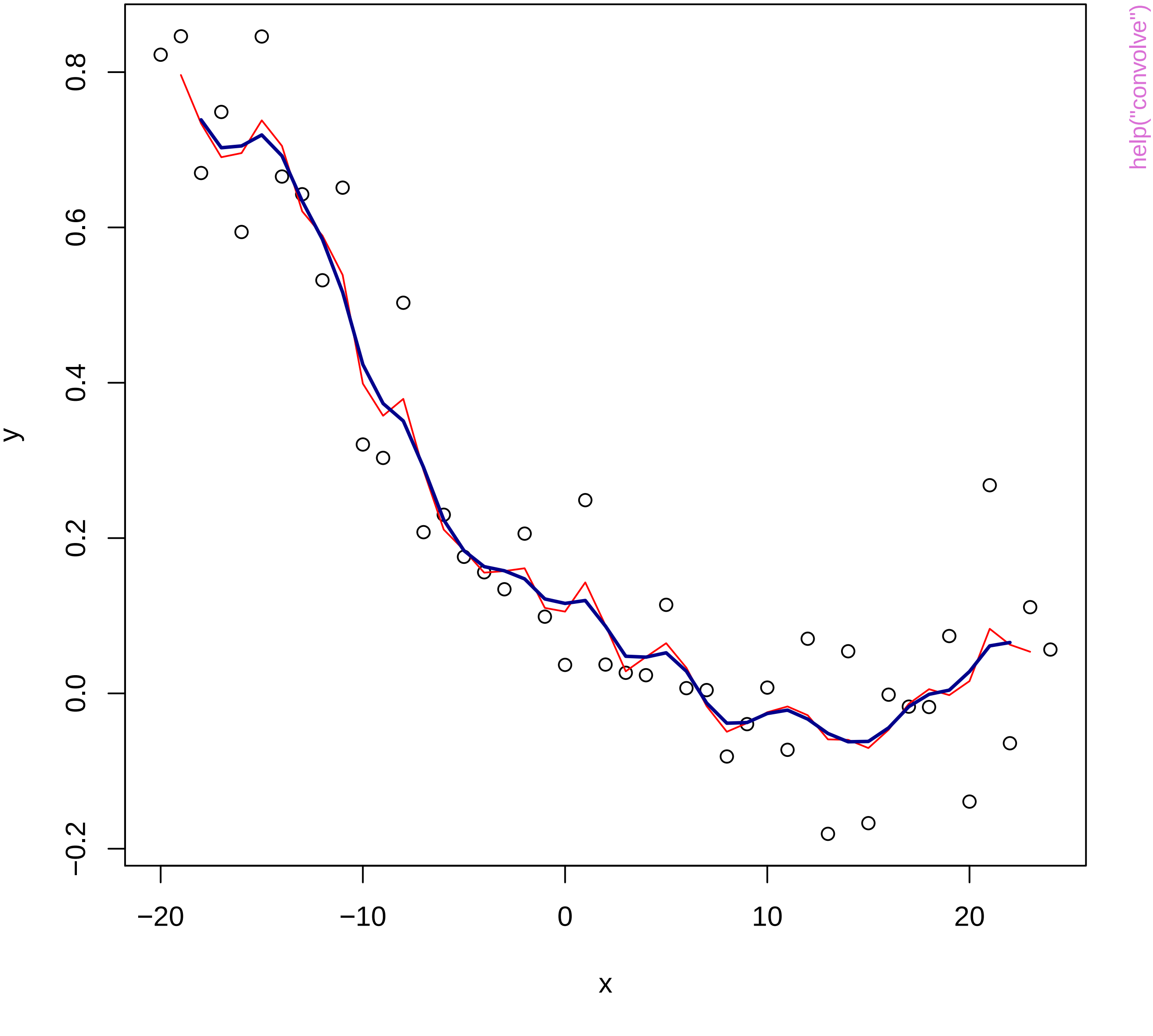
count
0
5
10
15
20
25
A
B
C
D
E
F
spray
help("bartlett.test")

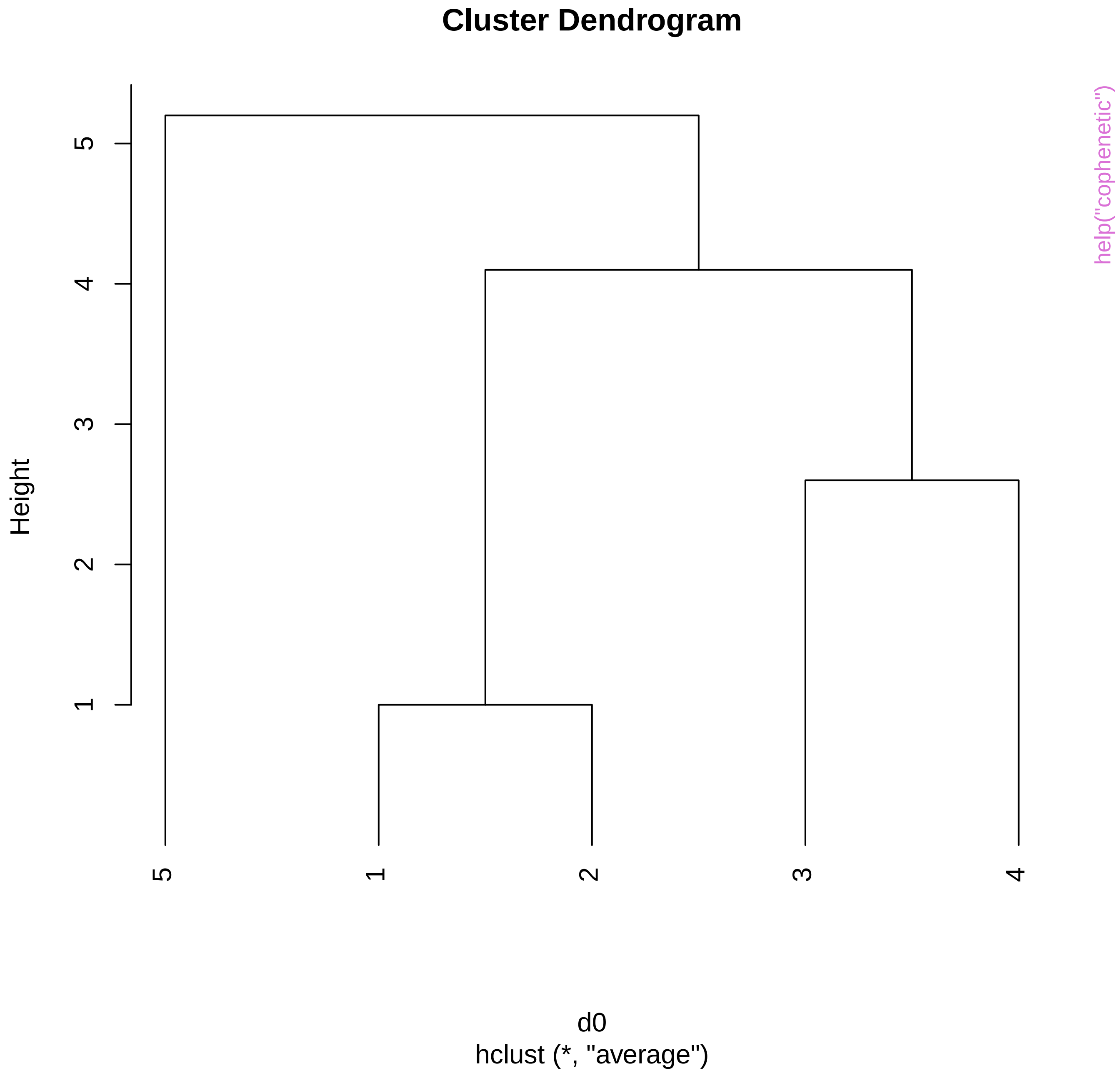


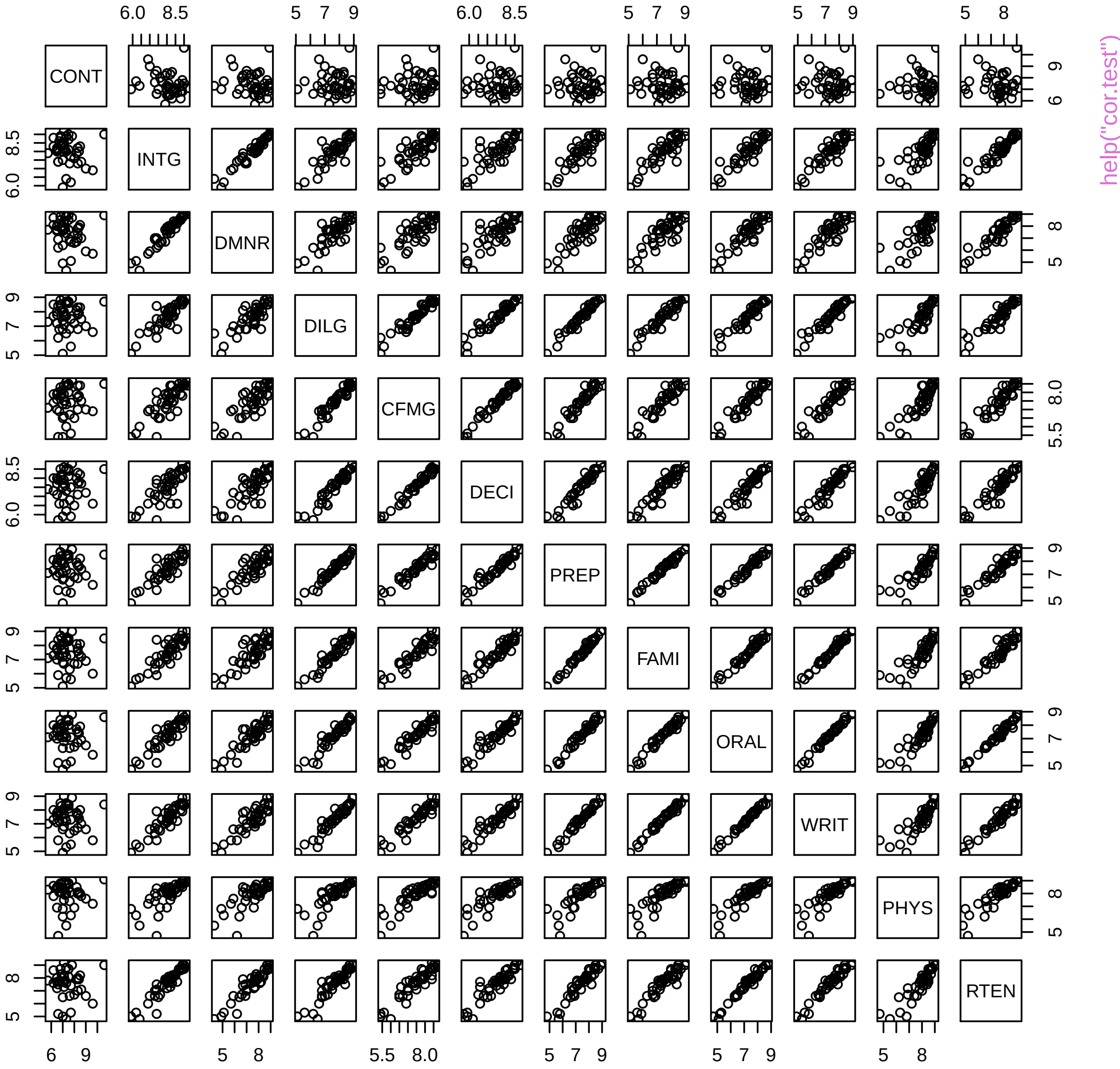
−600
−400
−200
0
200
400
600
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
Comp.1
Comp.2
Mississippi
Vermont
South Carolina
West Virginia
Alaska
Arkansas
South Dakota
North Dakota
Alabama
Kentucky
Maine
Idaho
Montana
Georgia
Tennessee
Wyoming
Maryland
Louisiana
New Hampshire
Iowa
Virginia
New Mexico
Nebraska
Murder
Rape
Delaware
Oklahoma
Oregon
Indiana
Kansas
UrbanPop
Missouri
Michigan
Minnesota
Wisconsin
Arizona
Pennsylvania
Washington
Illinois
Texas
Colorado
Ohio
Connecticut
Nevada
New York
Utah
Rhode Island
Massachusetts
California
New Jersey
Hawaii

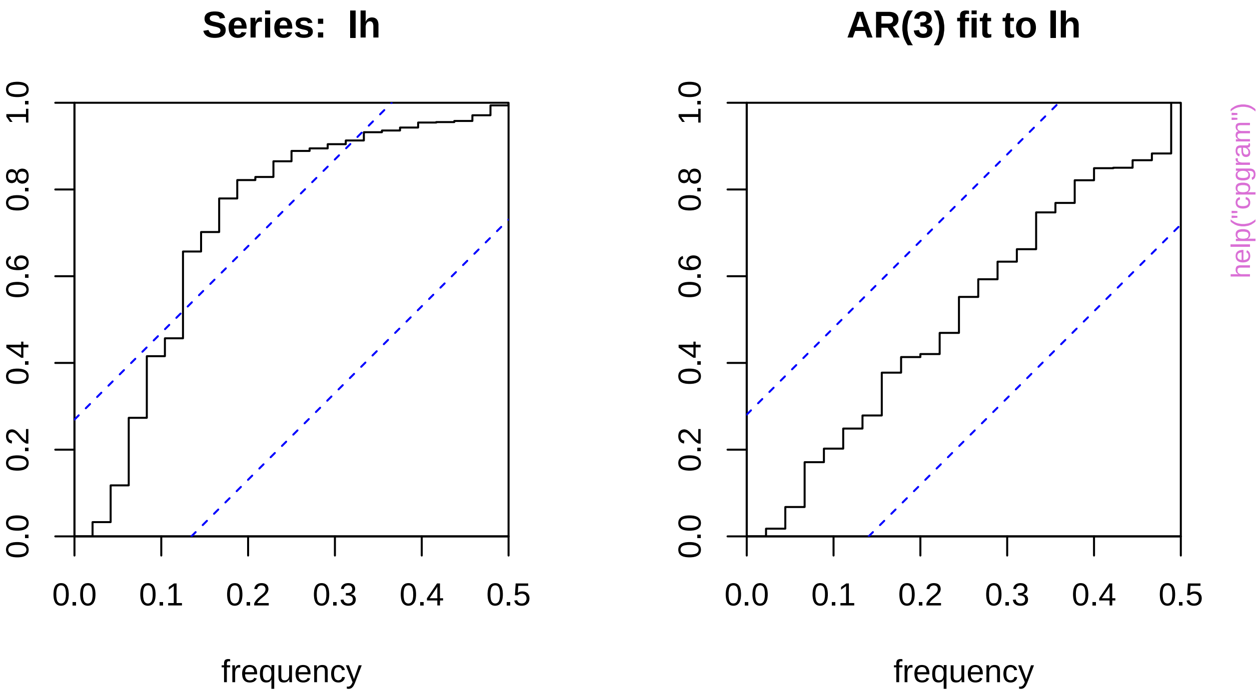

cmdscale(eurodist)
help("cmdscale")
Stockholm
Copenhagen
Hamburg
Hook of Holland
Calais
Cologne
Brussels
Cherbourg
Paris
Lisbon
Munich
Lyons
Geneva
Vienna
Madrid
Marseilles
Milan
Barcelona
Gibraltar
Rome
Athens

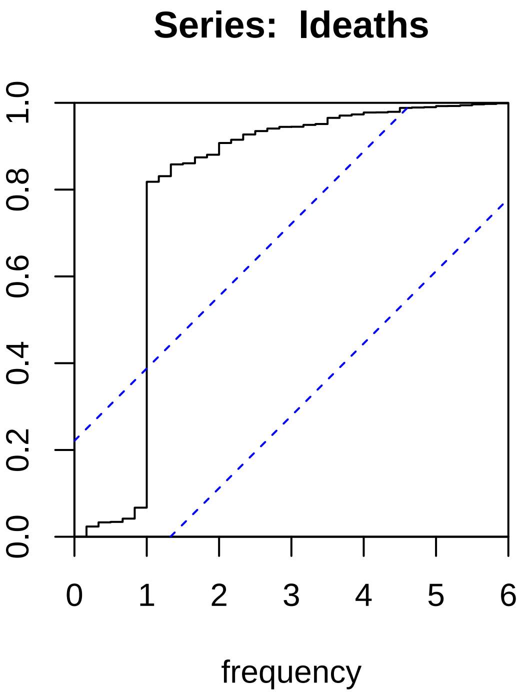
Using convolve(.) for Hanning filters

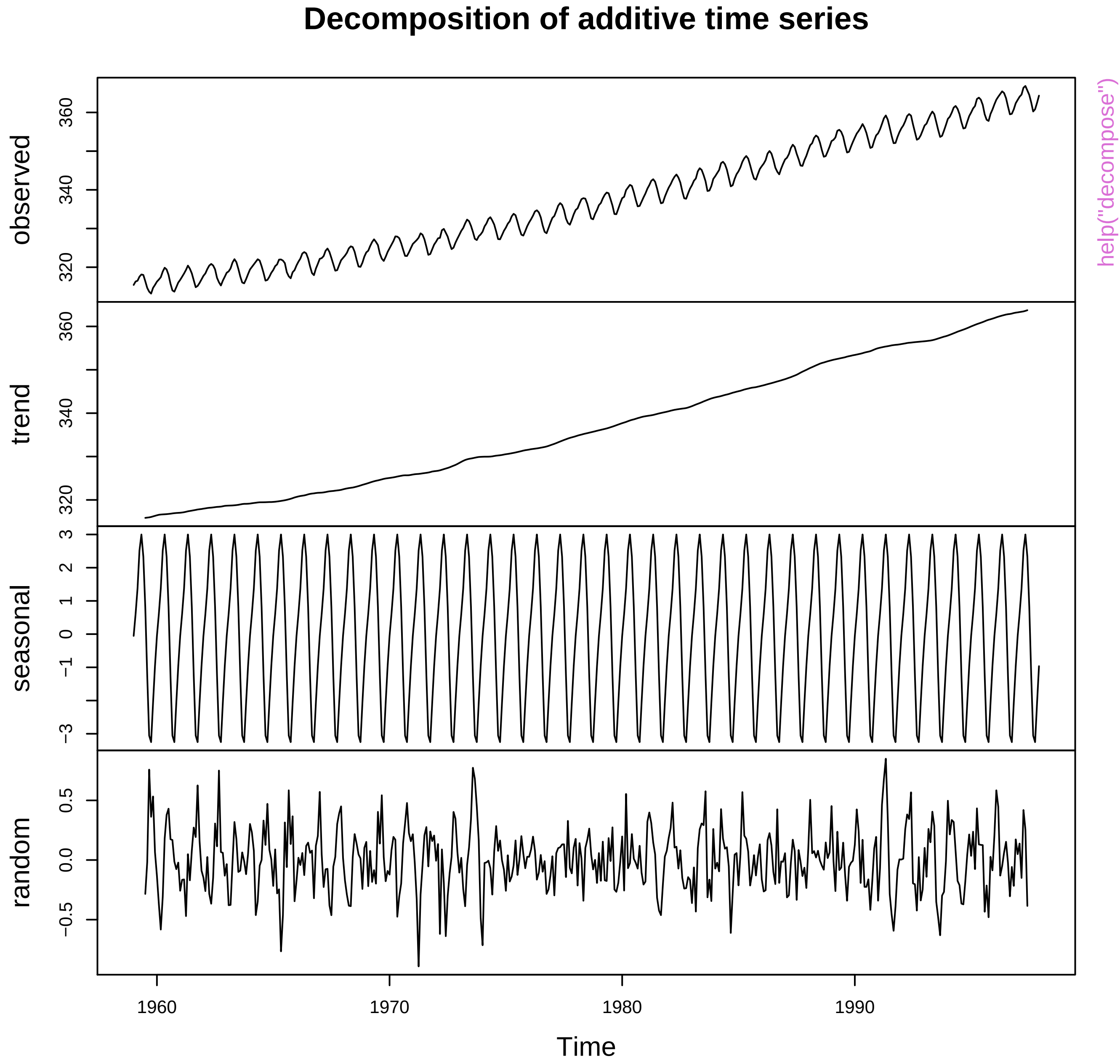



Cluster Dendrogram
Height
1
2
3
4
5
5
1
2
3
4
d0
hclust (*, "average")
help("cophenetic")

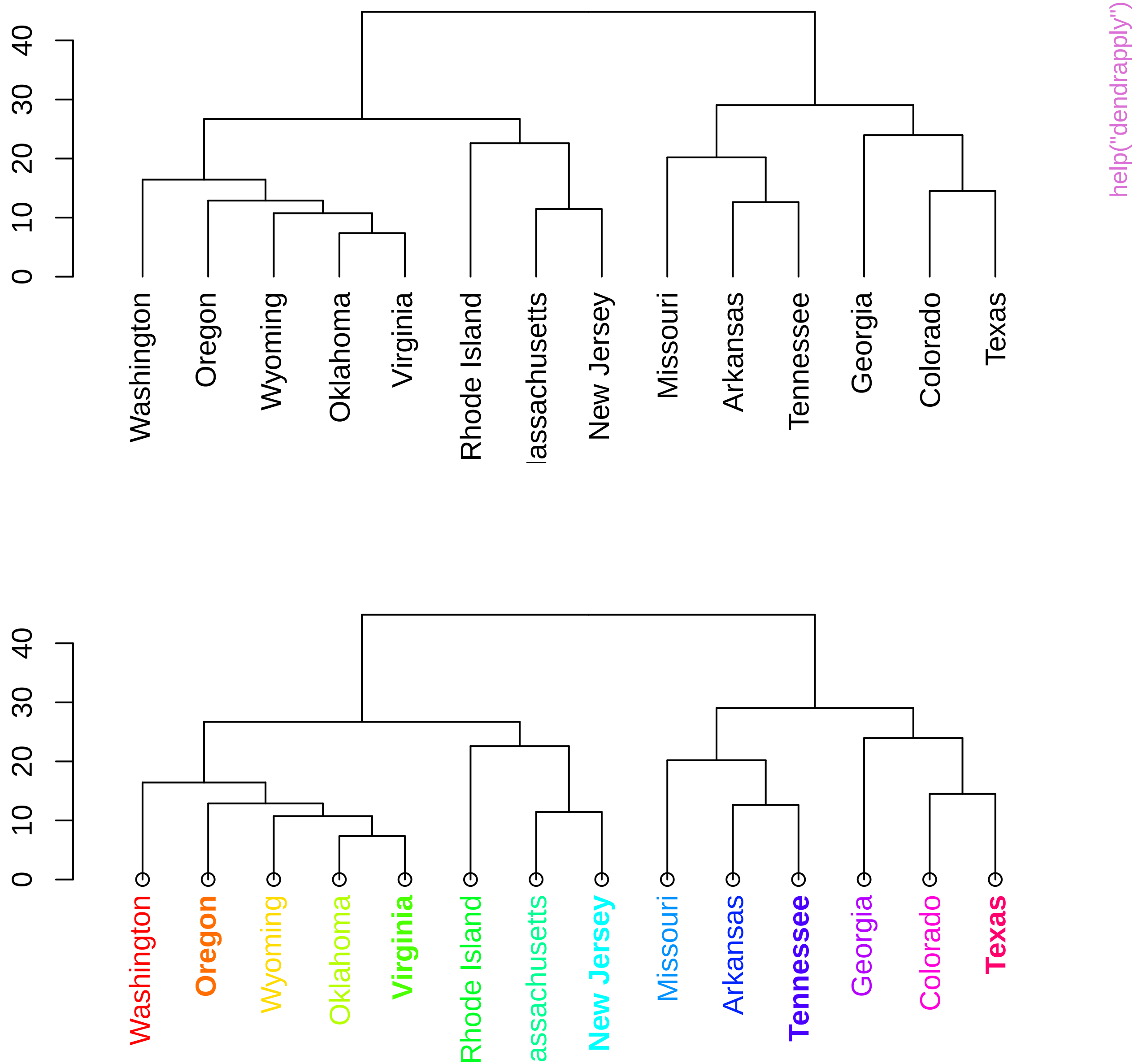

CONT
INTG
DMNR
DILG
CFMG
DECI
PREP
FAMI
ORAL
WRIT
PHYS
RTEN
help("cor.test")


Series: lh
AR(3) fit to lh
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.1
0.2
0.3
0.4
0.5
frequency
help("cpgram")

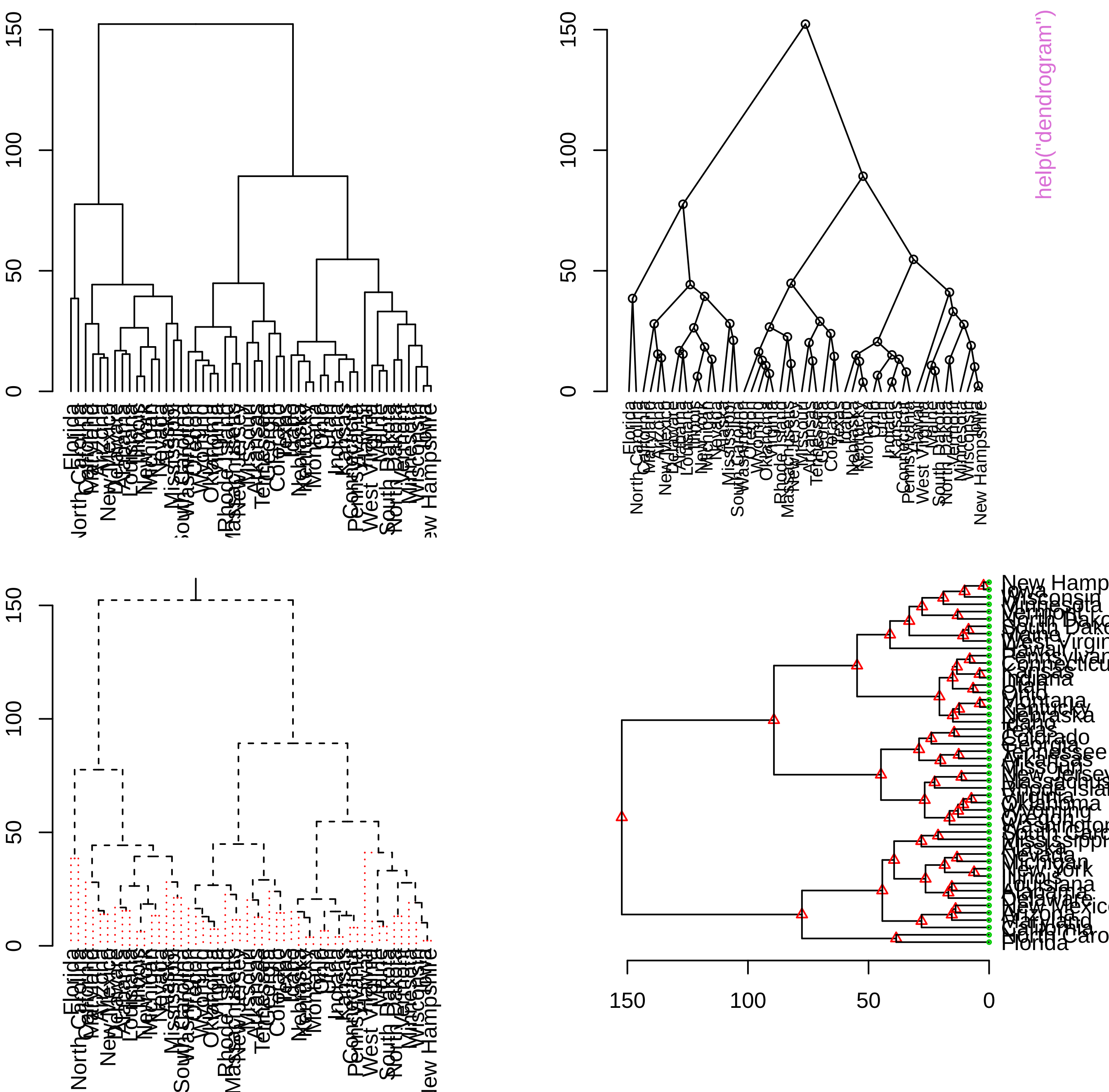

Series: ldeaths
1.0
0.8
0.6
0.4
0.2
0.0
0
1
2
3
4
5
6
frequency

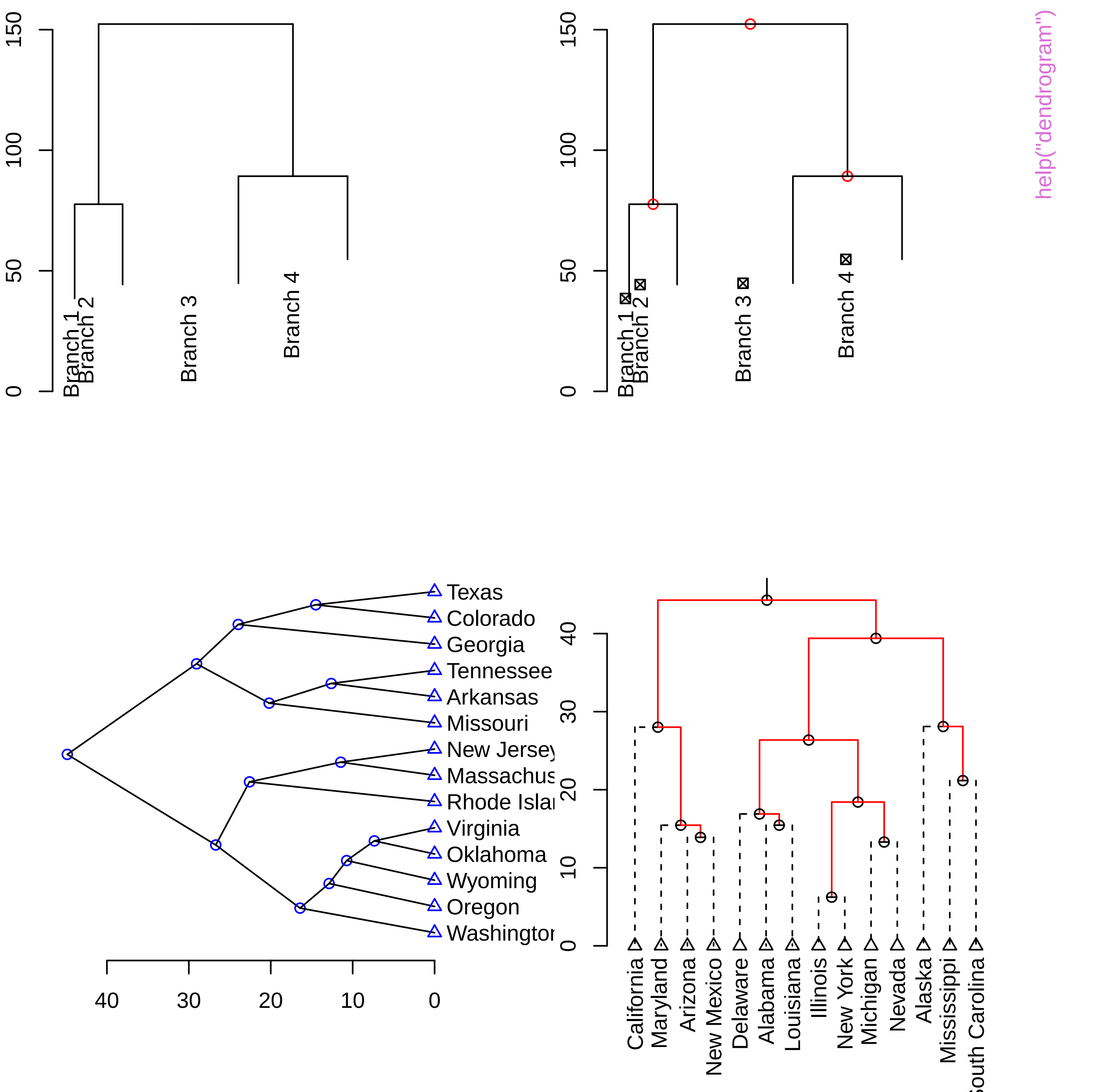


Decomposition of additive time series
observed
trend
seasonal
random
360
340
320
3
2
1
0
−1
−3
0.5
0.0
−0.5
1960
1970
1980
1990
Time
help("decompose")



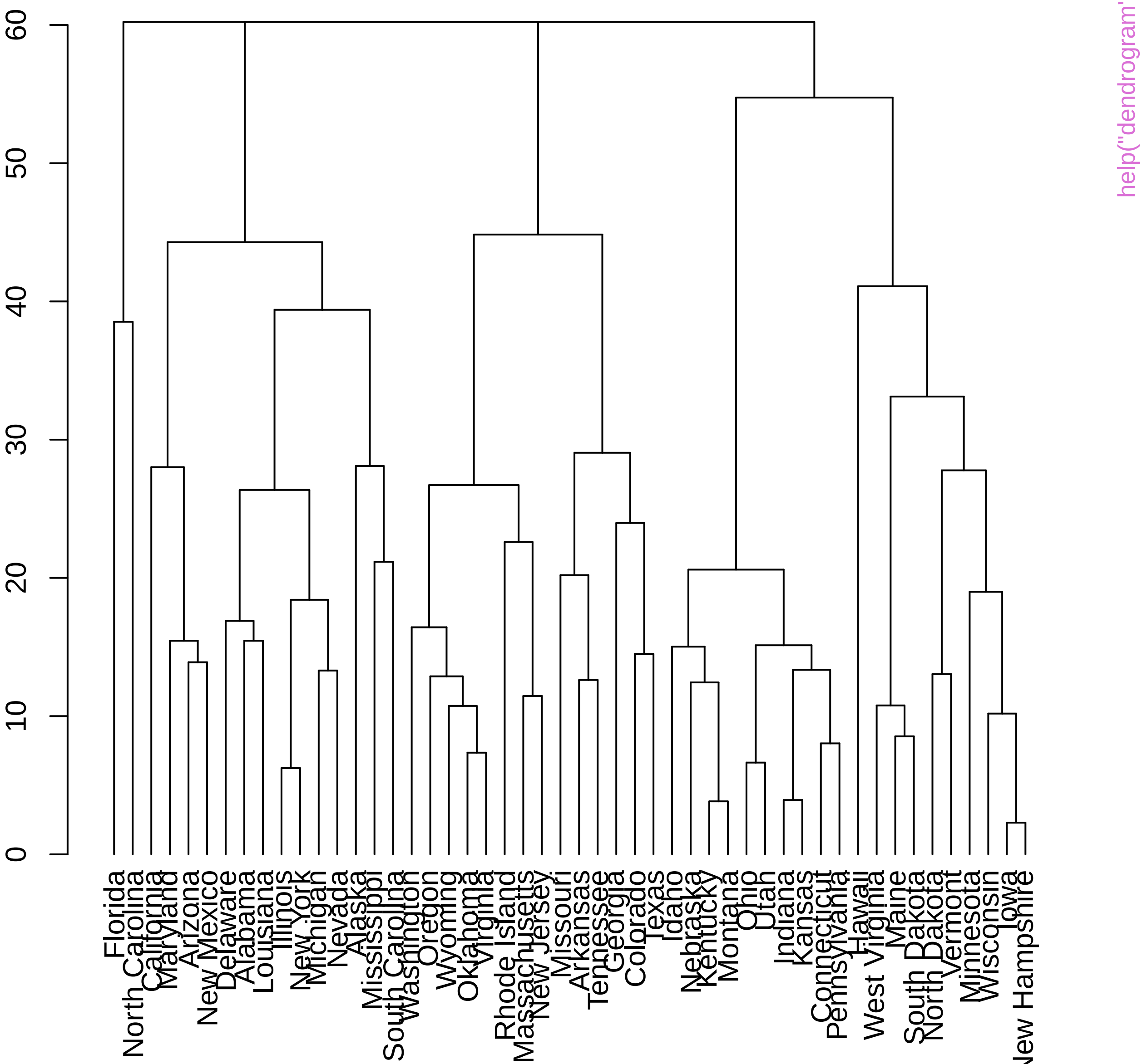
help("dendrapply")
0
10
20
30
40
Washington
Oregon
Wyoming
Oklahoma
Virginia
Rhode Island
lassachusetts
New Jersey
Missouri
Arkansas
Tennessee
Georgia
Colorado
Texas
0
10
20
30
40
Washington
Oregon
Wyoming
Oklahoma
Virginia
Rhode Island
lassachusetts
New Jersey
Missouri
Arkansas
Tennessee
Georgia
Colorado
Texas

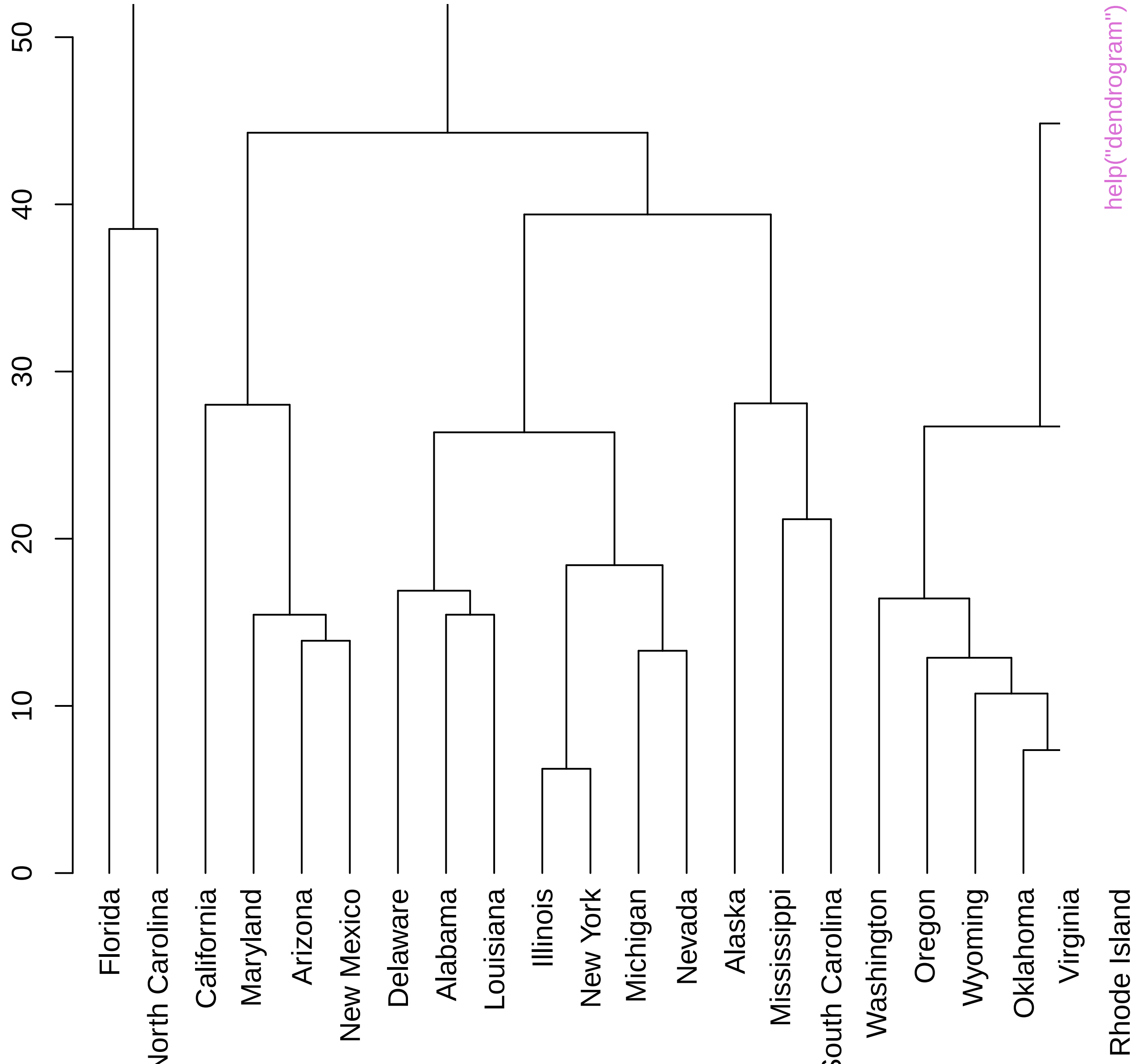

150
100
50
0
help("dendrogram")



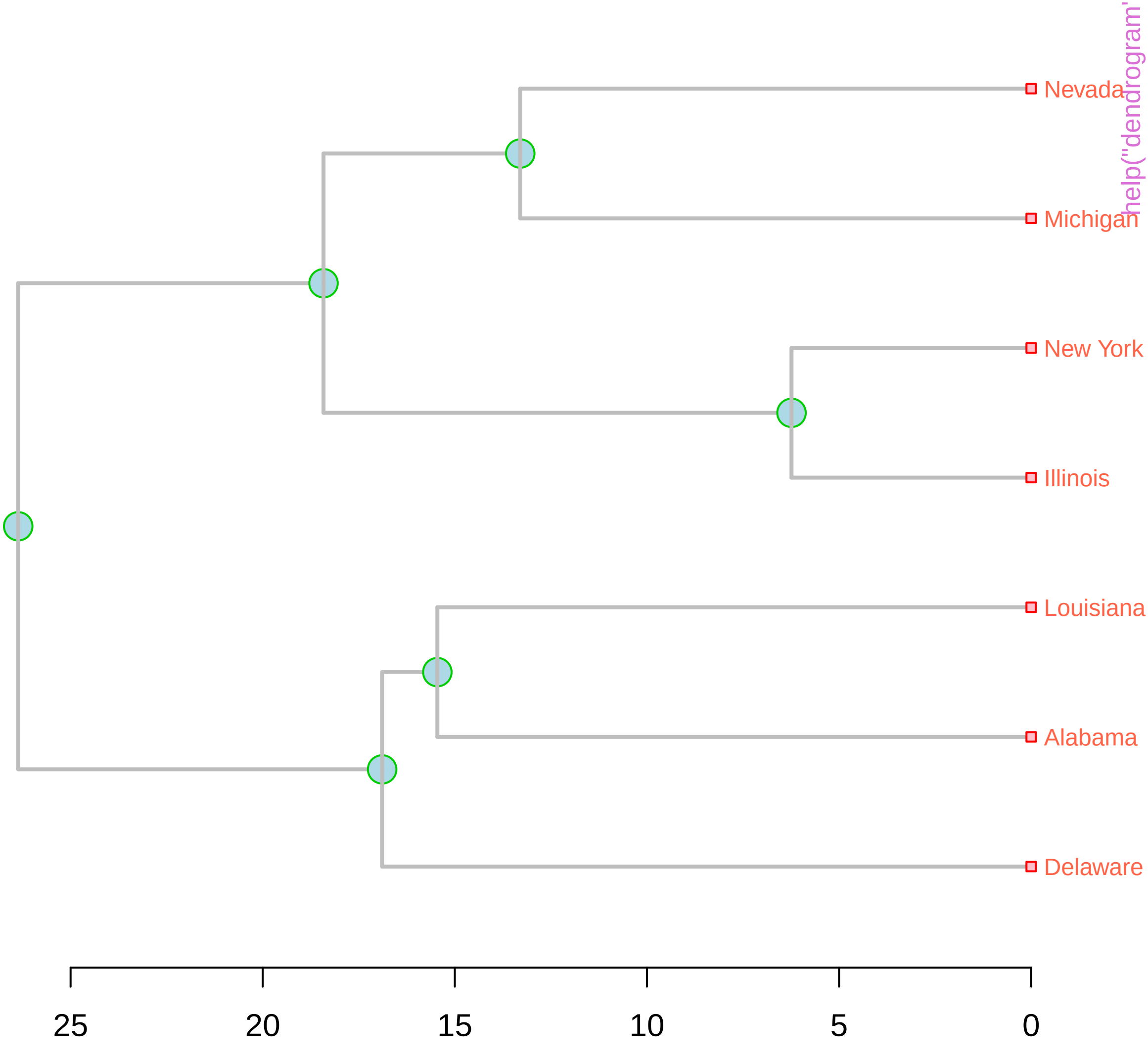
150
100
50
0
Branch 1
Branch 2
Branch 3
Branch 4
help("dendrogram")
Texas
Colorado
Georgia
Tennessee
Arkansas
Missouri
New Jersey
Massachus
Rhode Islai
Virginia
Oklahoma
Wyoming
Oregon
Washingtor
40
30
20
10
0
California
Maryland
Arizona
New Mexico
Delaware
Alabama
Louisiana
Illinois
New York
Michigan
Nevada
Alaska
Mississippi
South Carolina

merge(d1, d2, d3, d4) |−> dendrogram with a 4−split

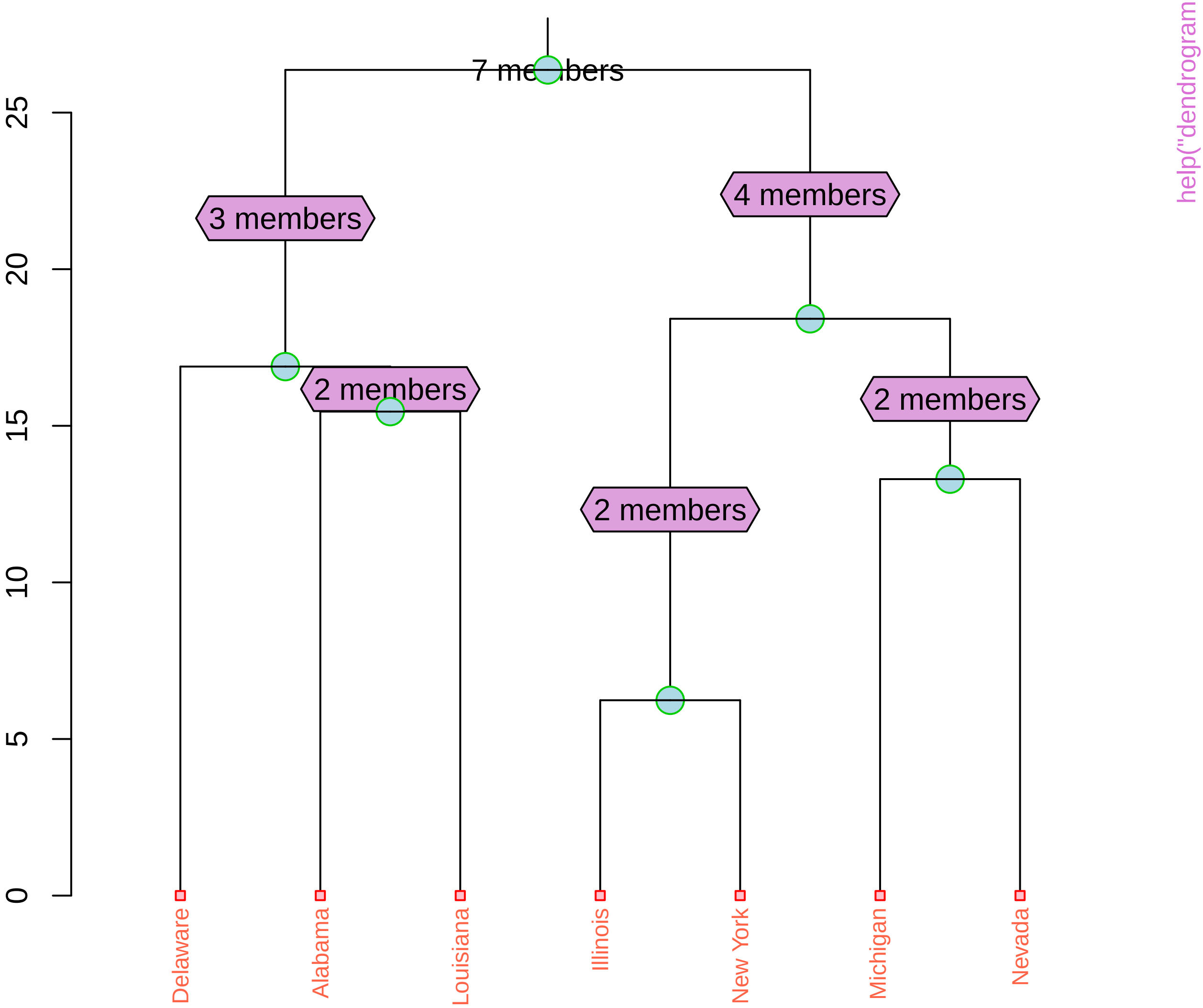




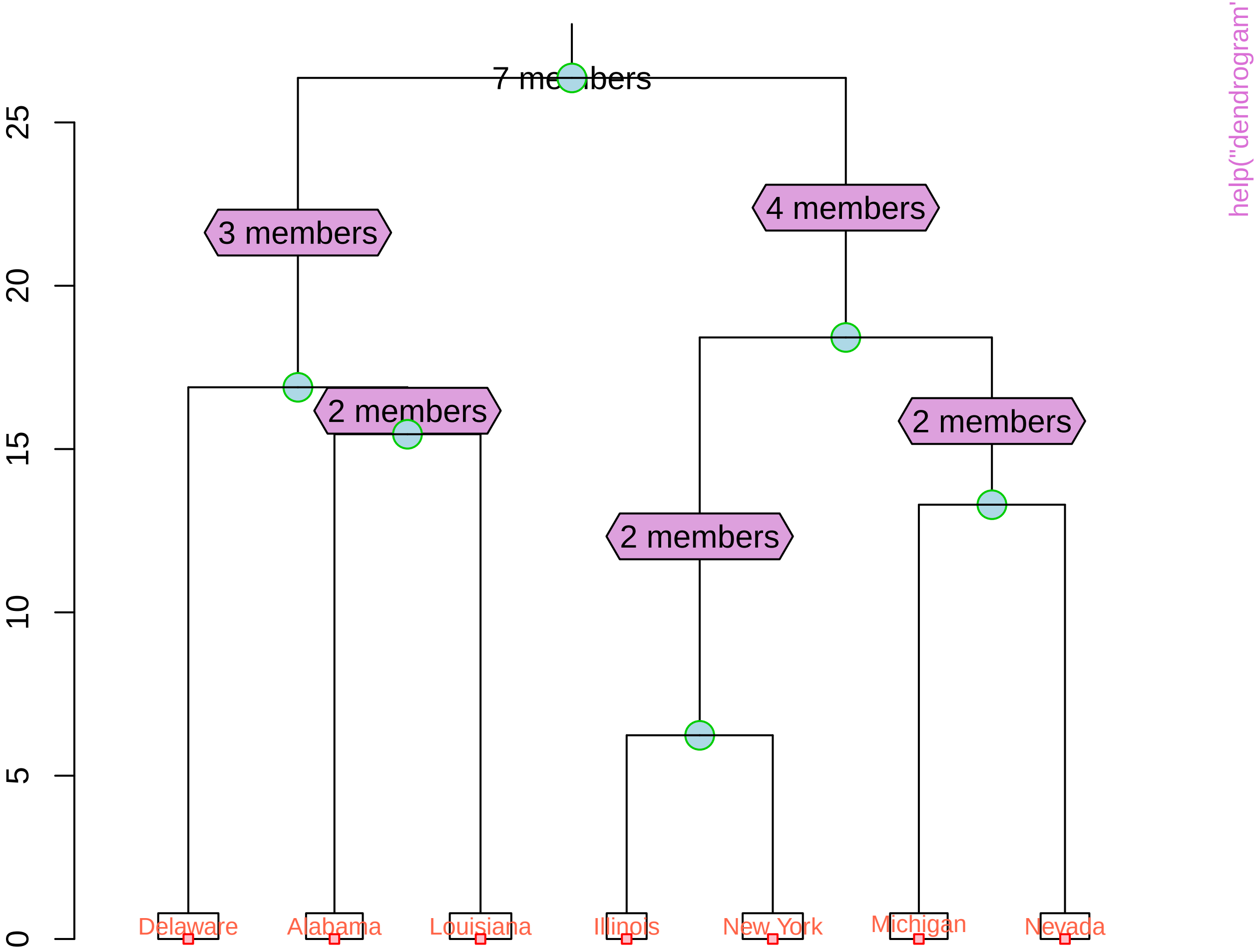
0
10
20
30
40
50
Florida
North Carolina
California
Maryland
Arizona
New Mexico
Delaware
Alabama
Louisiana
Illinois
New York
Michigan
Nevada
Alaska
Mississippi
South Carolina
Washington
Oregon
Wyoming
Oklahoma
Virginia
Rhode Island
help("dendrogram")

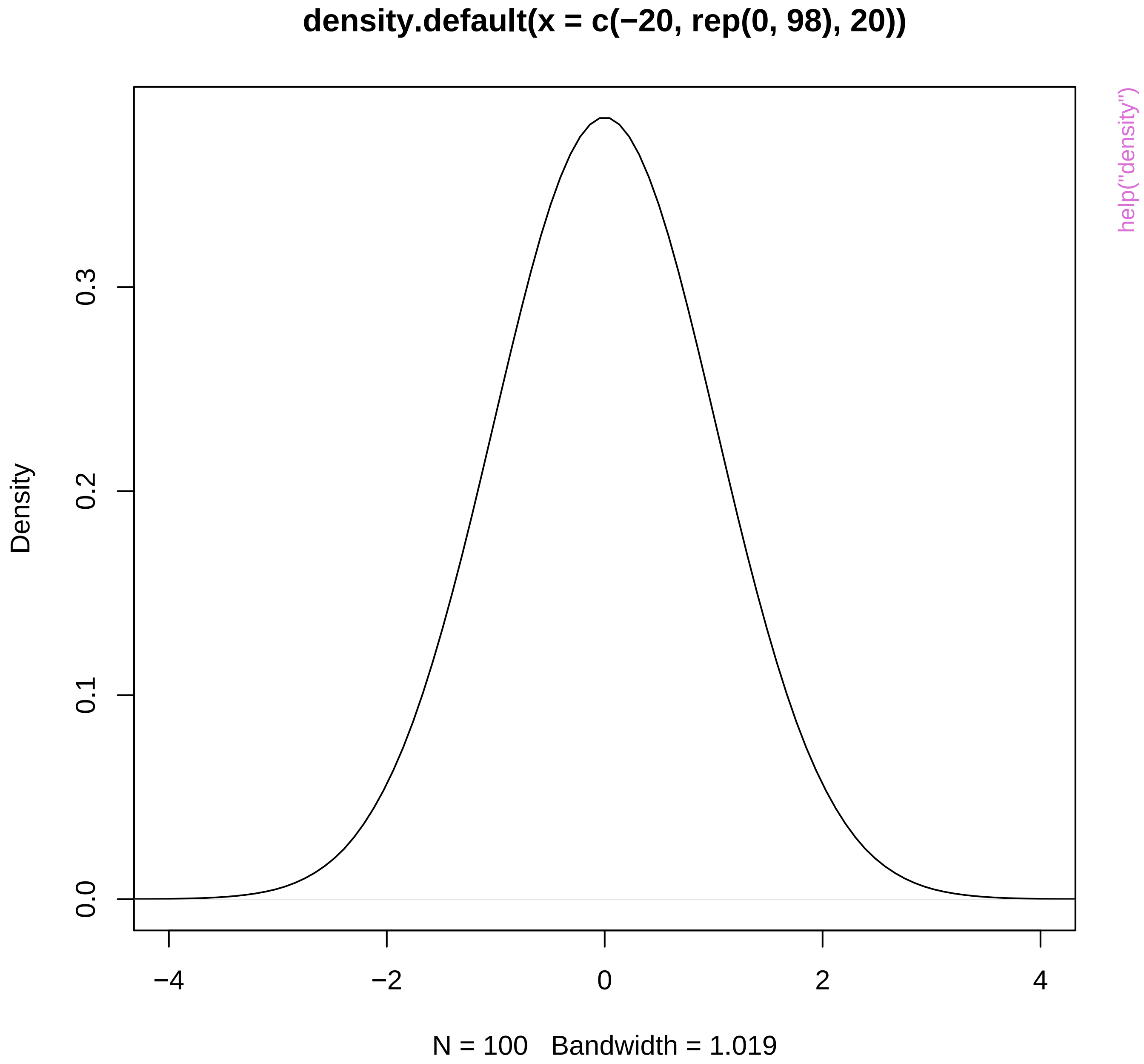


help("dendrogram")
Nevada
Michigan
New York
Illinois
Louisiana
Alabama
Delaware
25
20
15
10
5
0

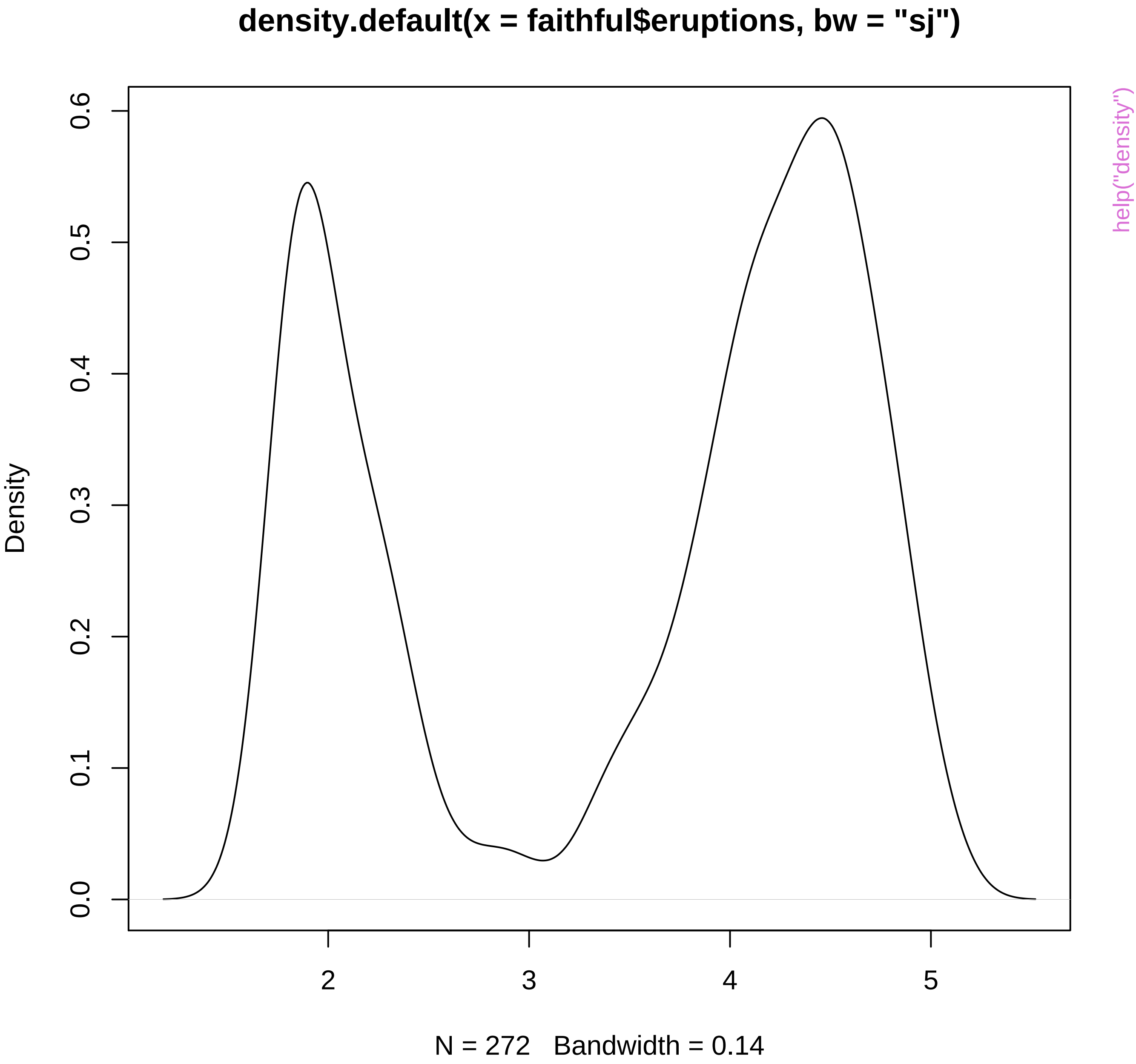


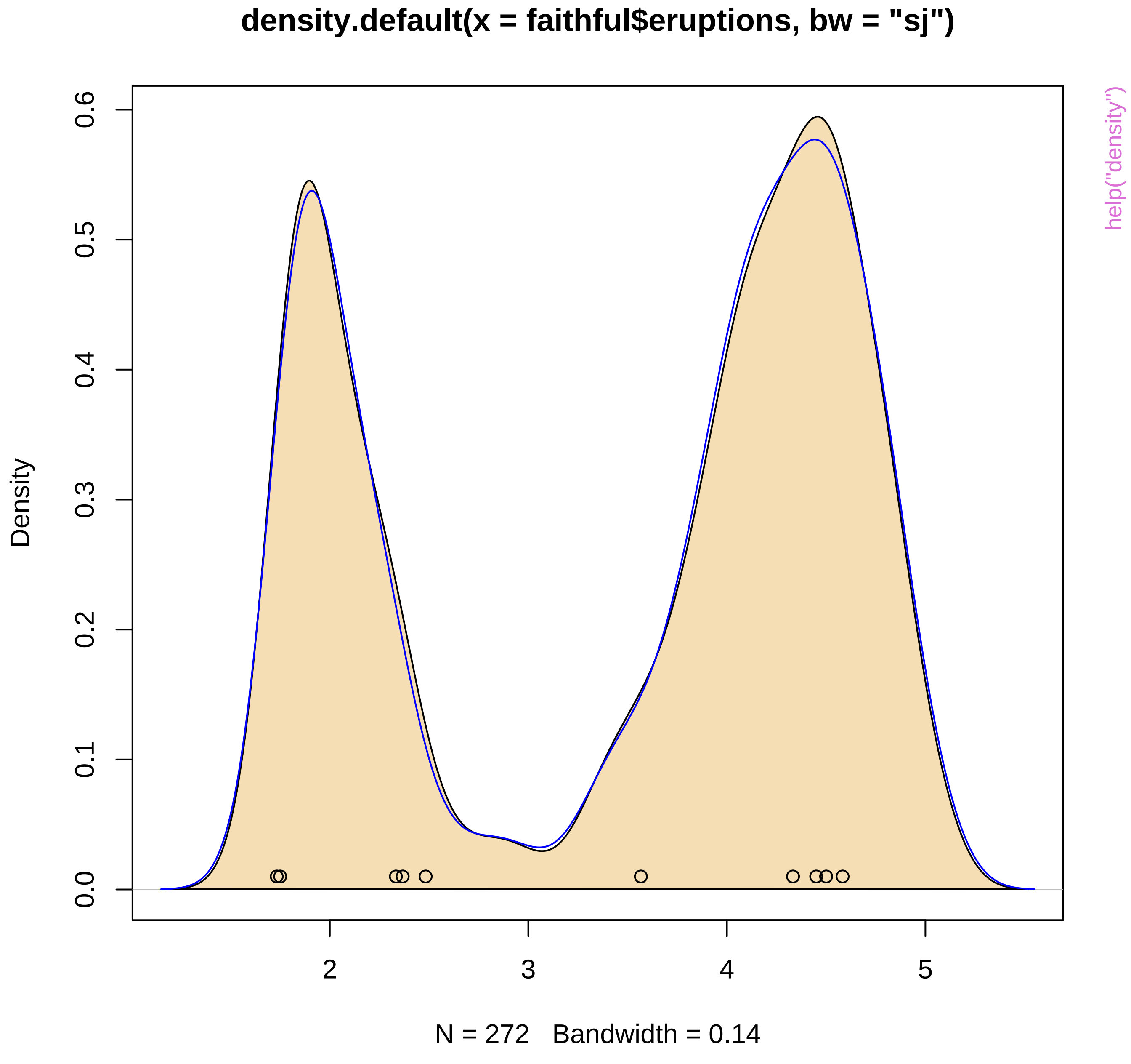
7 members
3 members
4 members
2 members
2 members
2 members
0
5
10
15
20
25
Delaware
Alabama
Louisiana
Illinois
New York
Michigan
Nevada
help("dendrogram")


7 members
3 members
4 members
2 members
2 members
2 members
0
5
10
15
20
25
Delaware
Alabama
Louisiana
Illinois
New York
Michigan
Nevada
help("dendrogram")

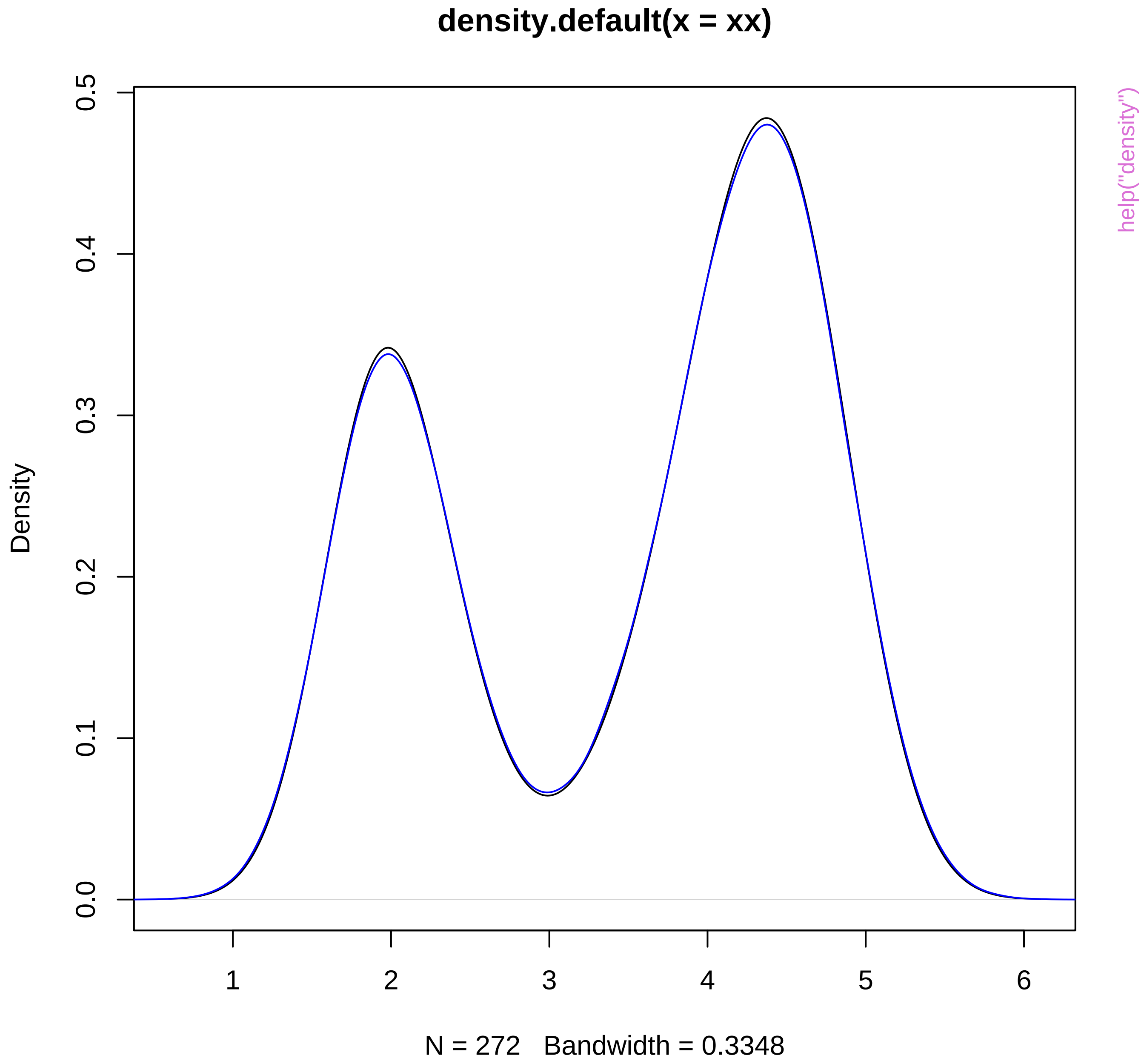


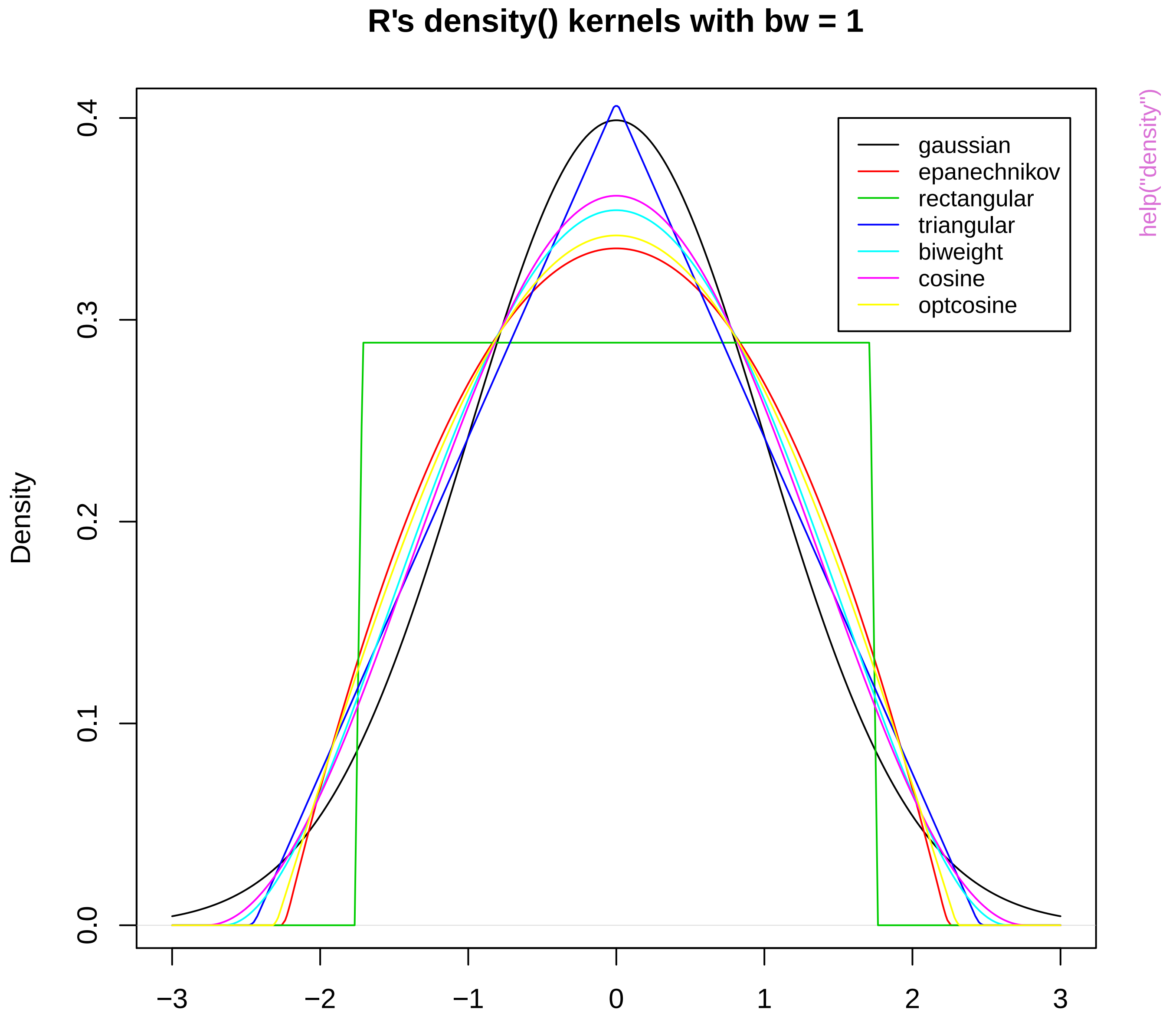
density.default(x = c(−20, rep(0, 98), 20))
Density
0.0
0.1
0.2
0.3
−4
−2
0
2
4
N = 100 Bandwidth = 1.019
help("density")


density.default(x = faithful$eruptions, bw = "sj")
Density
0.0
0.1
0.2
0.3
0.4
0.5
0.6
2
3
4
5
N = 272   Bandwidth = 0.14
help("density")

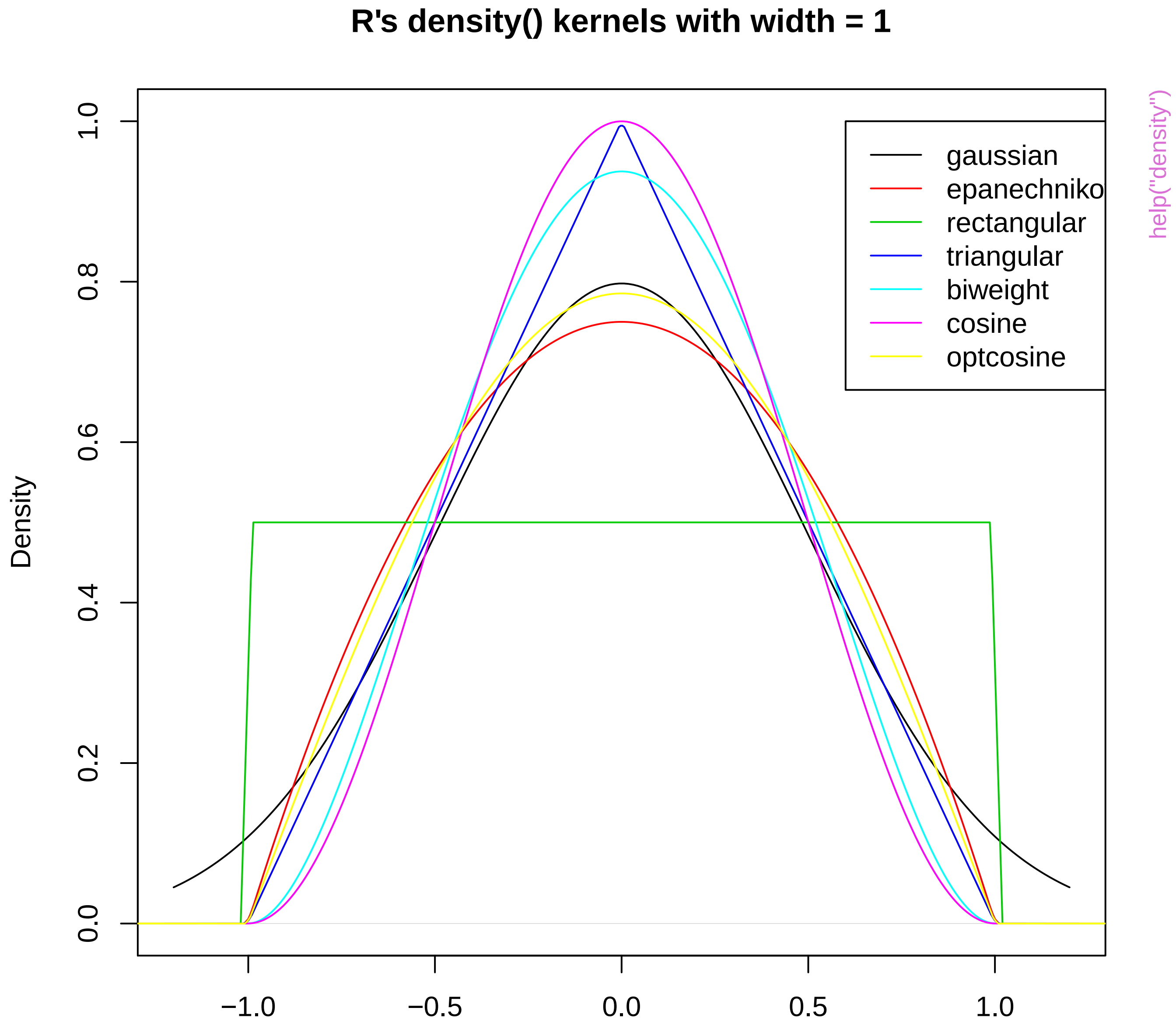


density.default(x = faithful$eruptions, bw = "sj")
Density
0.0
0.1
0.2
0.3
0.4
0.5
0.6
2
3
4
5
N = 272   Bandwidth = 0.14
help("density")

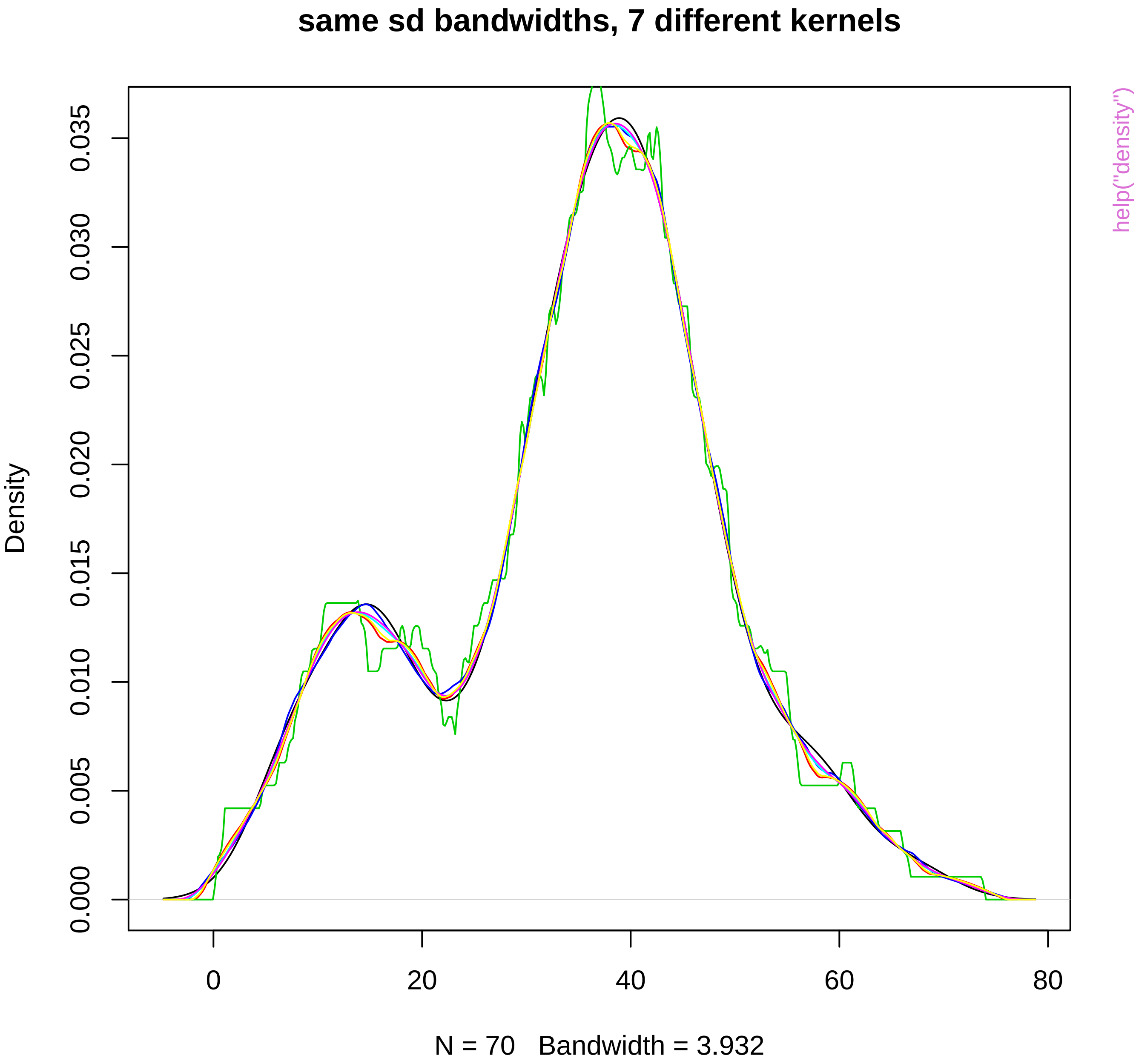

density.default(x = xx)
Density
0.0
0.1
0.2
0.3
0.4
0.5
1
2
3
4
5
6
N = 272   Bandwidth = 0.3348
help("density")



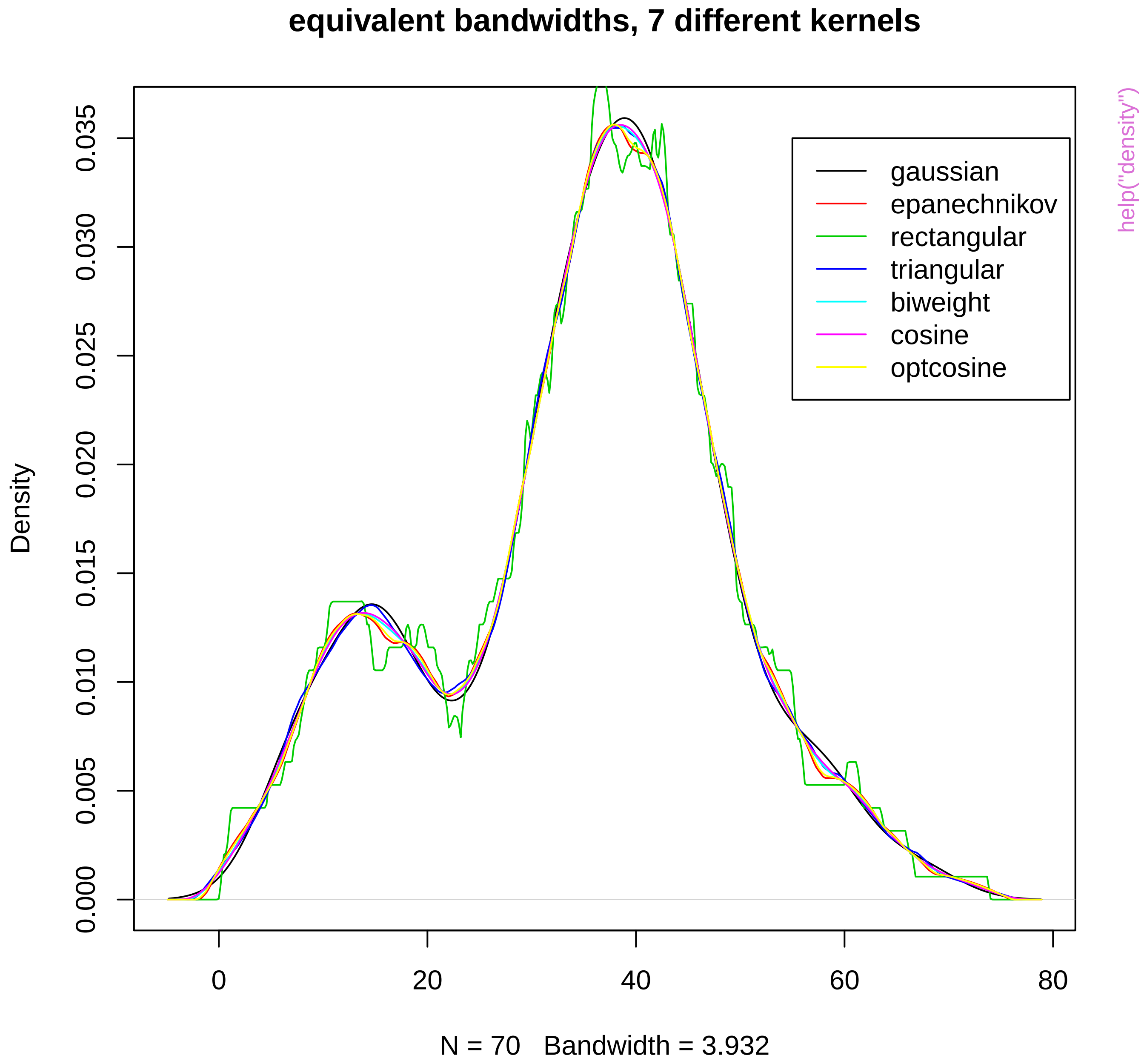
R's density() kernels with bw = 1
Density
0.0
0.1
0.2
0.3
0.4
−3
−2
−1
0
1
2
3
gaussian
epanechnikov
rectangular
triangular
biweight
cosine
optcosine
help("density")



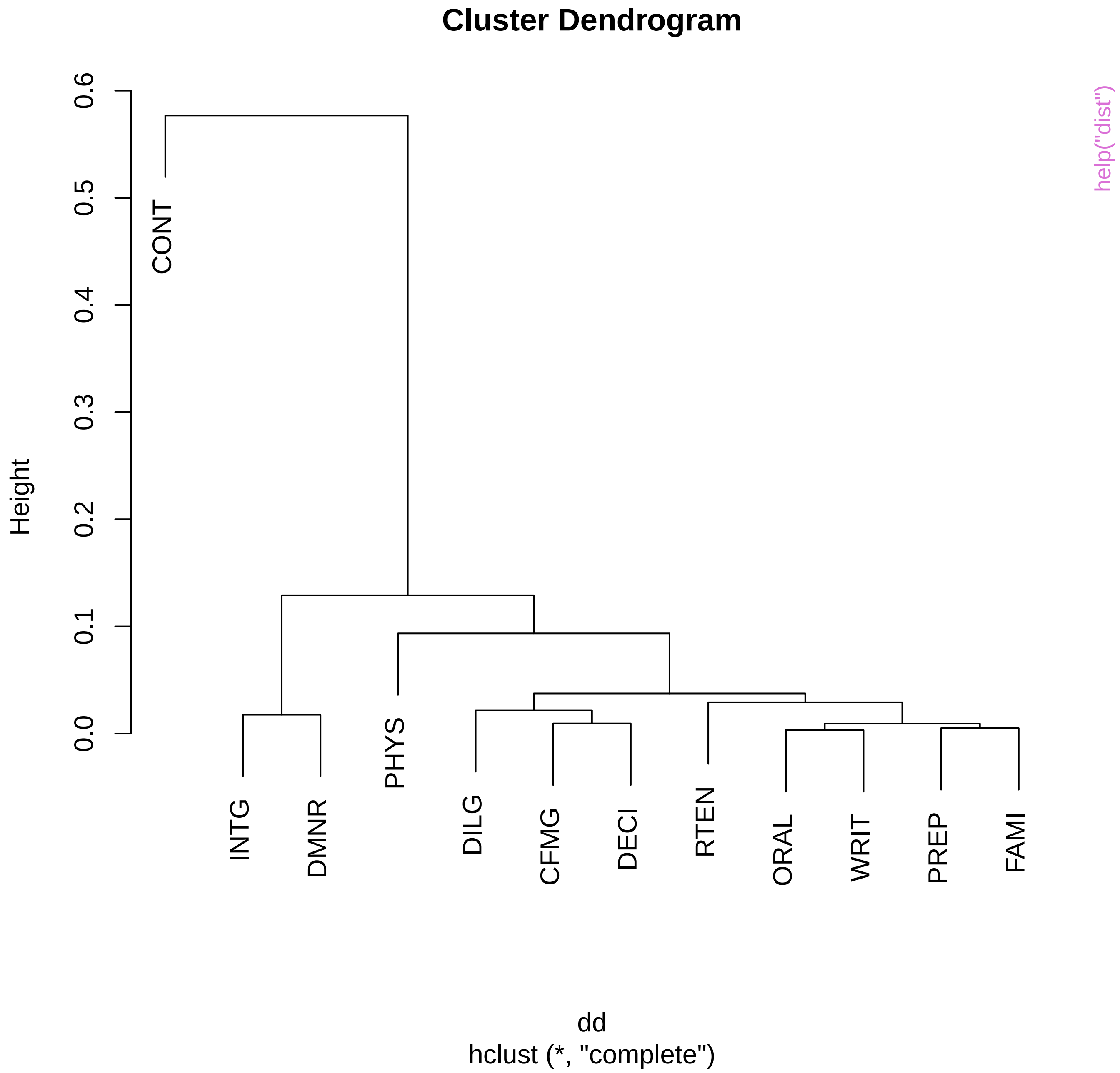
R's density() kernels with width = 1
Density
0.0
0.2
0.4
0.6
0.8
1.0
−1.0
−0.5
0.0
0.5
1.0
gaussian
epanechniko
rectangular
triangular
biweight
cosine
optcosine
help("density")



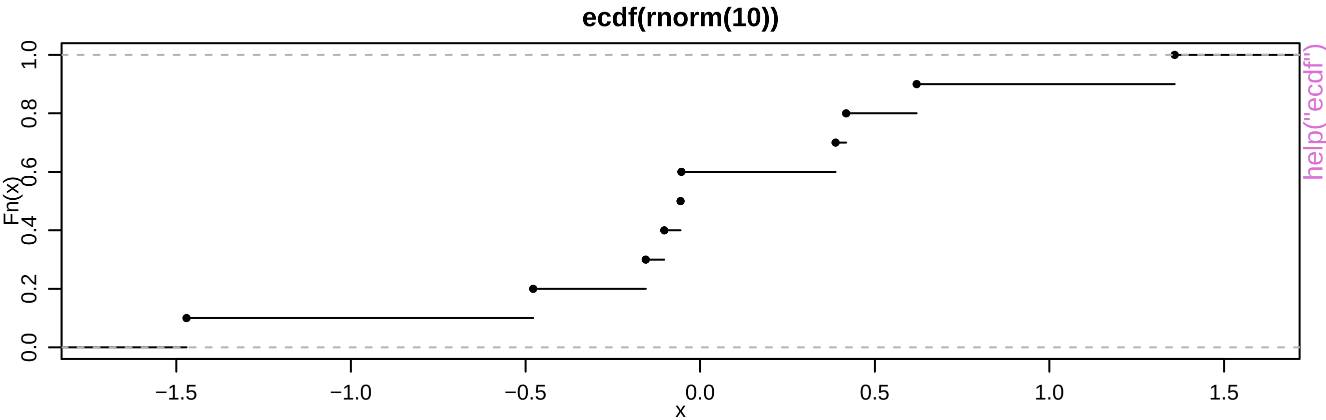
same sd bandwidths, 7 different kernels
Density
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
0
20
40
60
80
N = 70   Bandwidth = 3.932
help("density")

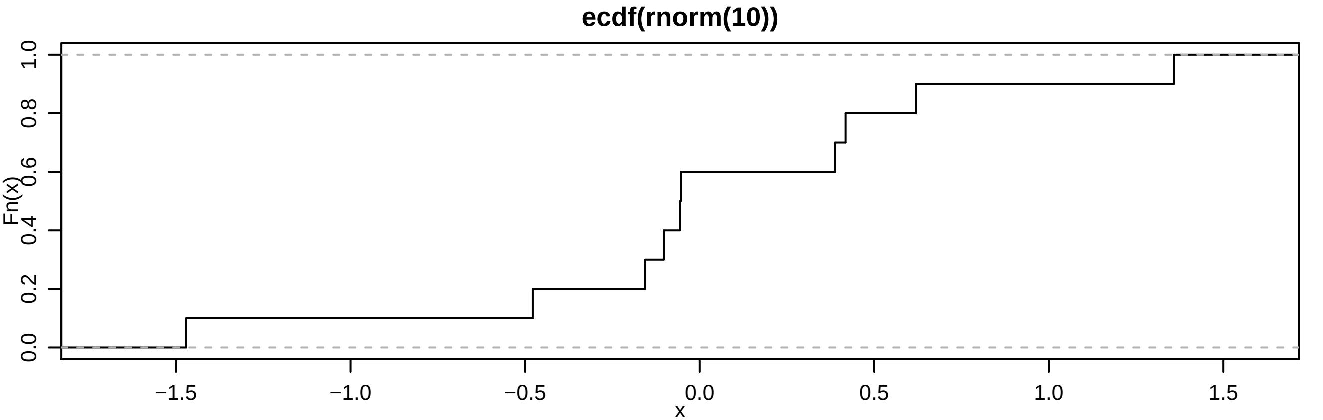


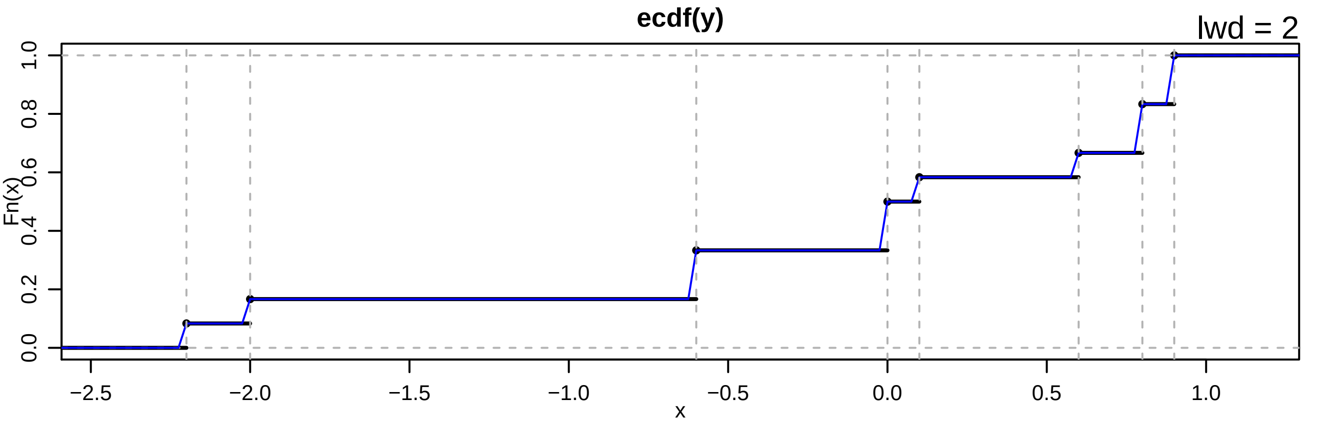
equivalent bandwidths, 7 different kernels
Density
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
0
20
40
60
80
N = 70 Bandwidth = 3.932
gaussian
epanechnikov
rectangular
triangular
biweight
cosine
optcosine
help("density")

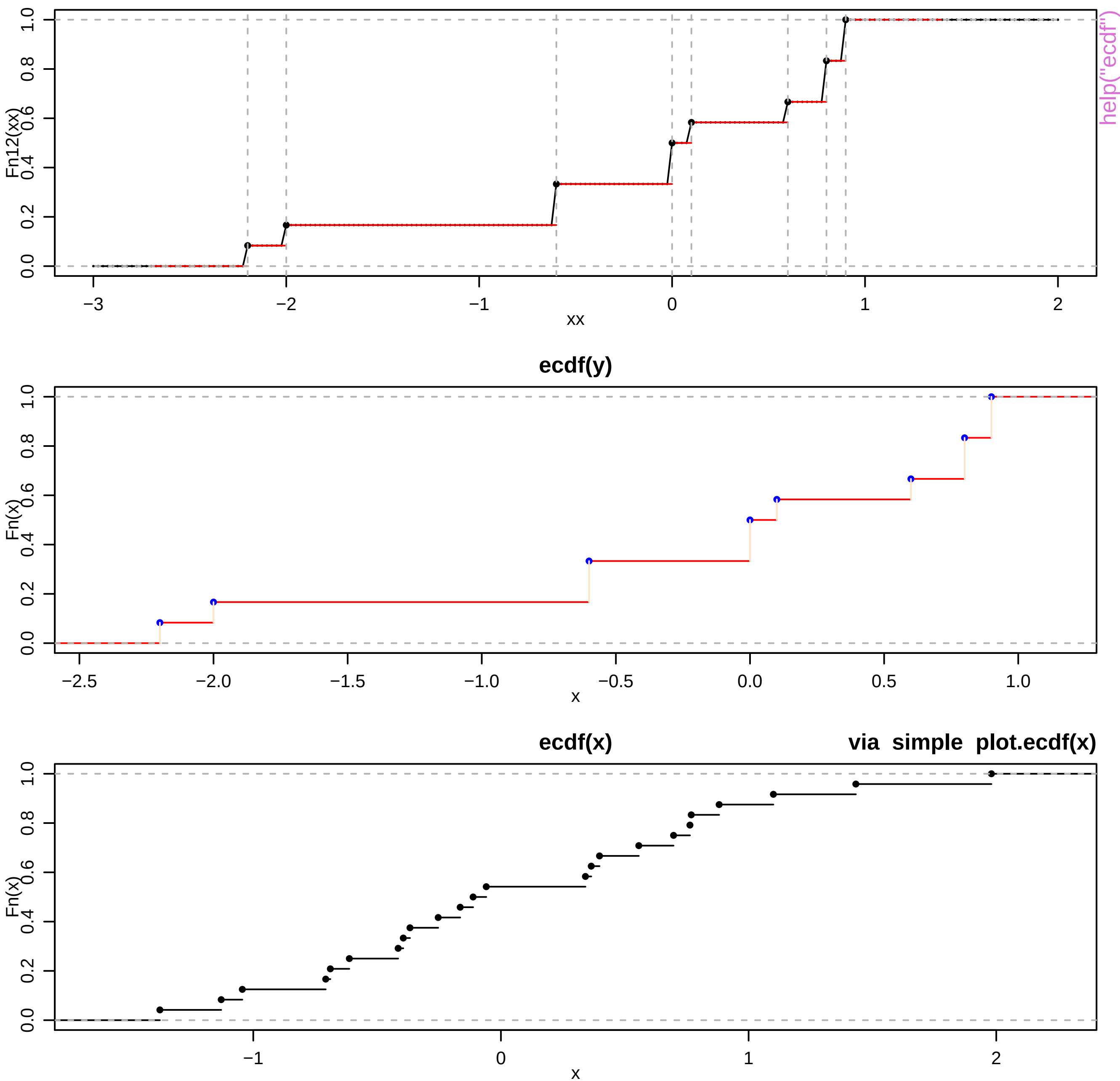


Cluster Dendrogram
Height
0.0
0.1
0.2
0.3
0.4
0.5
0.6
CONT
INTG
DMNR
PHYS
DILG
CFMG
DECI
RTEN
ORAL
WRIT
PREP
FAMI
dd
hclust (*, "complete")
help("dist")

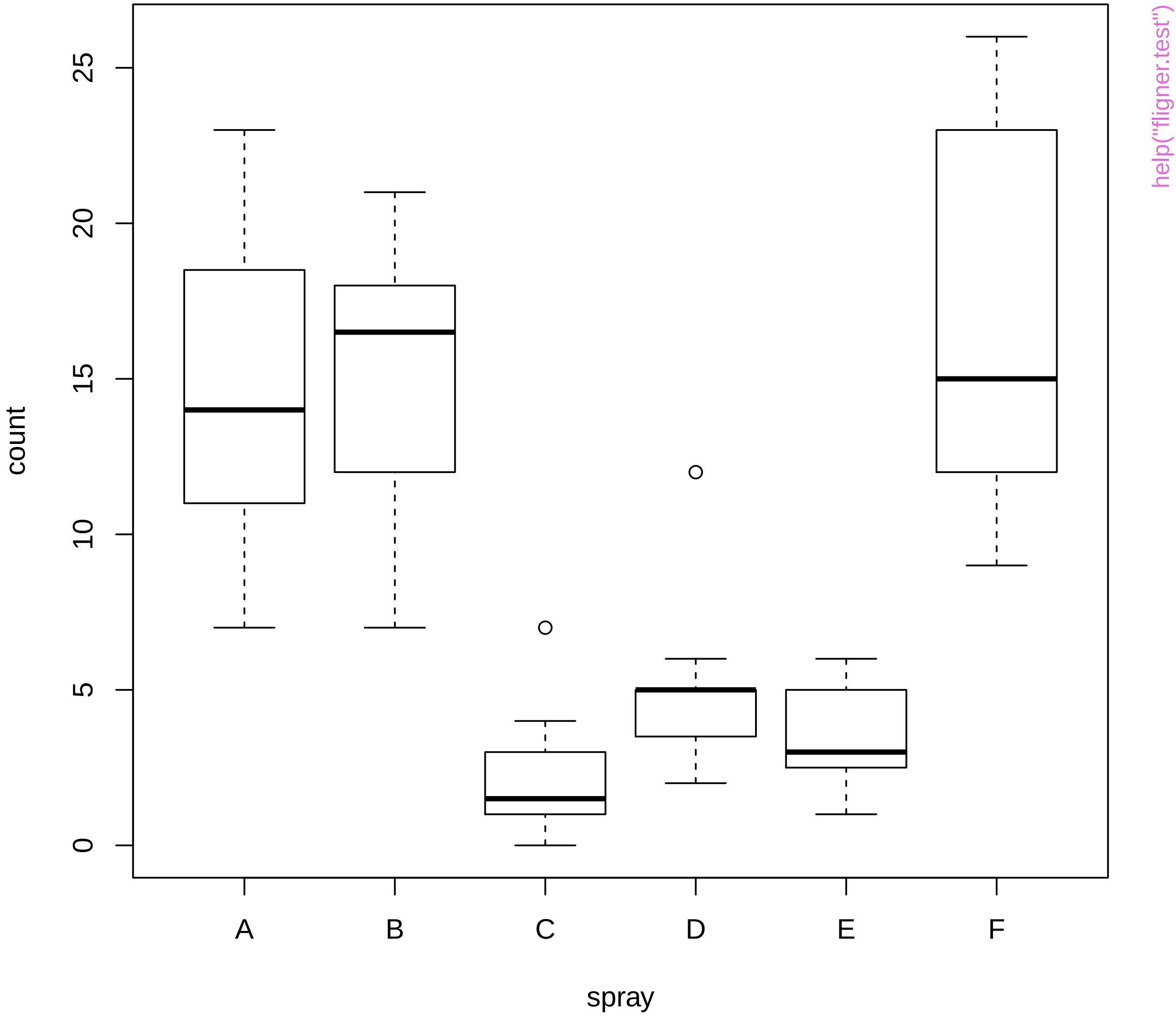

ecdf(rnorm(10))
Fn(x)
x
0.0
0.2
0.4
0.6
0.8
1.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
help("ecdf")

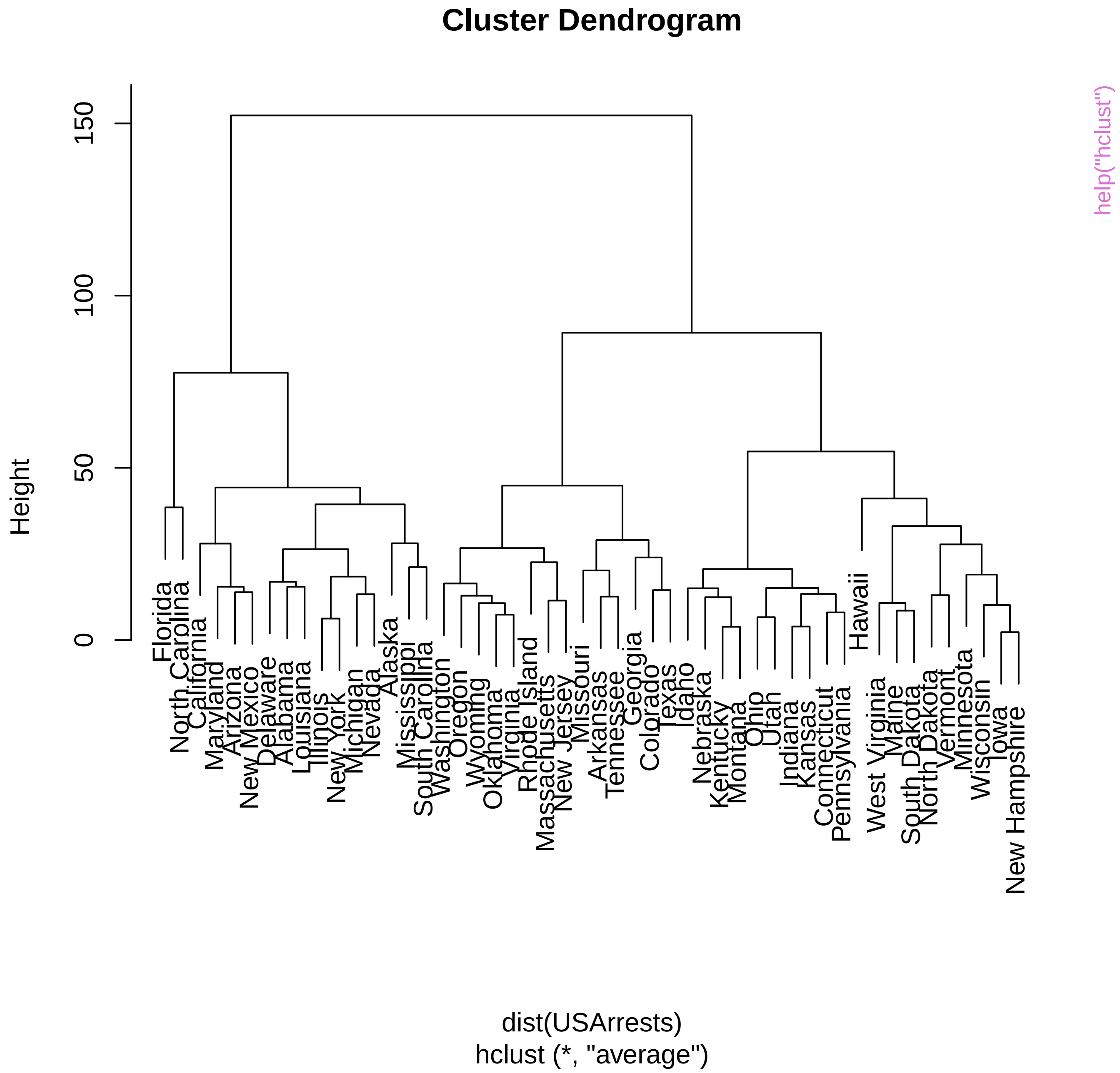

ecdf(rnorm(10))
Fn(x)
x
0.0
0.2
0.4
0.6
0.8
1.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5

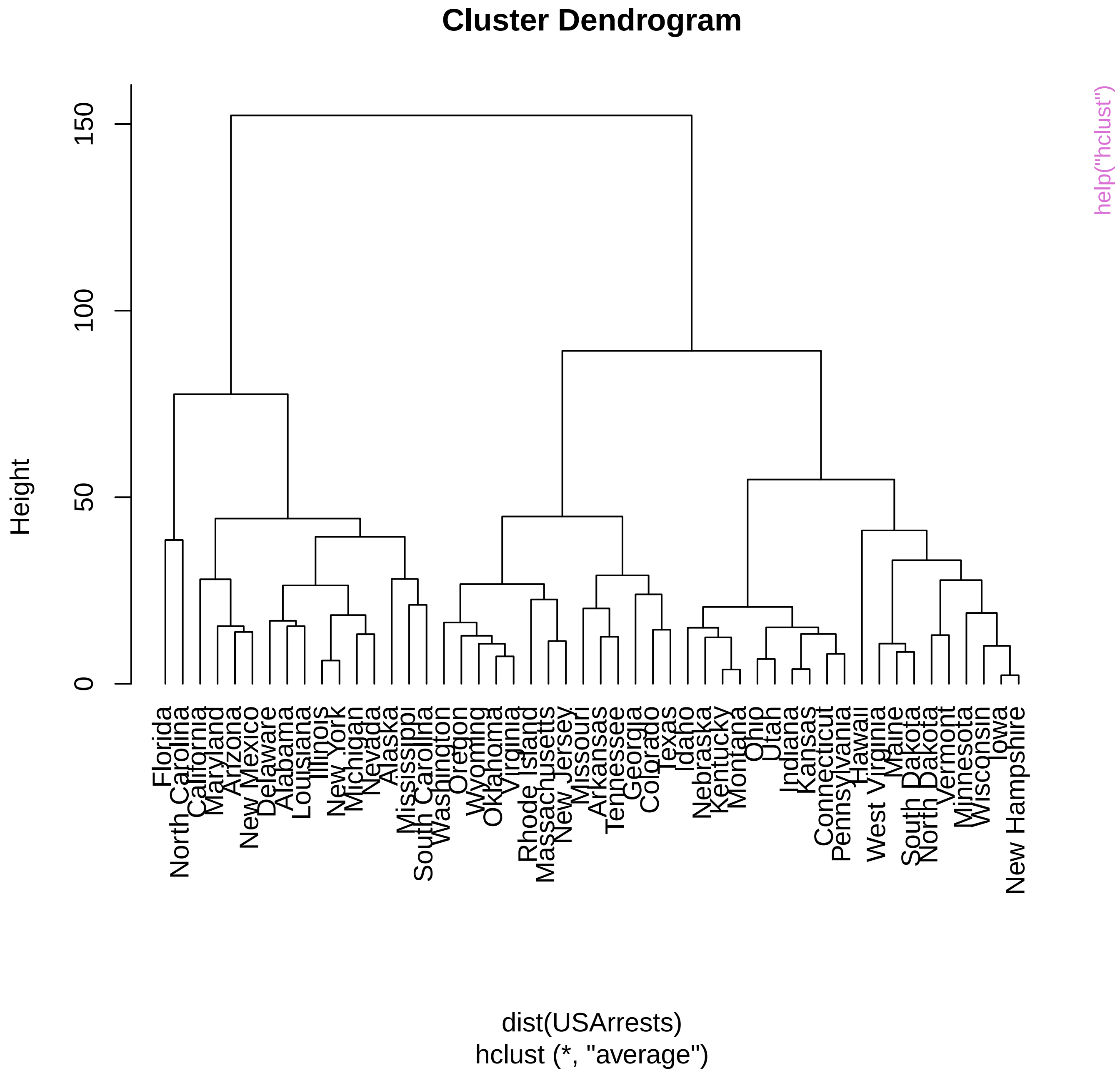

ecdf(y)
lwd = 2
Fn(x)
x
0.0
0.2
0.4
0.6
0.8
1.0
−2.5
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0

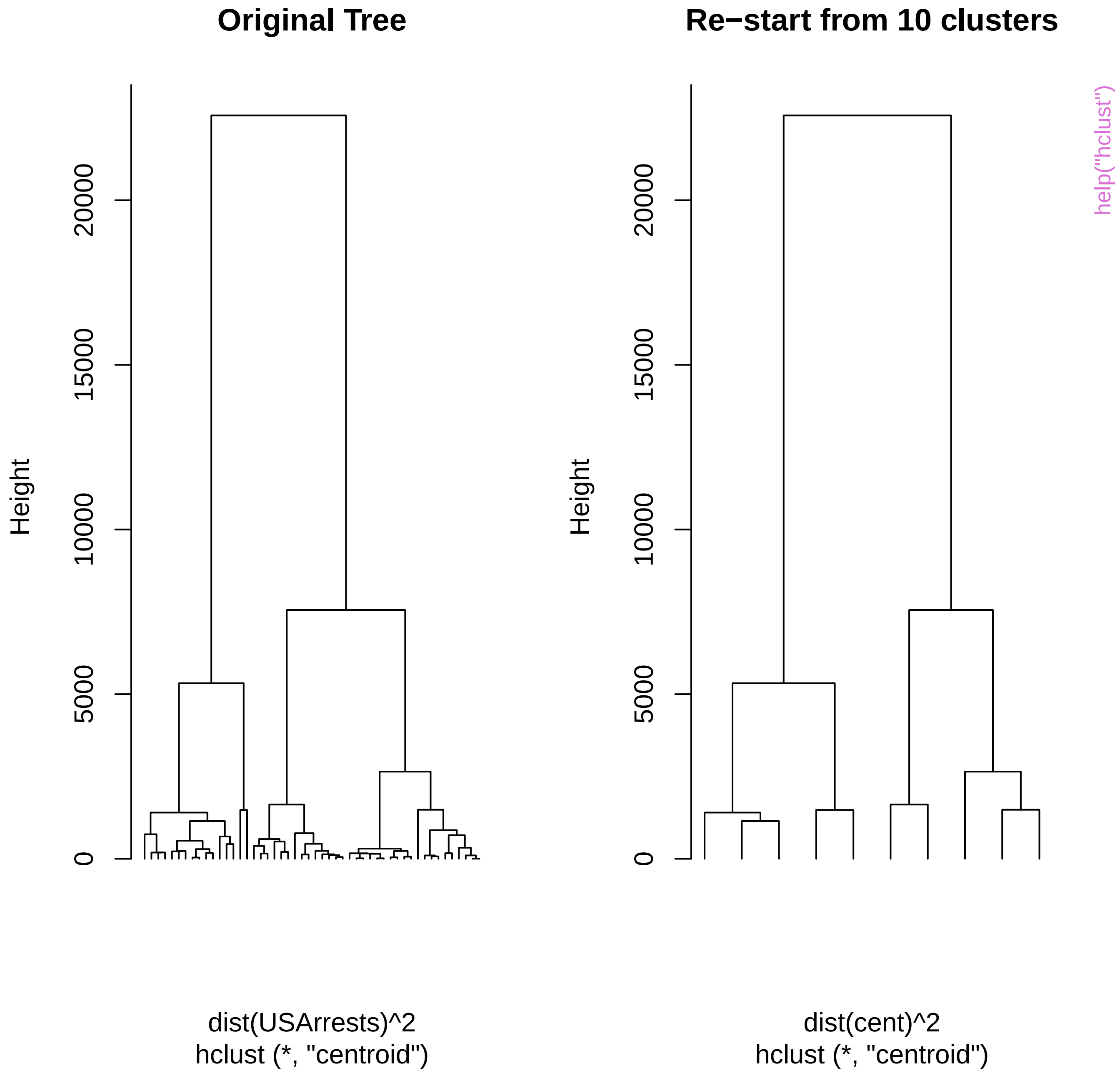


Fn12(xx)
xx
help("ecdf")
ecdf(y)
Fn(x)
x
ecdf(x)
via simple plot.ecdf(x)
Fn(x)
x

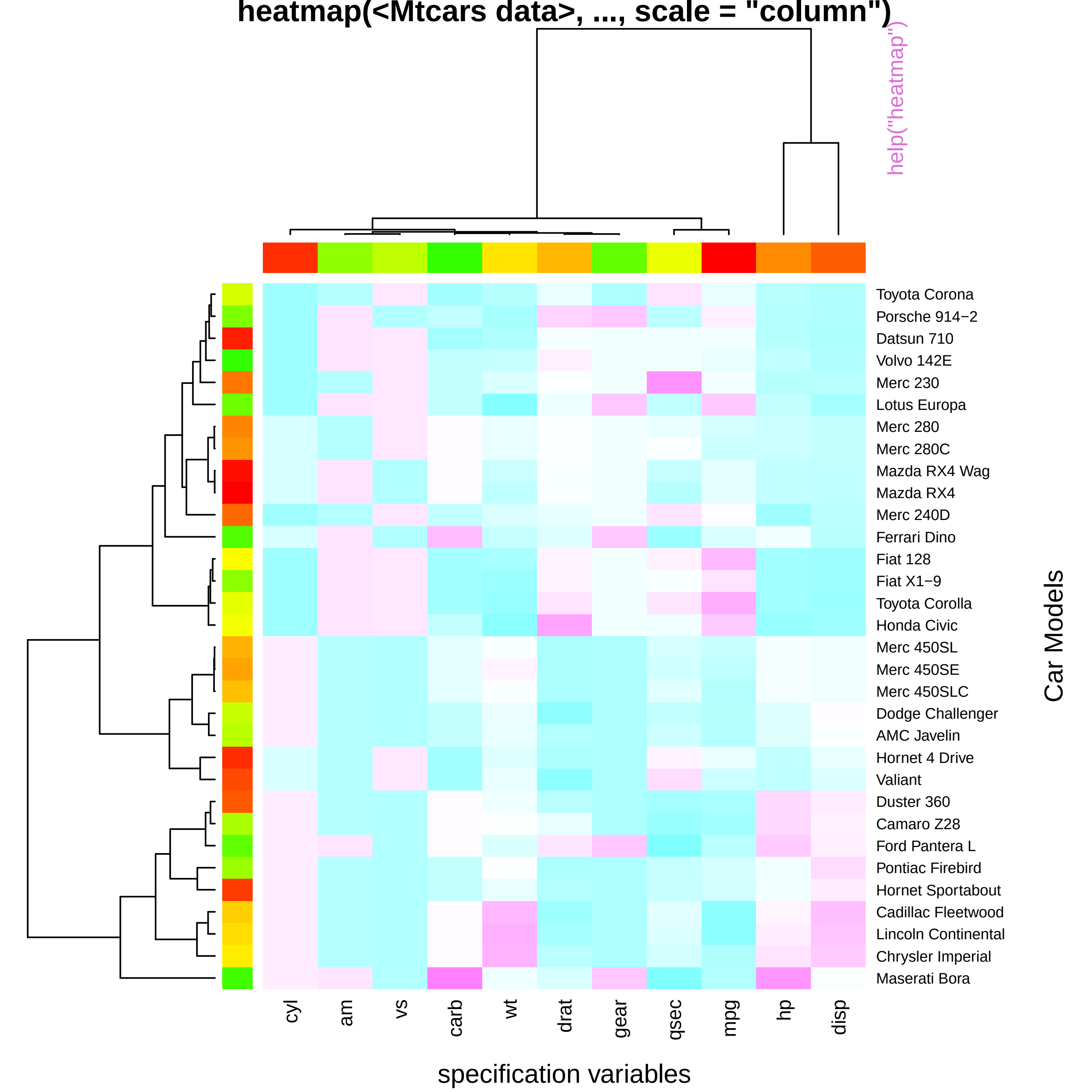

count
spray
0
5
10
15
20
25
A
B
C
D
E
F
help("fligner.test")


Cluster Dendrogram
Height
0
50
100
150
Florida
North Carolina
California
Maryland
Arizona
New Mexico
Delaware
Alabama
Louisiana
Illinois
New York
Michigan
Nevada
Alaska
Mississippi
South Carolina
Washington
Oregon
Wyoming
Oklahoma
Virginia
Rhode Island
Massachusetts
New Jersey
Missouri
Arkansas
Tennessee
Georgia
Colorado
Texas
Idaho
Nebraska
Kentucky
Montana
Ohio
Utah
Indiana
Kansas
Connecticut
Pennsylvania
Hawaii
West Virginia
Maine
South Dakota
North Dakota
Vermont
Minnesota
Wisconsin
Iowa
New Hampshire
dist(USArrests)
hclust (*, "average")
help("hclust")

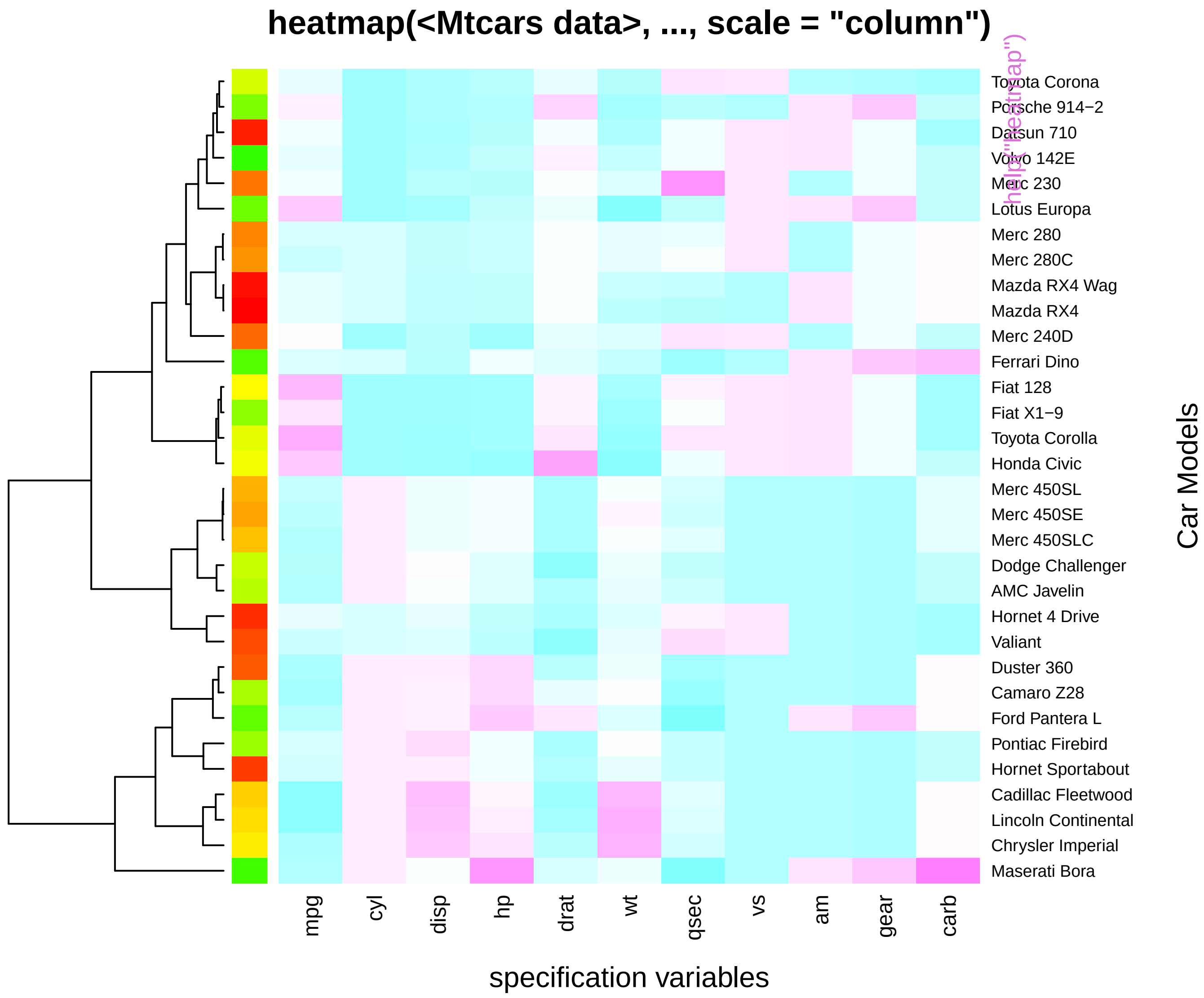

Cluster Dendrogram
Height
0
50
100
150
Florida
North Carolina
California
Maryland
Arizona
New Mexico
Delaware
Alabama
Louisiana
Illinois
New York
Michigan
Nevada
Alaska
Mississippi
South Carolina
Washington
Oregon
Wyoming
Oklahoma
Virginia
Rhode Island
Massachusetts
New Jersey
Missouri
Arkansas
Tennessee
Georgia
Colorado
Texas
Idaho
Nebraska
Kentucky
Montana
Ohio
Utah
Indiana
Kansas
Connecticut
Pennsylvania
Hawaii
West Virginia
Maine
South Dakota
North Dakota
Vermont
Minnesota
Wisconsin
Iowa
New Hampshire
dist(USArrests)
hclust (*, "average")
help("hclust")



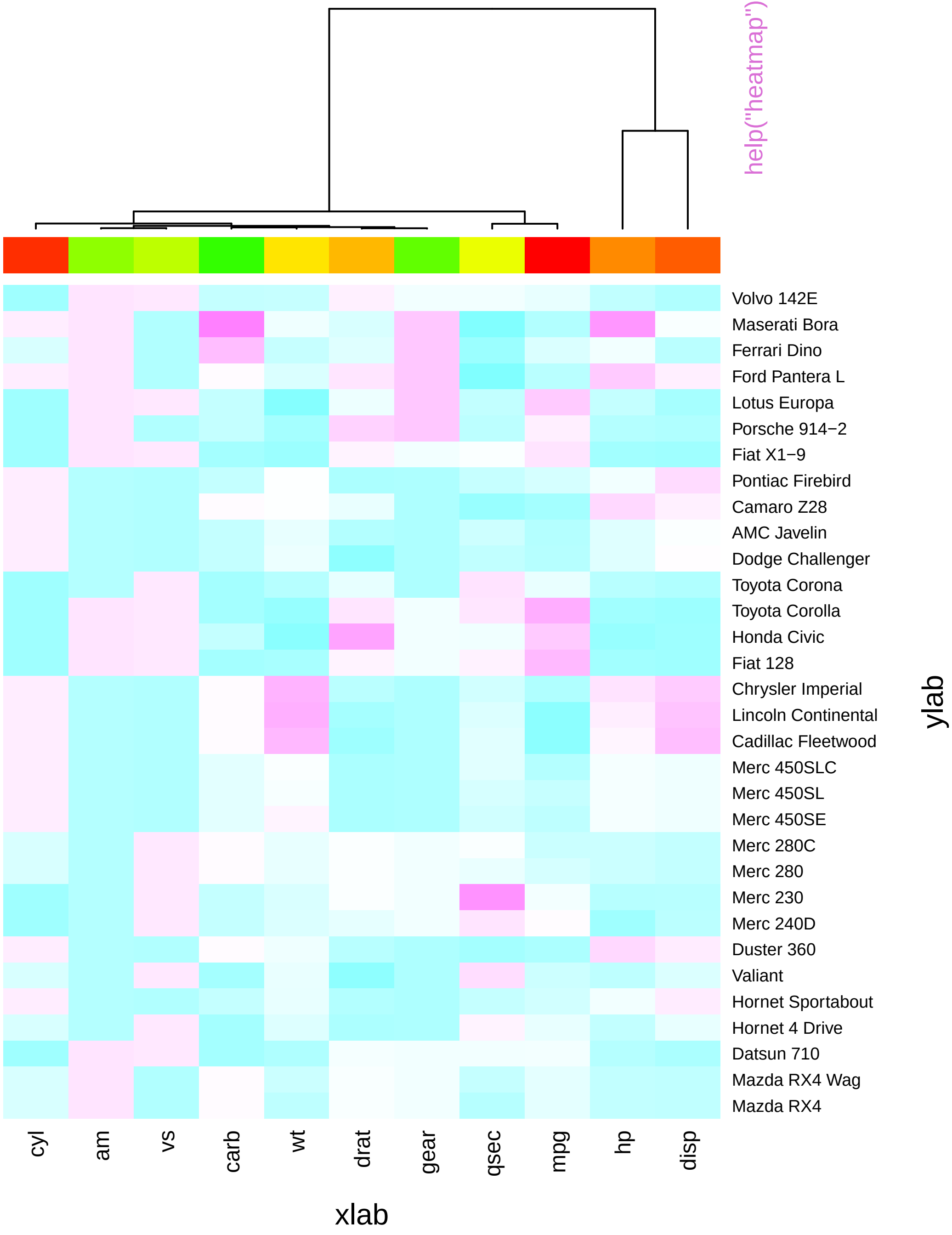
Original Tree
Re−start from 10 clusters
Height
0
5000
10000
15000
20000
dist(USArrests)^2
hclust (*, "centroid")
dist(cent)^2
hclust (*, "centroid")
help("hclust")

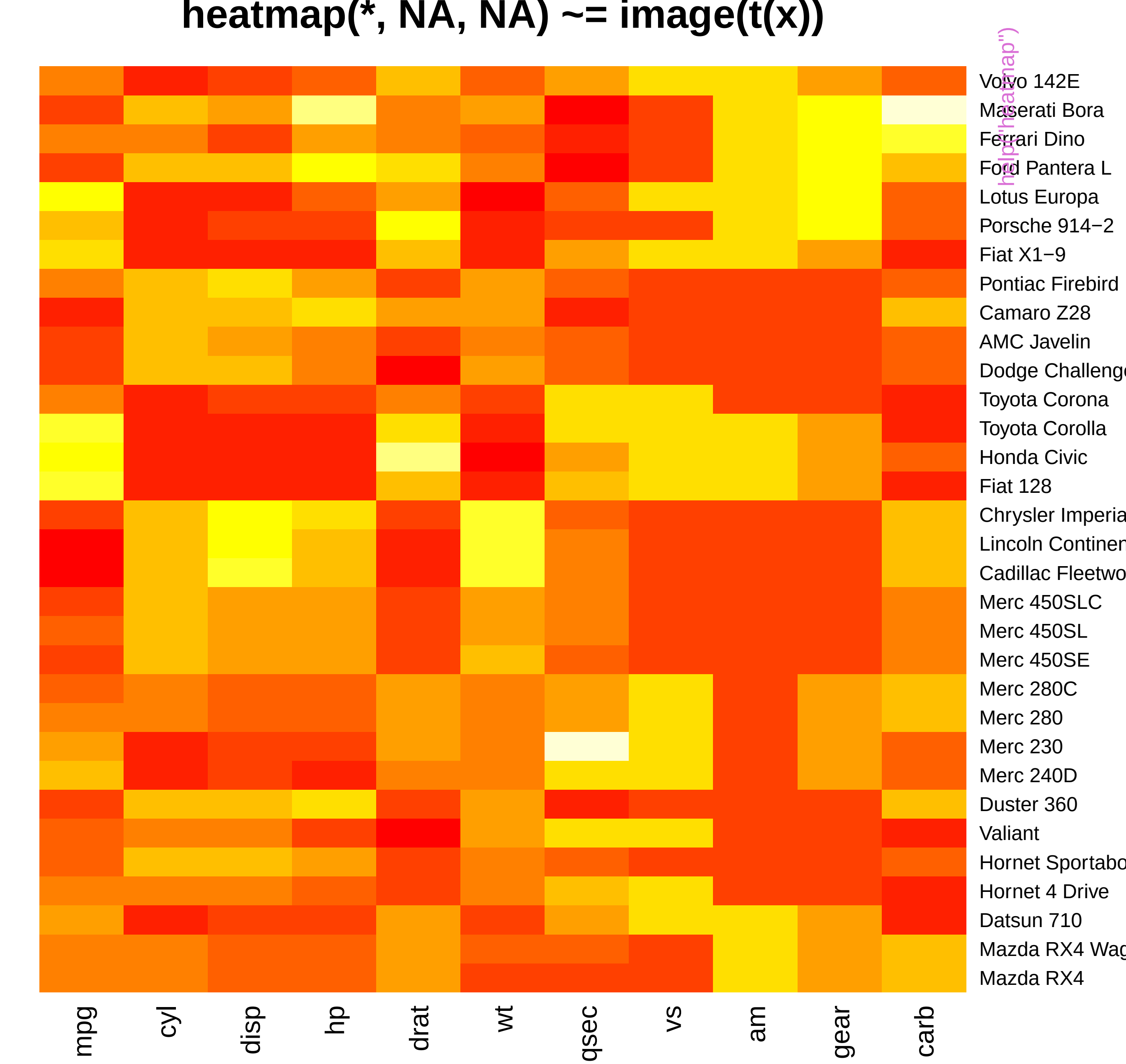


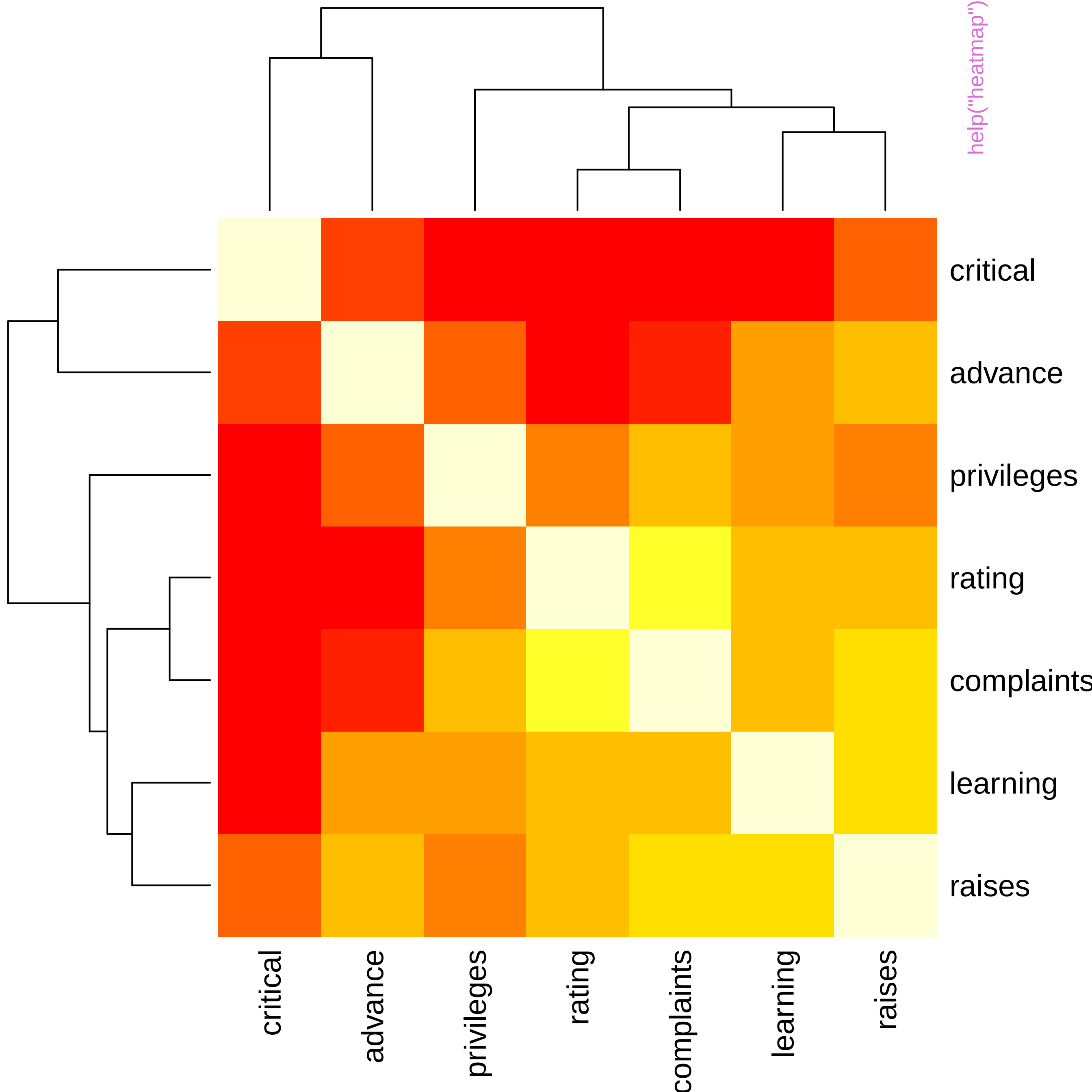
heatmap(<Mtcars data>, ..., scale = "column")
help("heatmap")
Toyota Corona
Porsche 914−2
Datsun 710
Volvo 142E
Merc 230
Lotus Europa
Merc 280
Merc 280C
Mazda RX4 Wag
Mazda RX4
Merc 240D
Ferrari Dino
Fiat 128
Fiat X1−9
Toyota Corolla
Honda Civic
Merc 450SL
Merc 450SE
Merc 450SLC
Dodge Challenger
AMC Javelin
Hornet 4 Drive
Valiant
Duster 360
Camaro Z28
Ford Pantera L
Pontiac Firebird
Hornet Sportabout
Cadillac Fleetwood
Lincoln Continental
Chrysler Imperial
Maserati Bora
Car Models
cyl
am
vs
carb
wt
drat
gear
qsec
mpg
hp
disp
specification variables

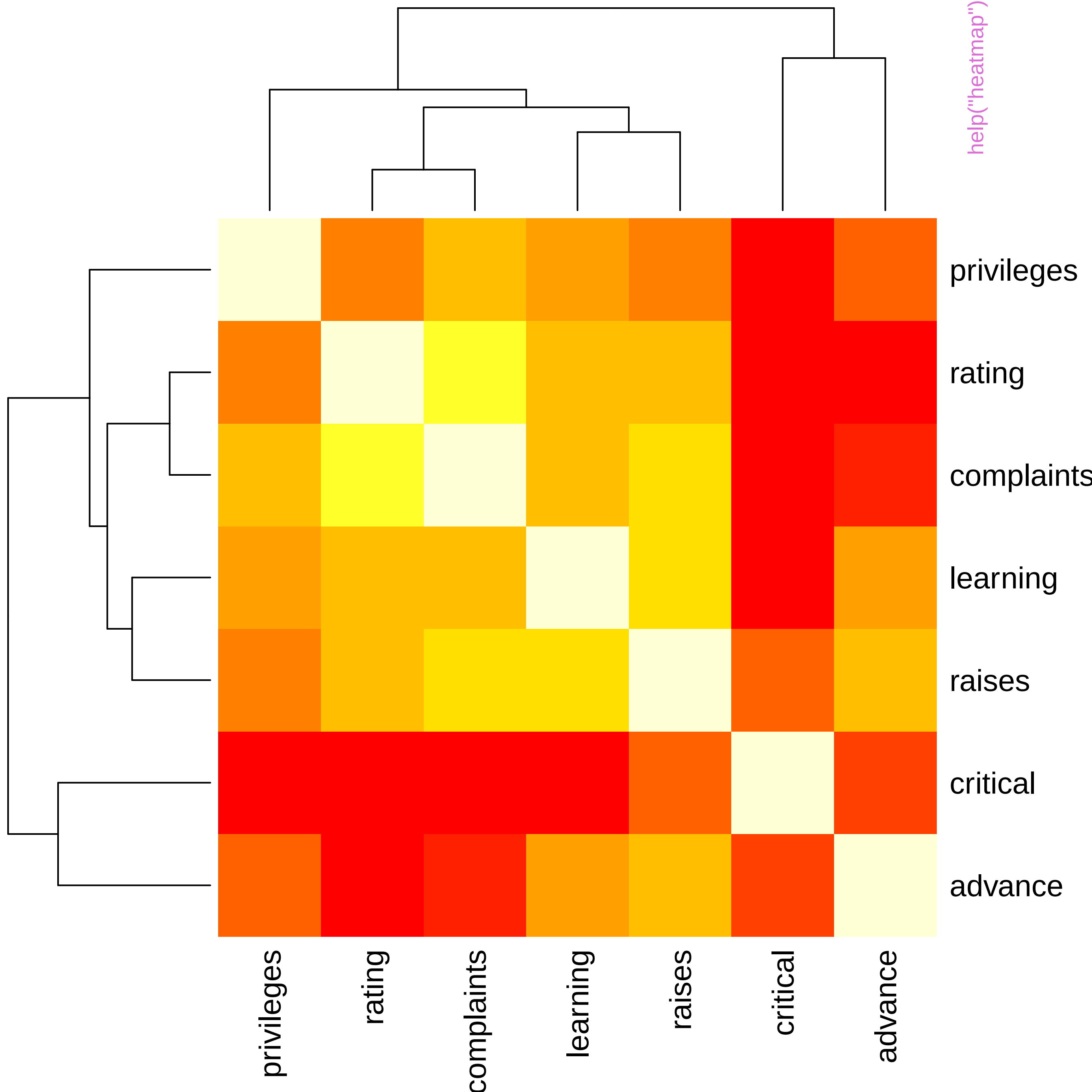


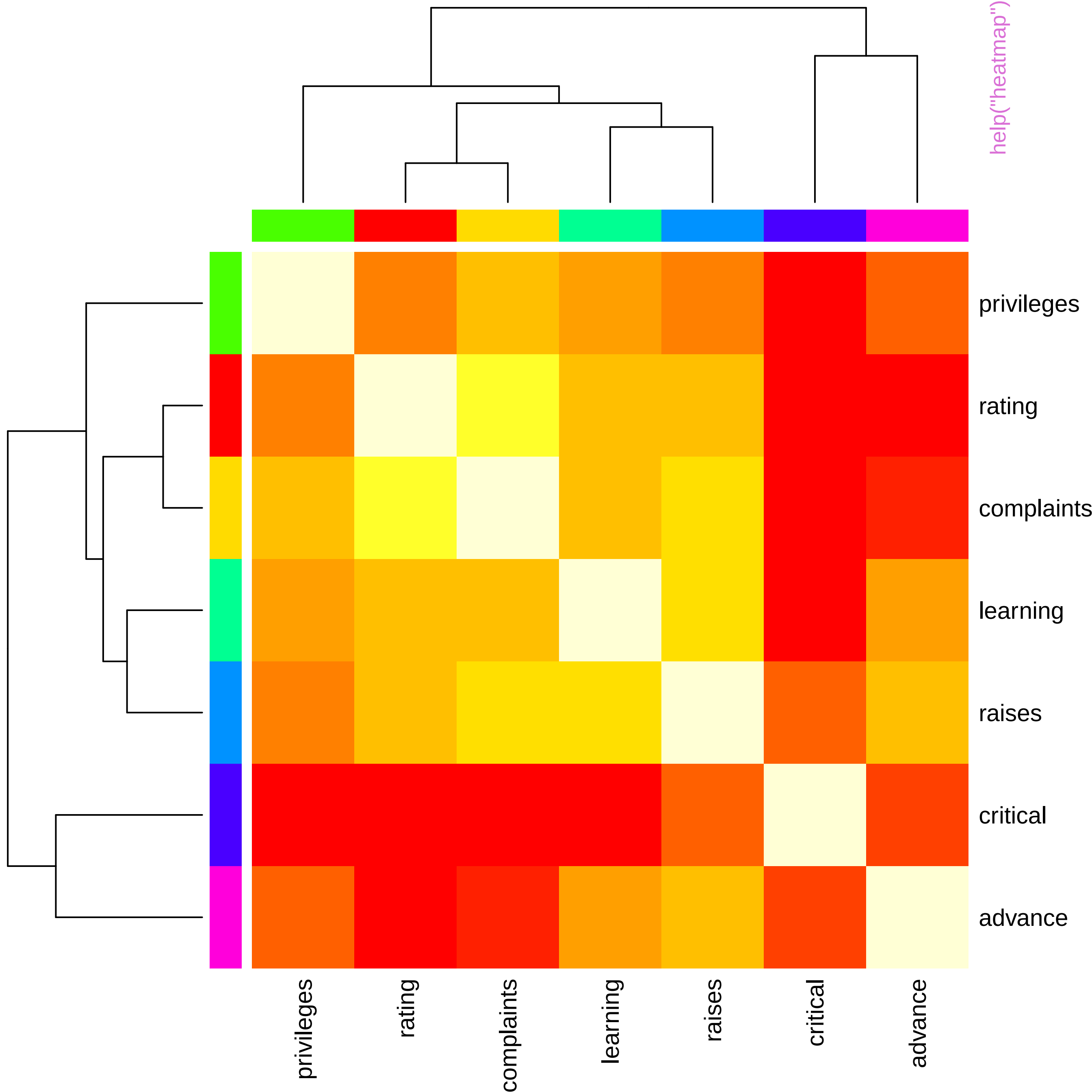
heatmap(<Mtcars data>, ..., scale = "column")
help("heatmap")
Toyota Corona
Porsche 914−2
Datsun 710
Volvo 142E
Merc 230
Lotus Europa
Merc 280
Merc 280C
Mazda RX4 Wag
Mazda RX4
Merc 240D
Ferrari Dino
Fiat 128
Fiat X1−9
Toyota Corolla
Honda Civic
Merc 450SL
Merc 450SE
Merc 450SLC
Dodge Challenger
AMC Javelin
Hornet 4 Drive
Valiant
Duster 360
Camaro Z28
Ford Pantera L
Pontiac Firebird
Hornet Sportabout
Cadillac Fleetwood
Lincoln Continental
Chrysler Imperial
Maserati Bora
Car Models
mpg
cyl
disp
hp
drat
wt
qsec
vs
am
gear
carb
specification variables


help("heatmap")
Volvo 142E
Maserati Bora
Ferrari Dino
Ford Pantera L
Lotus Europa
Porsche 914−2
Fiat X1−9
Pontiac Firebird
Camaro Z28
AMC Javelin
Dodge Challenger
Toyota Corona
Toyota Corolla
Honda Civic
Fiat 128
Chrysler Imperial
Lincoln Continental
Cadillac Fleetwood
Merc 450SLC
Merc 450SL
Merc 450SE
Merc 280C
Merc 280
Merc 230
Merc 240D
Duster 360
Valiant
Hornet Sportabout
Hornet 4 Drive
Datsun 710
Mazda RX4 Wag
Mazda RX4
ylab
cyl
am
vs
carb
wt
drat
gear
qsec
mpg
hp
disp
xlab

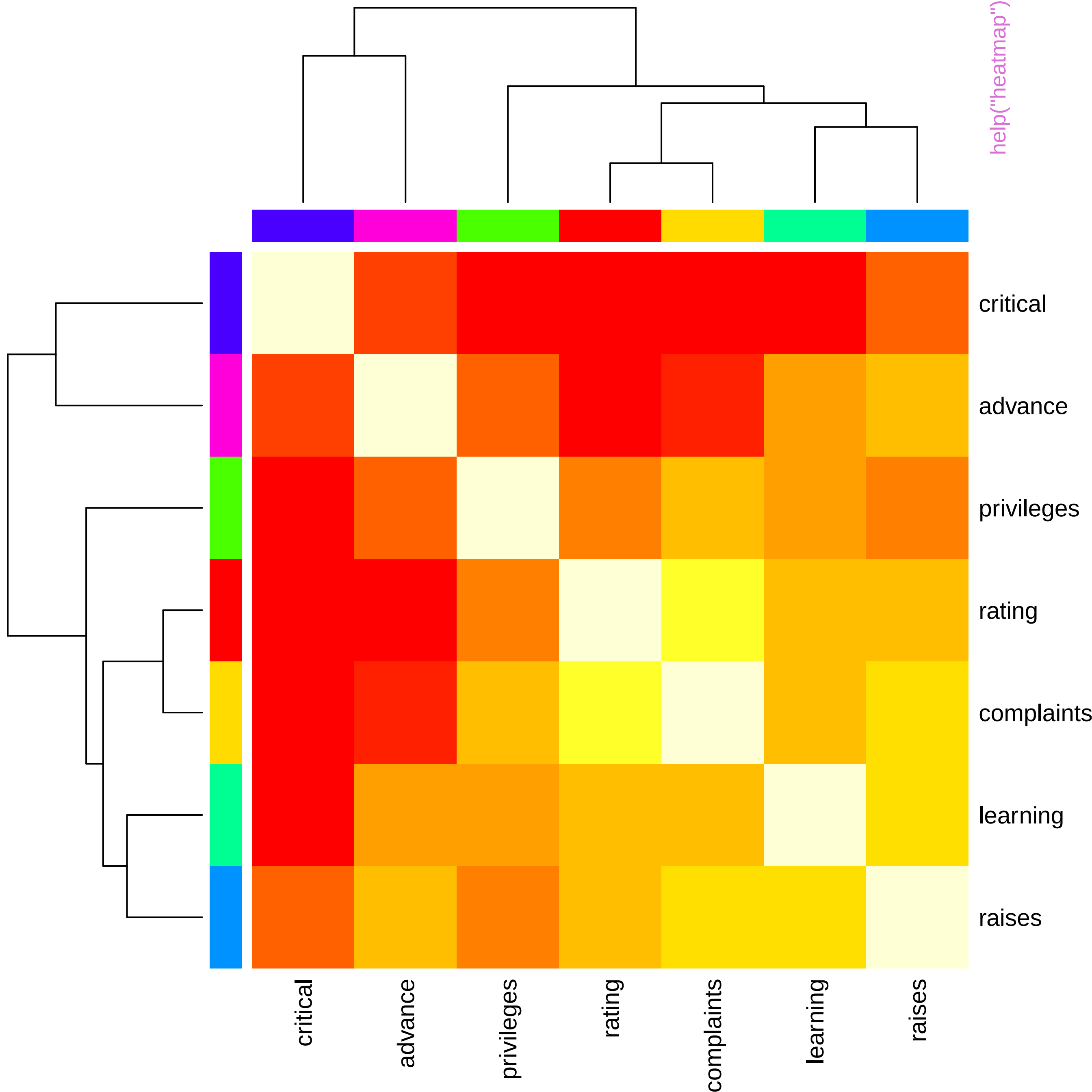

heatmap(*, NA, NA) ~= image(t(x))
help("heatmap")
Volvo 142E
Maserati Bora
Ferrari Dino
Ford Pantera L
Lotus Europa
Porsche 914−2
Fiat X1−9
Pontiac Firebird
Camaro Z28
AMC Javelin
Dodge Challenge
Toyota Corona
Toyota Corolla
Honda Civic
Fiat 128
Chrysler Imperia
Lincoln Continen
Cadillac Fleetwo
Merc 450SLC
Merc 450SL
Merc 450SE
Merc 280C
Merc 280
Merc 230
Merc 240D
Duster 360
Valiant
Hornet Sportabo
Hornet 4 Drive
Datsun 710
Mazda RX4 Wag
Mazda RX4
mpg
cyl
disp
hp
drat
wt
qsec
vs
am
gear
carb

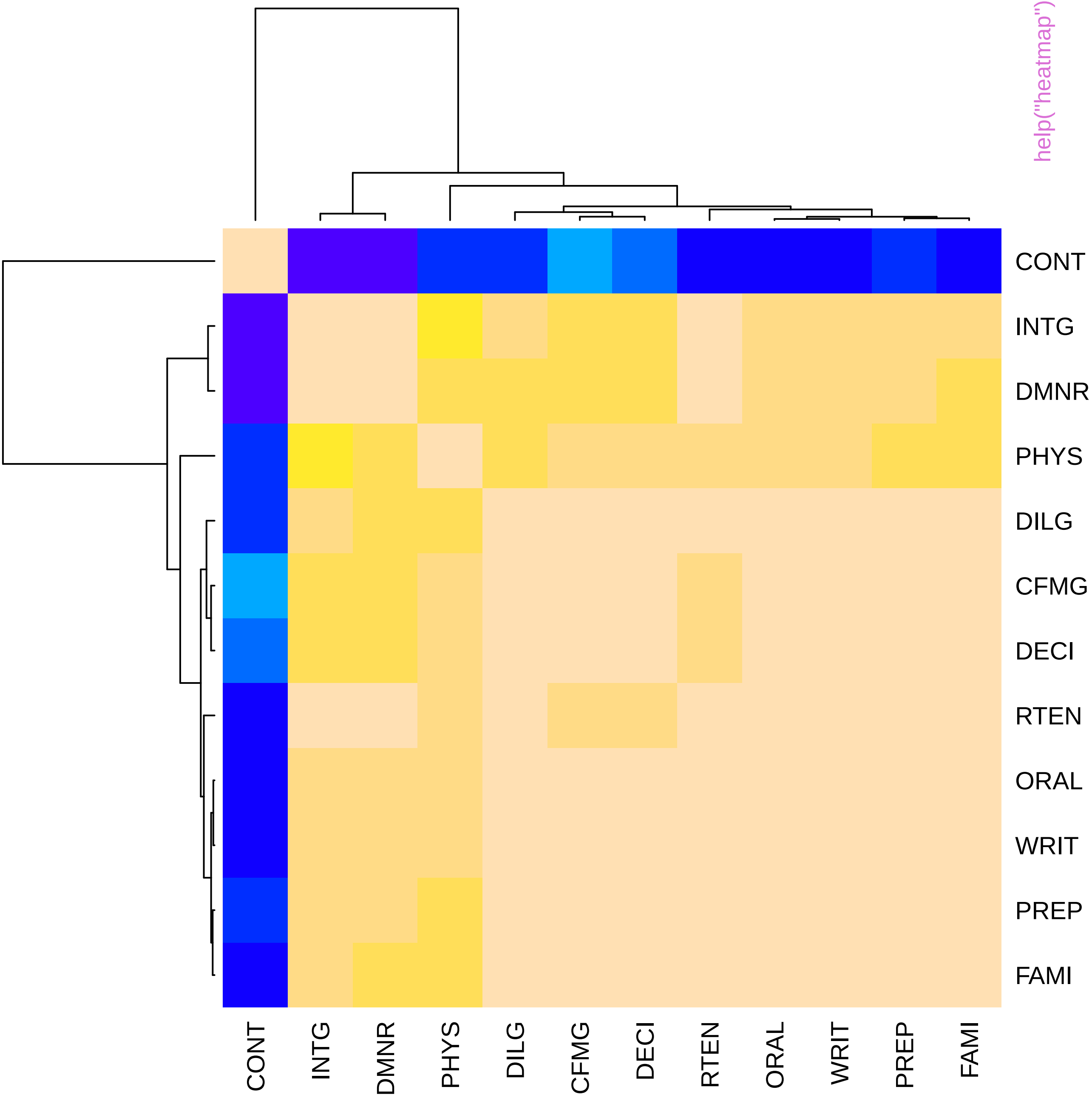

help("heatmap")
critical
advance
privileges
rating
complaints
learning
raises
critical
advance
privileges
rating
complaints
learning
raises

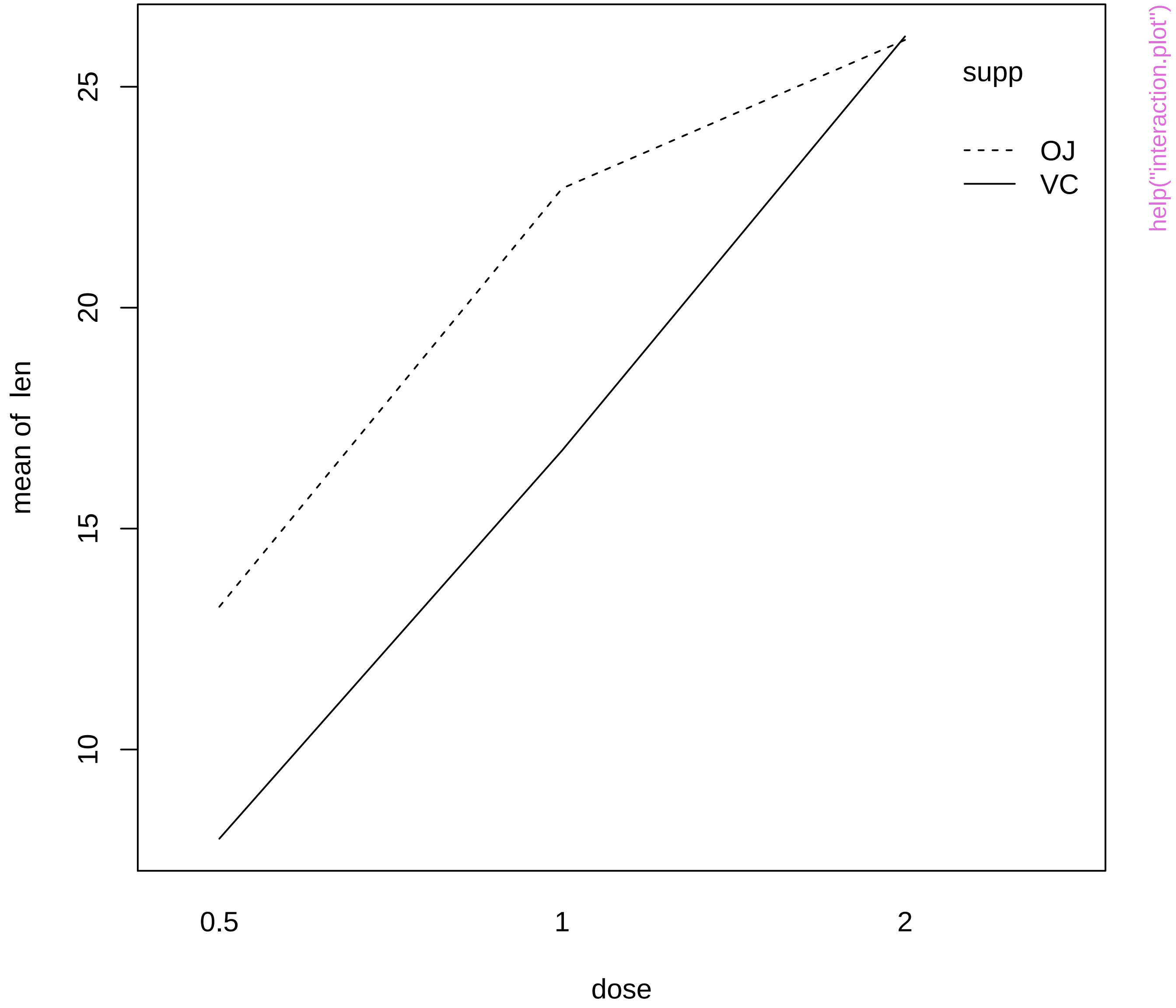

help("heatmap")
privileges
rating
complaints
learning
raises
critical
advance
privileges
rating
complaints
learning
raises
critical
advance

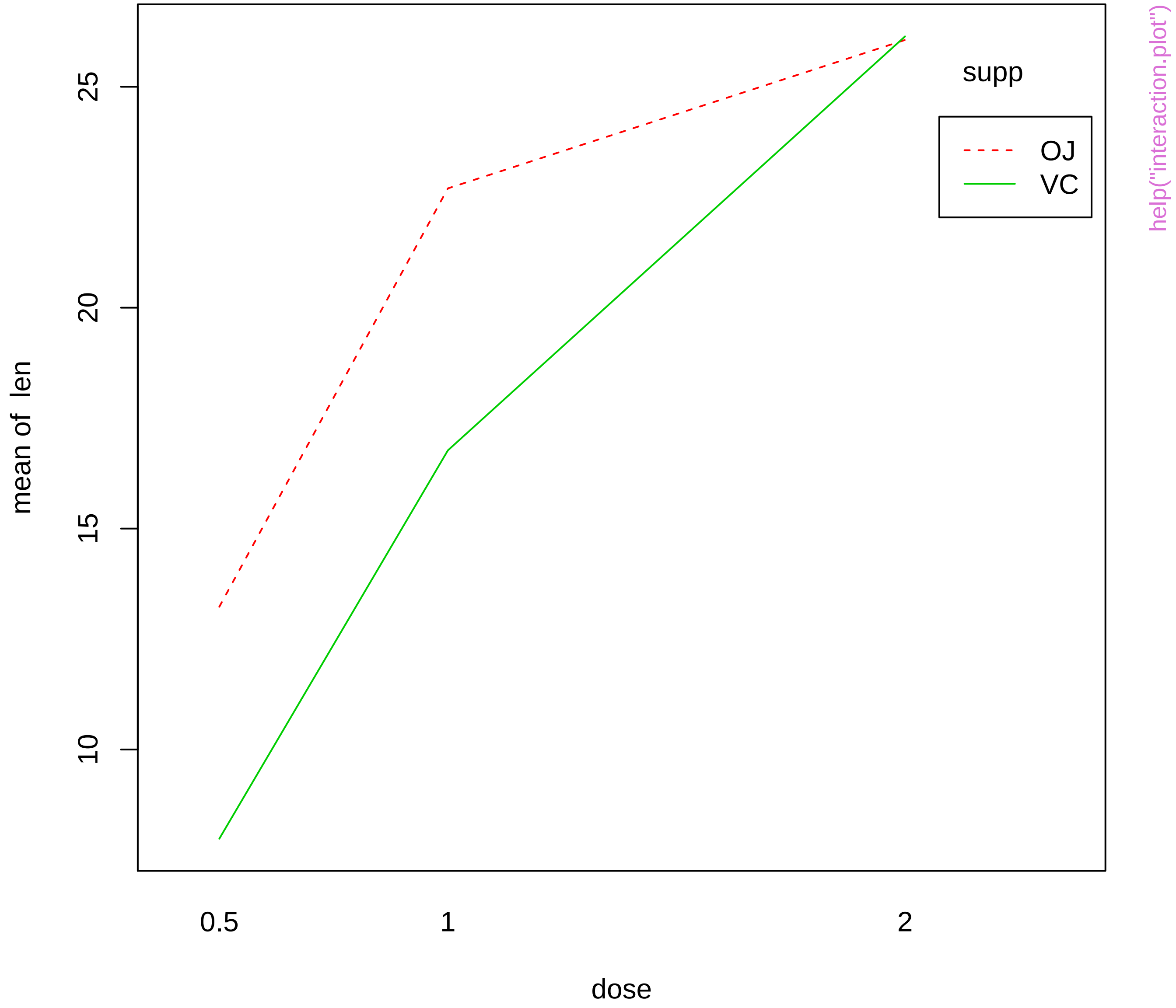


help("heatmap")
privileges
rating
complaints
learning
raises
critical
advance
privileges
rating
complaints
learning
raises
critical
advance

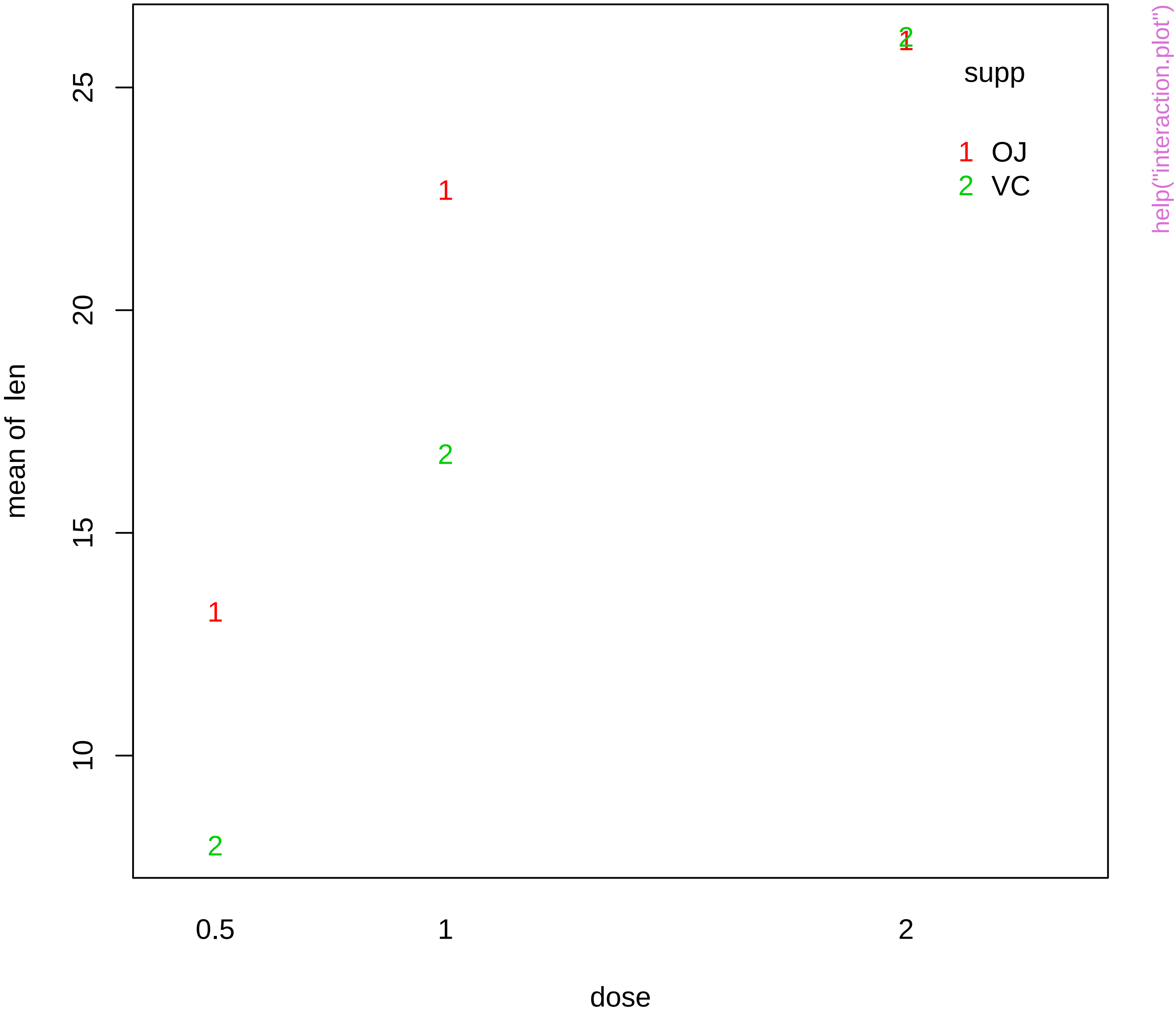

help("heatmap")
critical
advance
privileges
rating
complaints
learning
raises
critical
advance
privileges
rating
complaints
learning
raises

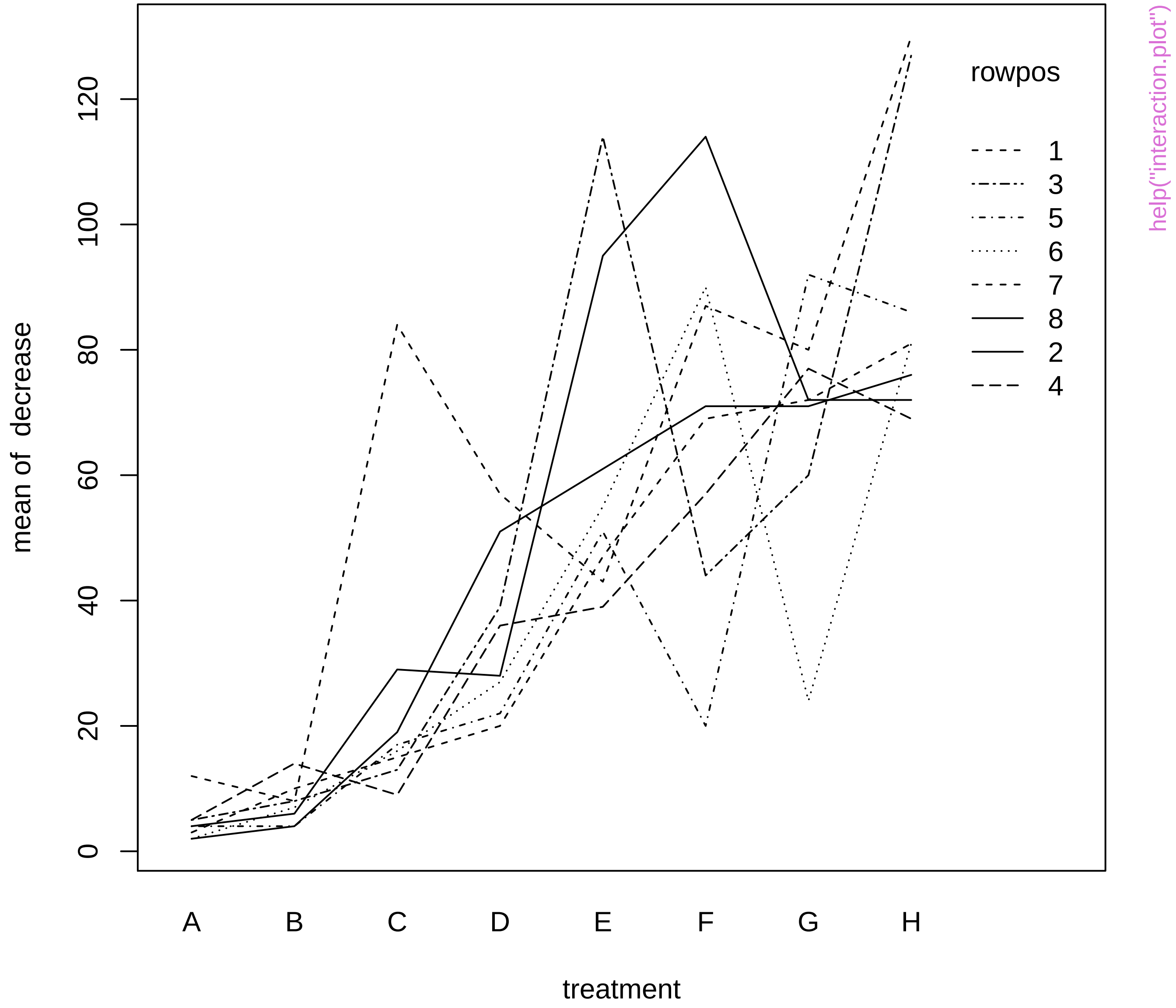

help("heatmap")
CONT
INTG
DMNR
PHYS
DILG
CFMG
DECI
RTEN
ORAL
WRIT
PREP
FAMI
CONT
INTG
DMNR
PHYS
DILG
CFMG
DECI
RTEN
ORAL
WRIT
PREP
FAMI


supp
OJ
VC
mean of len
25
20
15
10
0.5
1
2
dose
help("interaction.plot")

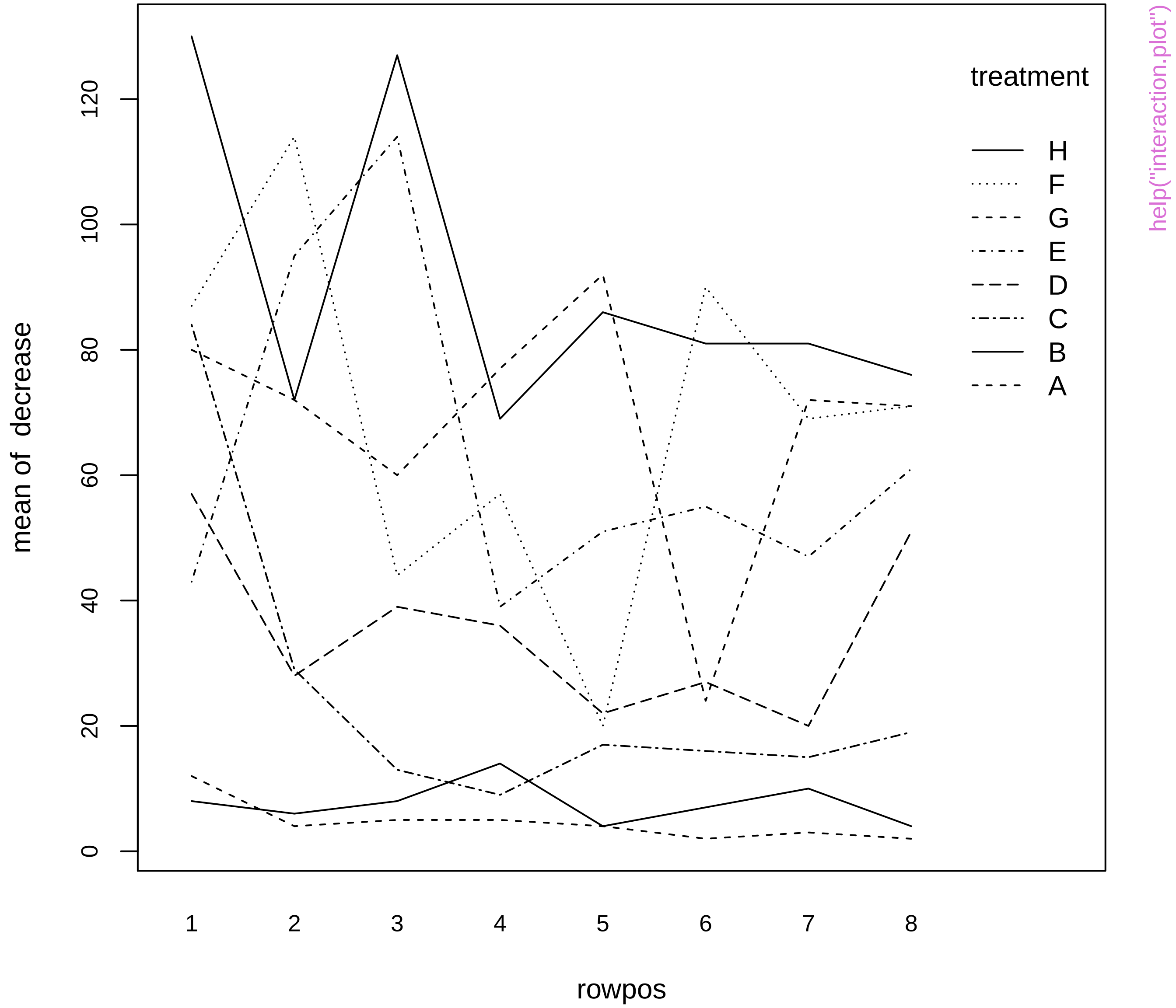


mean of len
25
20
15
10
0.5
1
2
dose
supp
OJ
VC
help("interaction.plot")

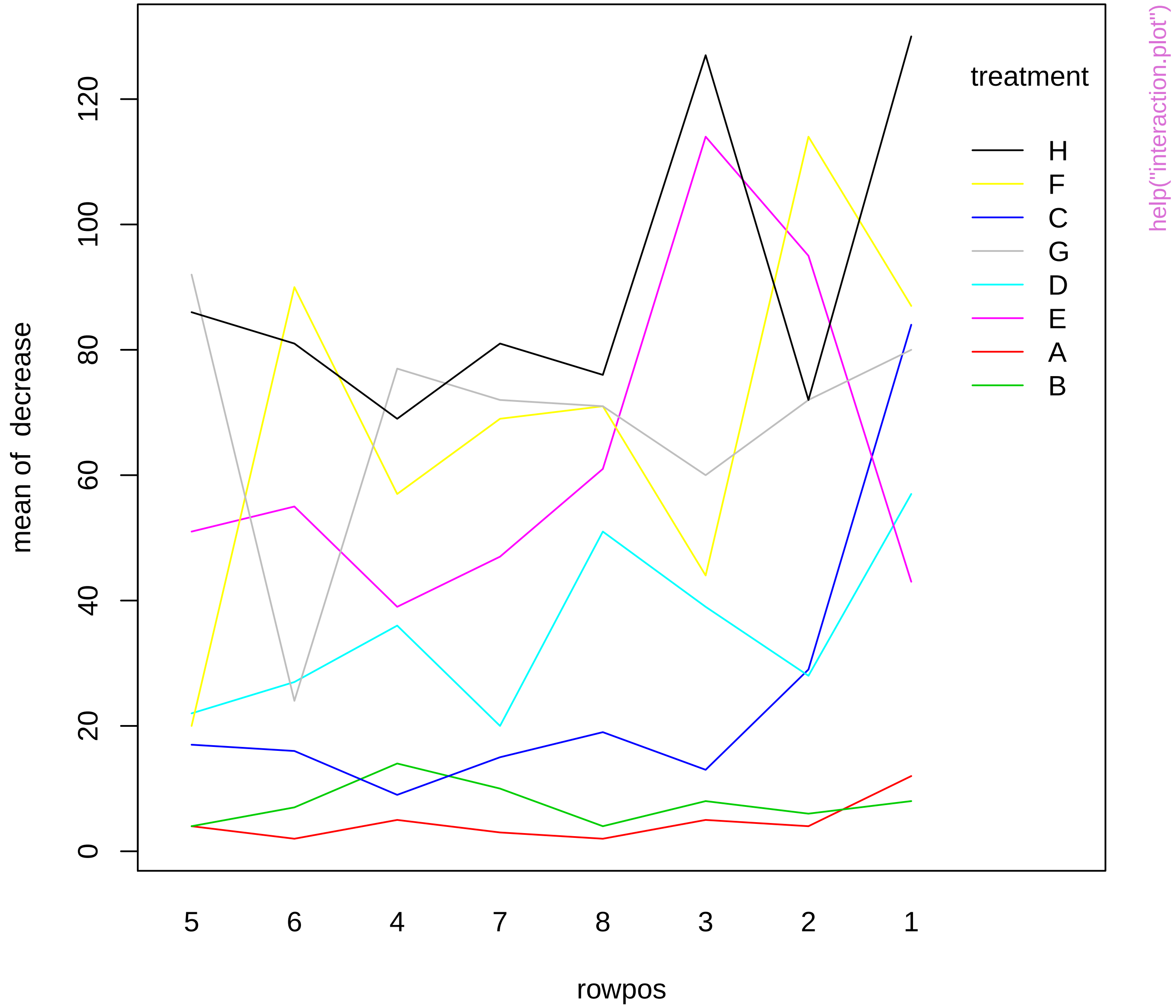

mean of len
dose
25
20
15
10
0.5
1
2
supp
1 OJ
2 VC
help("interaction.plot")

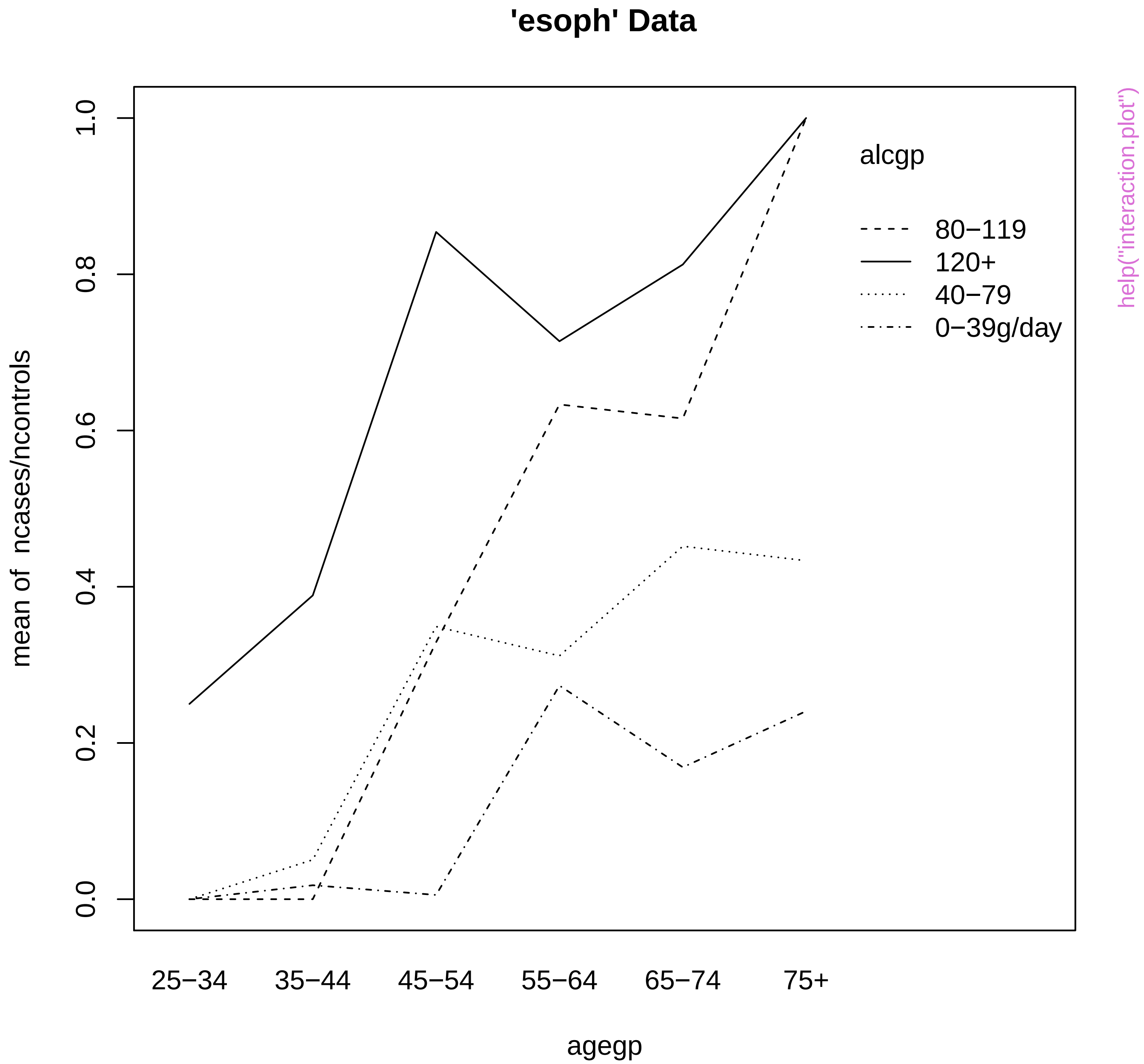


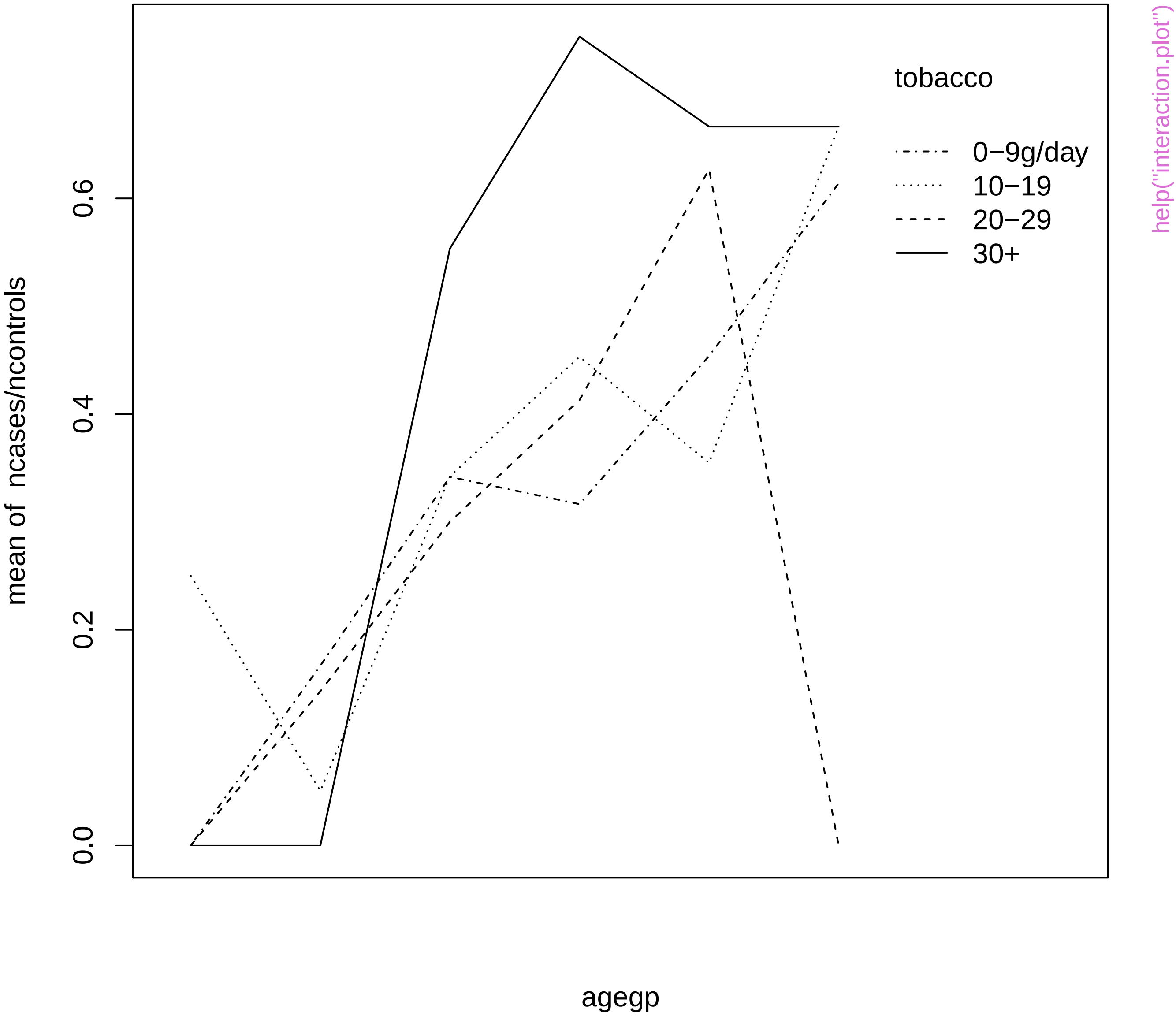
rowpos
1
3
5
6
7
8
2
4
0
20
40
60
80
100
120
mean of decrease
A
B
C
D
E
F
G
H
treatment
help("interaction.plot")

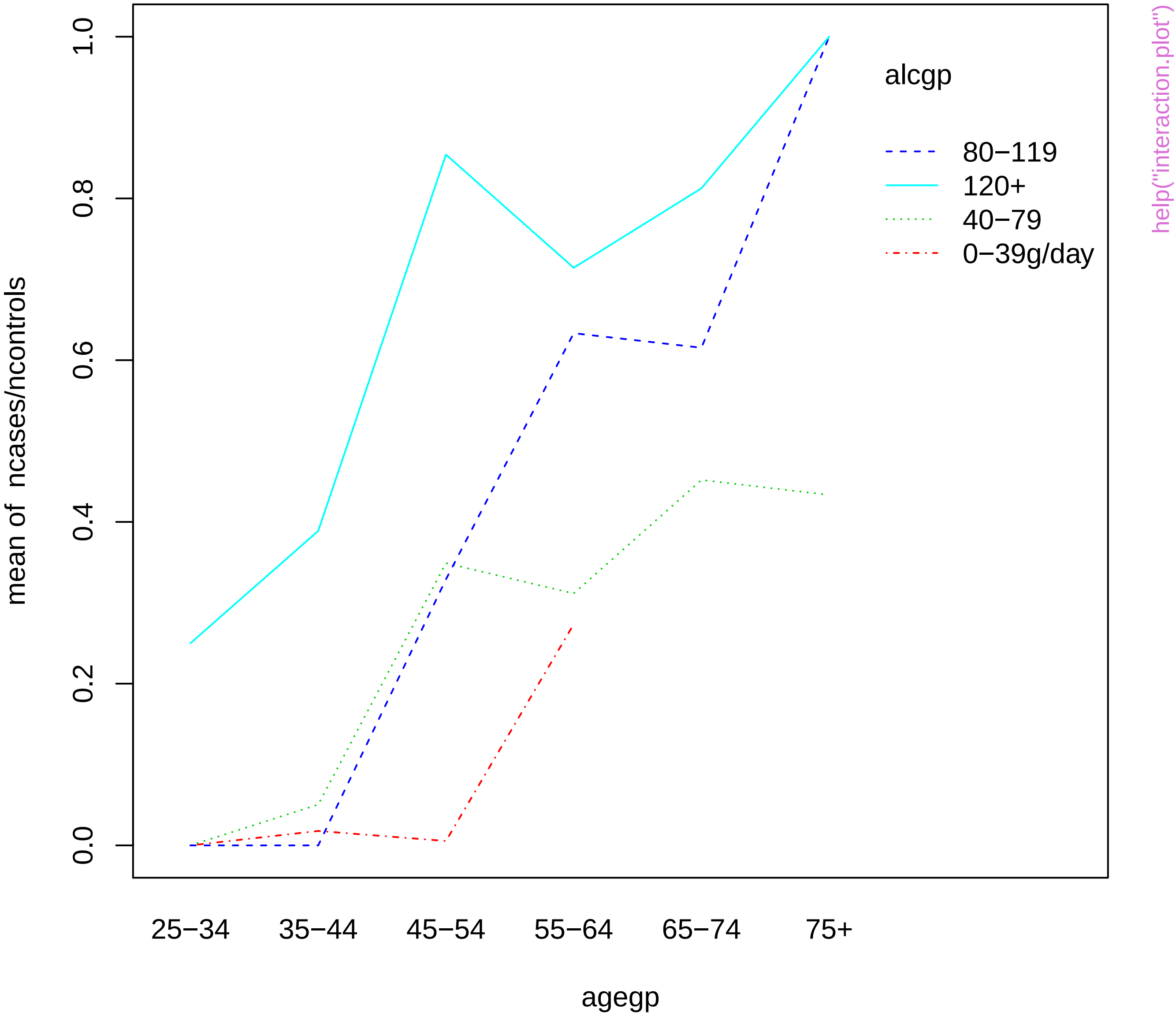


treatment
H
F
G
E
D
C
B
A
mean of decrease
0
20
40
60
80
100
120
1
2
3
4
5
6
7
8
rowpos
help("interaction.plot")

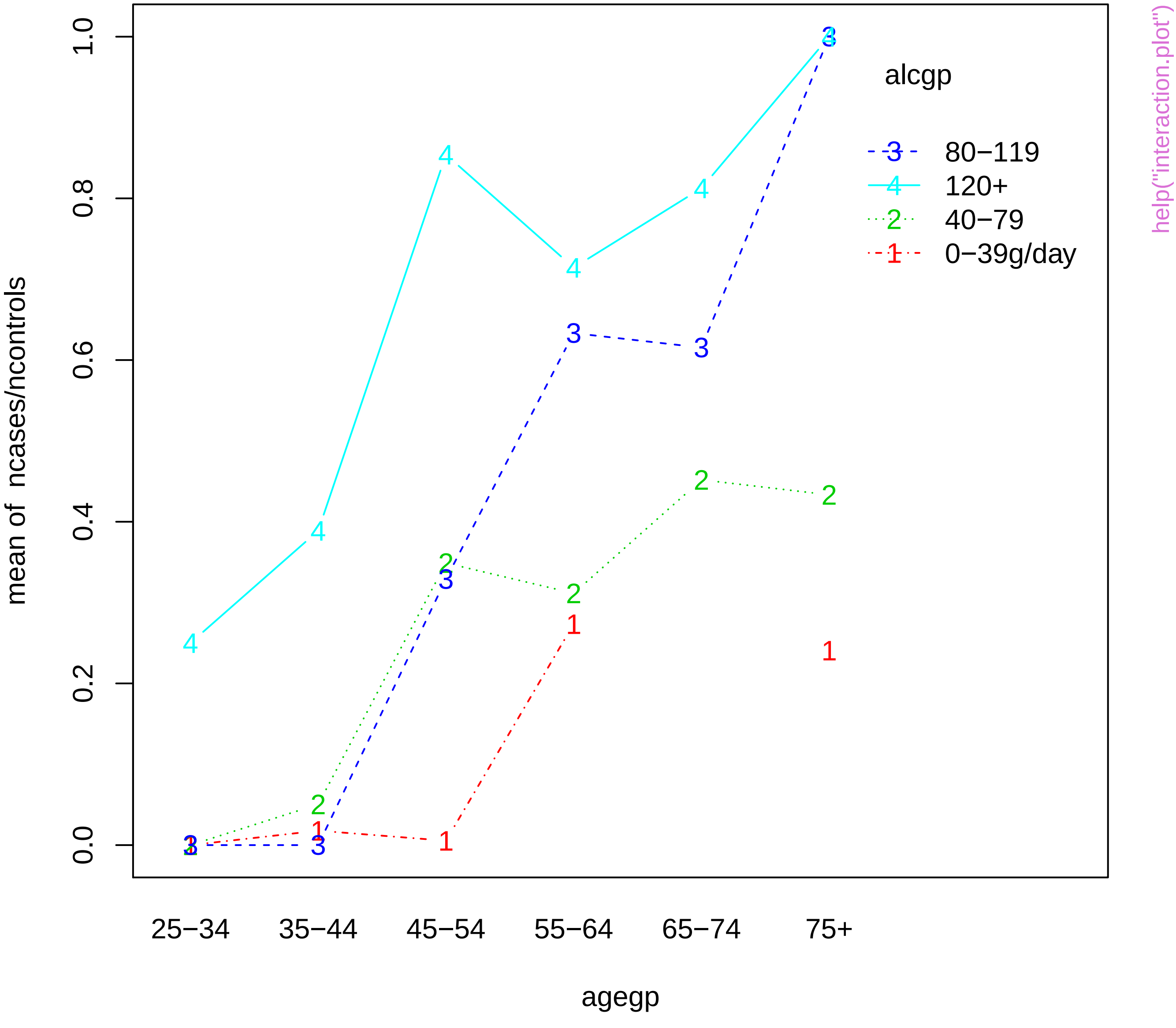

treatment
H
F
C
G
D
E
A
B
mean of decrease
rowpos
0
20
40
60
80
100
120
5
6
4
7
8
3
2
1
help("interaction.plot")


'esoph' Data
mean of ncases/ncontrols
0.0
0.2
0.4
0.6
0.8
1.0
25−34
35−44
45−54
55−64
65−74
75+
agegp
alcgp
80−119
120+
40−79
0−39g/day
help("interaction.plot")

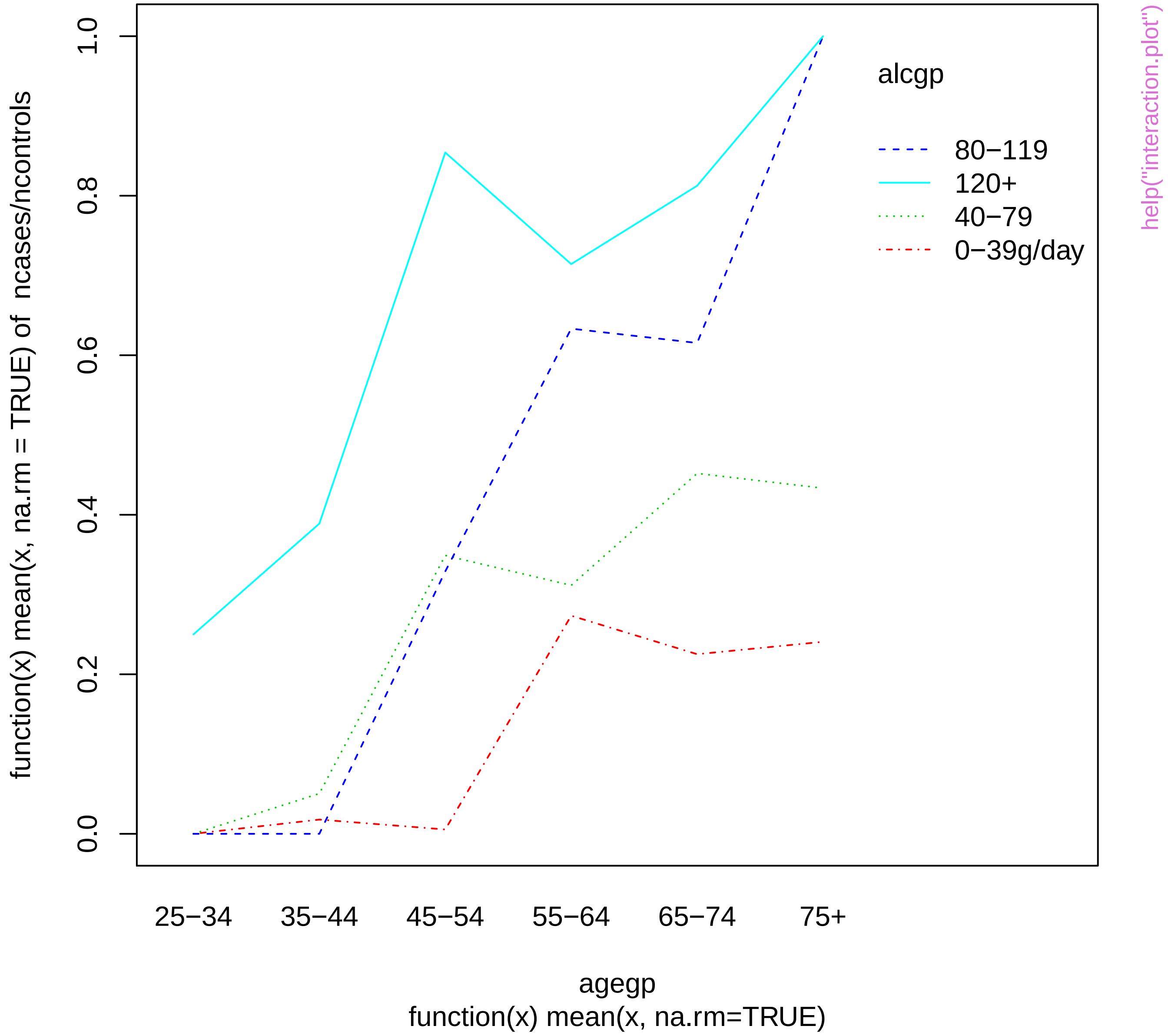

tobacco
0−9g/day
10−19
20−29
30+
0.0
0.2
0.4
0.6
mean of ncases/ncontrols
agegp
help("interaction.plot")



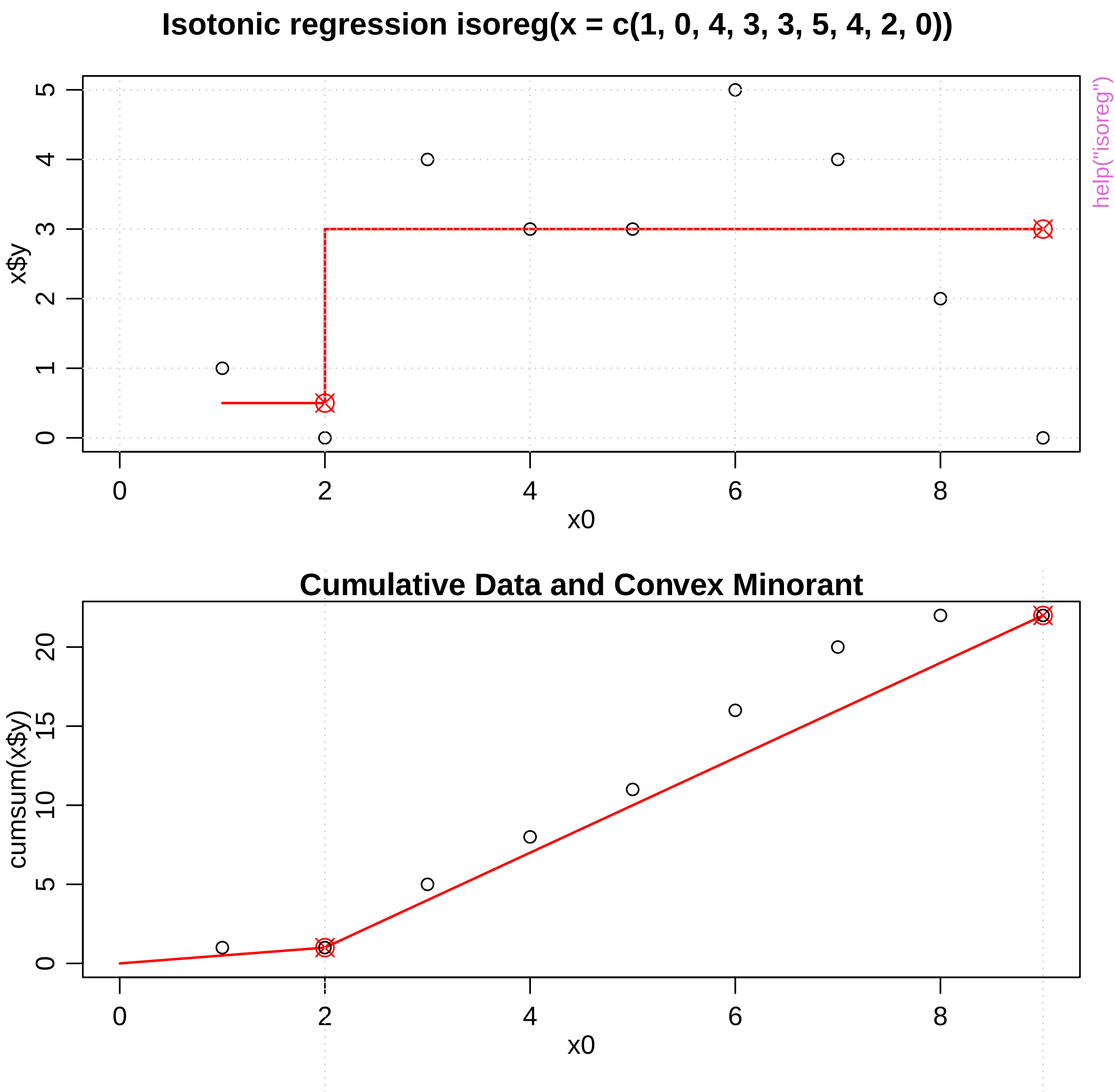
mean of ncases/ncontrols
0.0
0.2
0.4
0.6
0.8
1.0
alcgp
80−119
120+
40−79
0−39g/day
25−34
35−44
45−54
55−64
65−74
75+
agegp
help("interaction.plot")

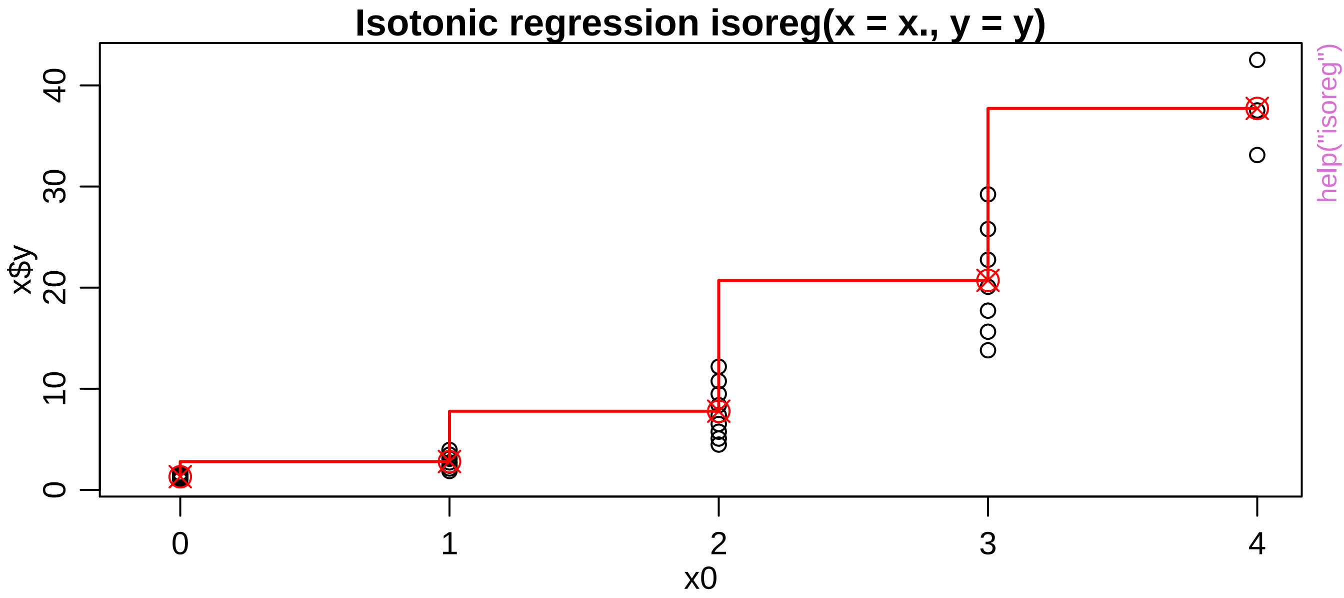


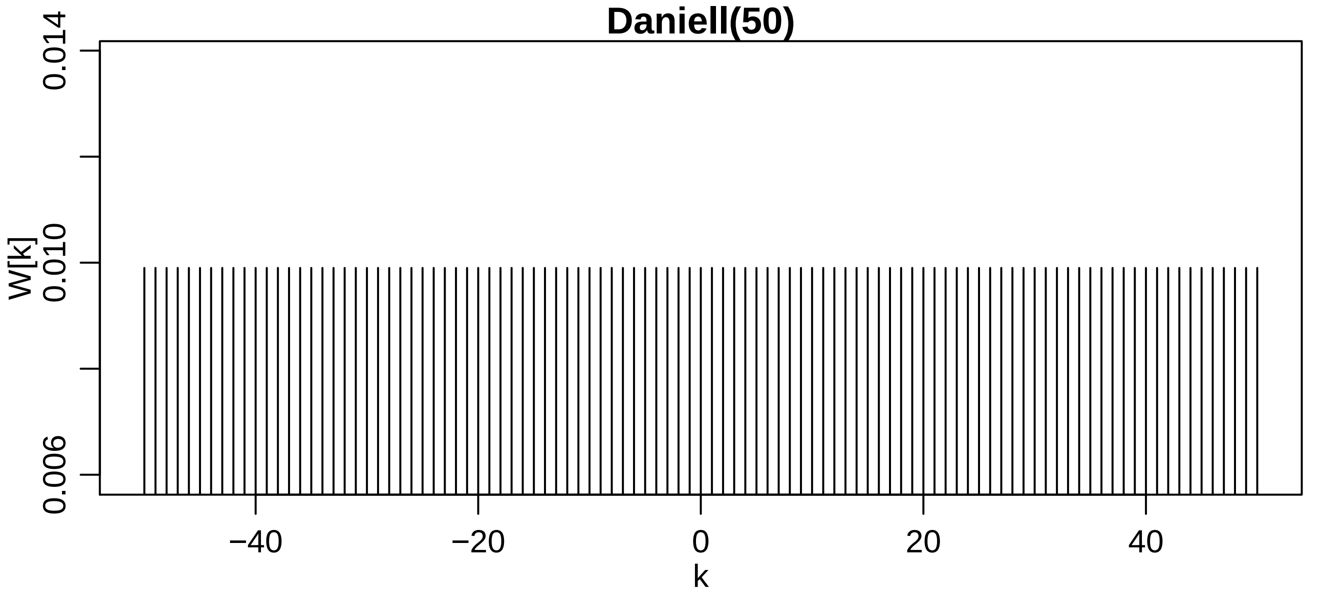
help("interaction.plot")
alcgp
80−119
120+
40−79
0−39g/day
mean of ncases/ncontrols
0.0
0.2
0.4
0.6
0.8
1.0
25−34
35−44
45−54
55−64
65−74
75+
agegp

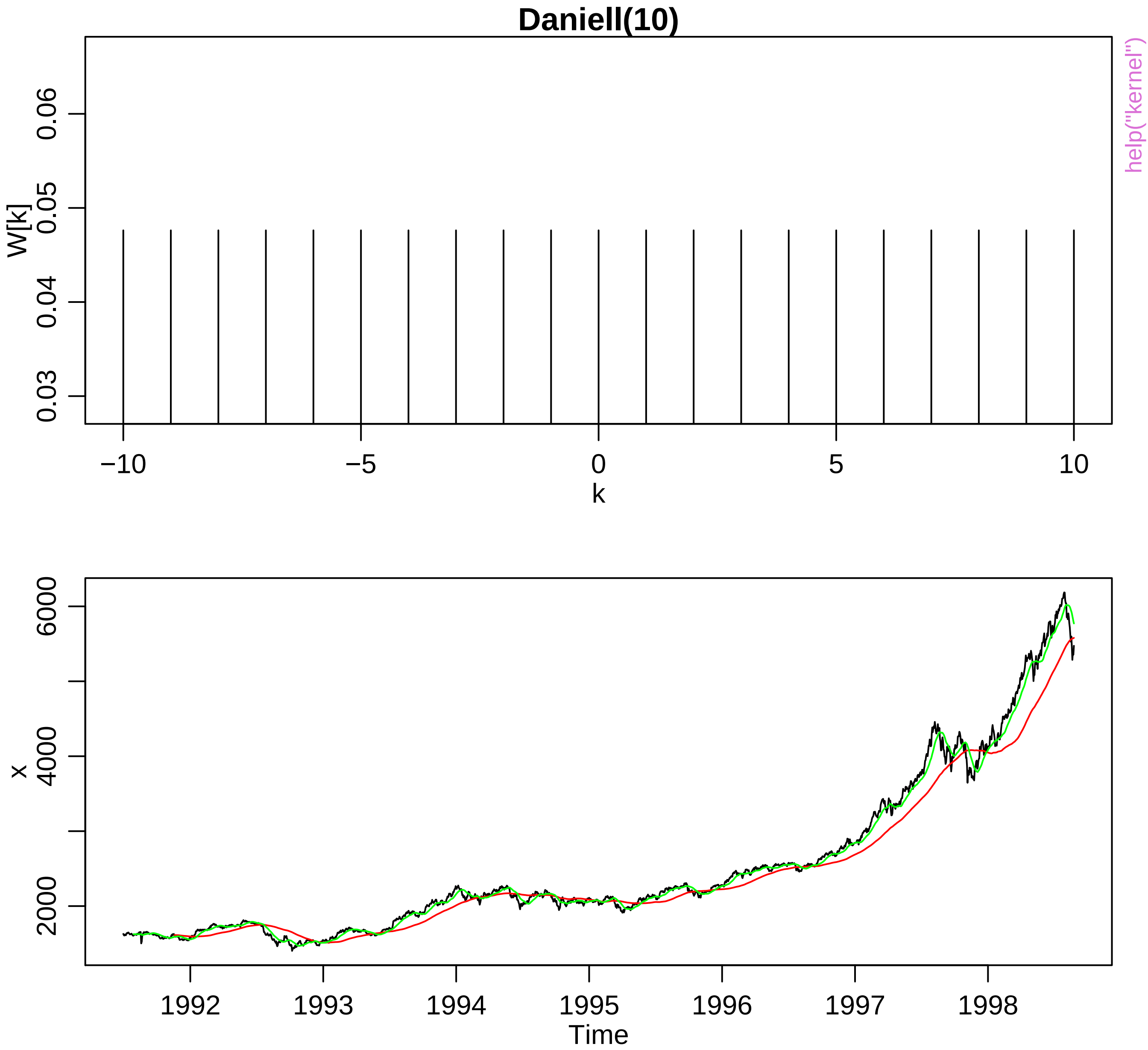


function(x) mean(x, na.rm = TRUE) of ncases/ncontrols
0.0
0.2
0.4
0.6
0.8
1.0
alcgp
80−119
120+
40−79
0−39g/day
25−34
35−44
45−54
55−64
65−74
75+
agegp
function(x) mean(x, na.rm=TRUE)
help("interaction.plot")

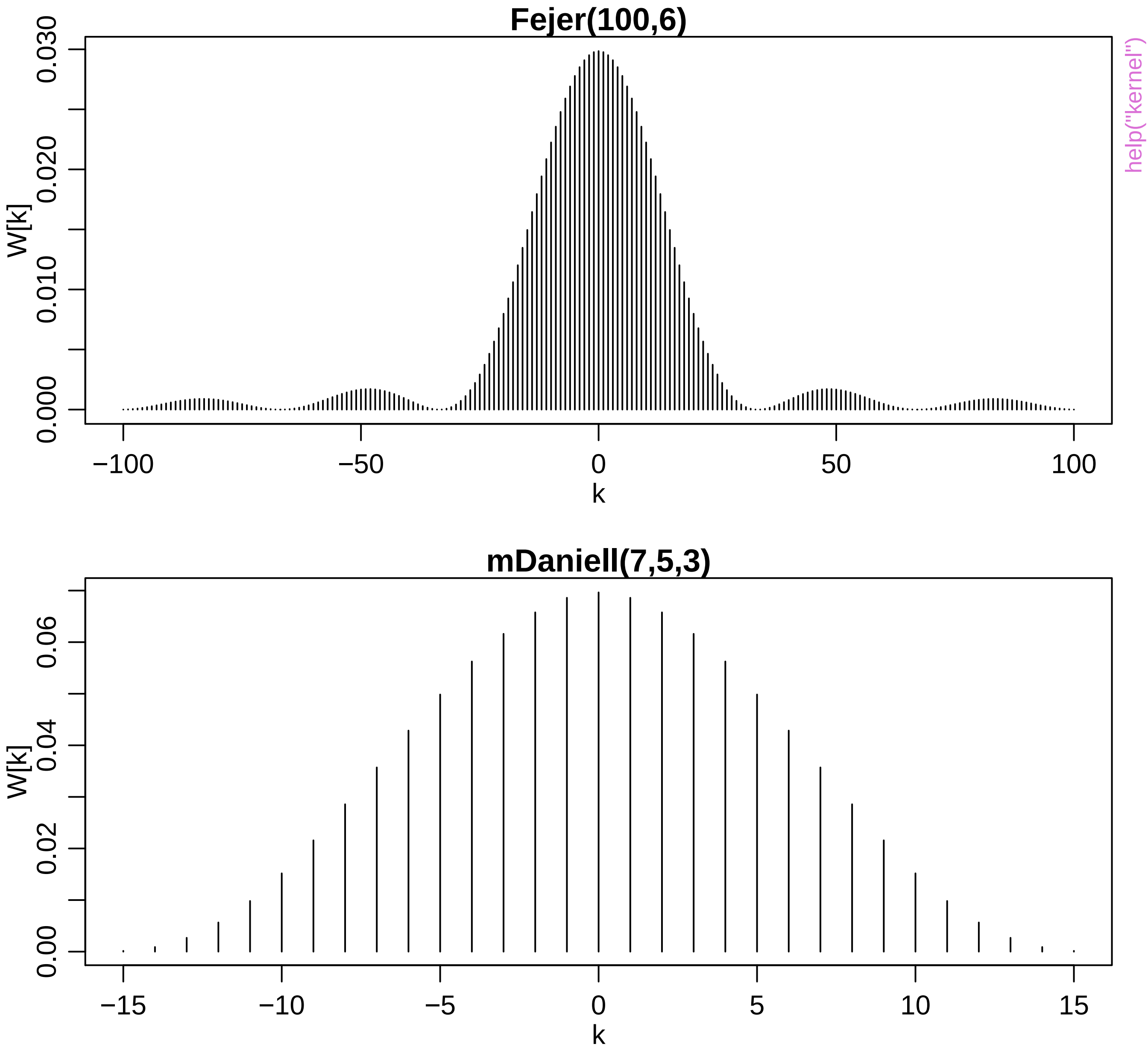

Isotonic regression isoreg(x = c(1, 0, 4, 3, 3, 5, 4, 2, 0))
x$y
x0
help("isoreg")
Cumulative Data and Convex Minorant
cumsum(x$y)
x0
0
1
2
3
4
5
0
2
4
6
8
0
5
10
15
20

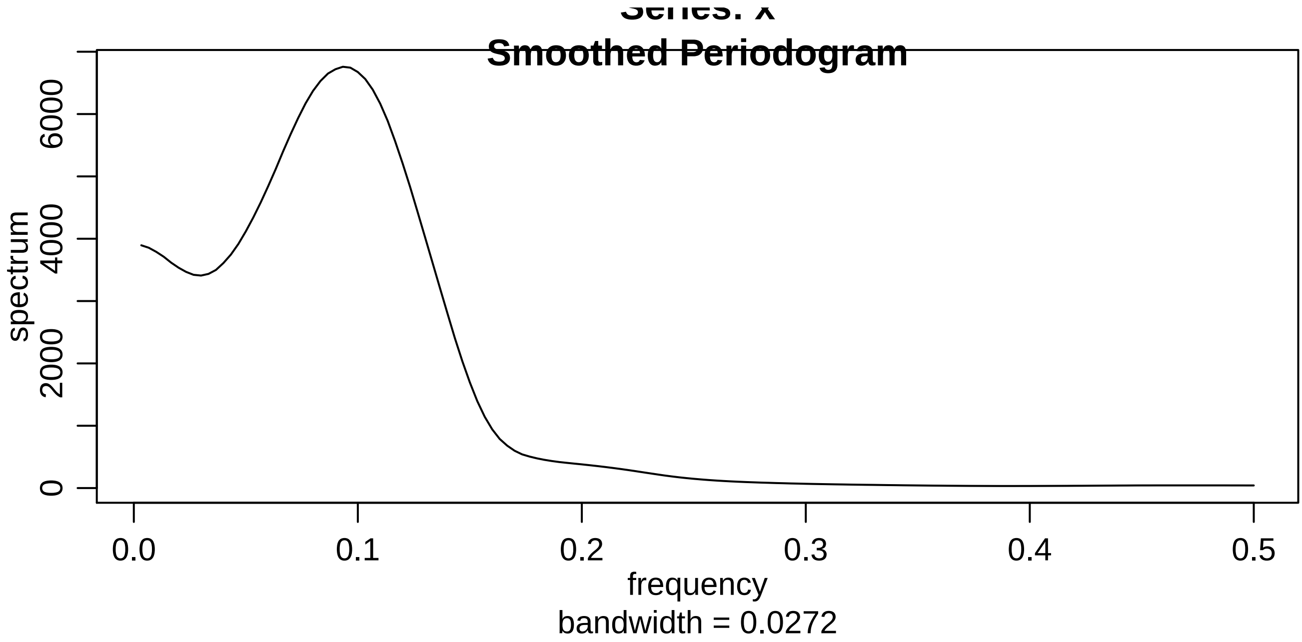

Isotonic regression isoreg(x = x., y = y)
help("isoreg")
x$y
x0
0
10
20
30
40
0
1
2
3
4


Daniell(50)
W[k]
k
0.006
0.010
0.014
−40
−20
0
20
40

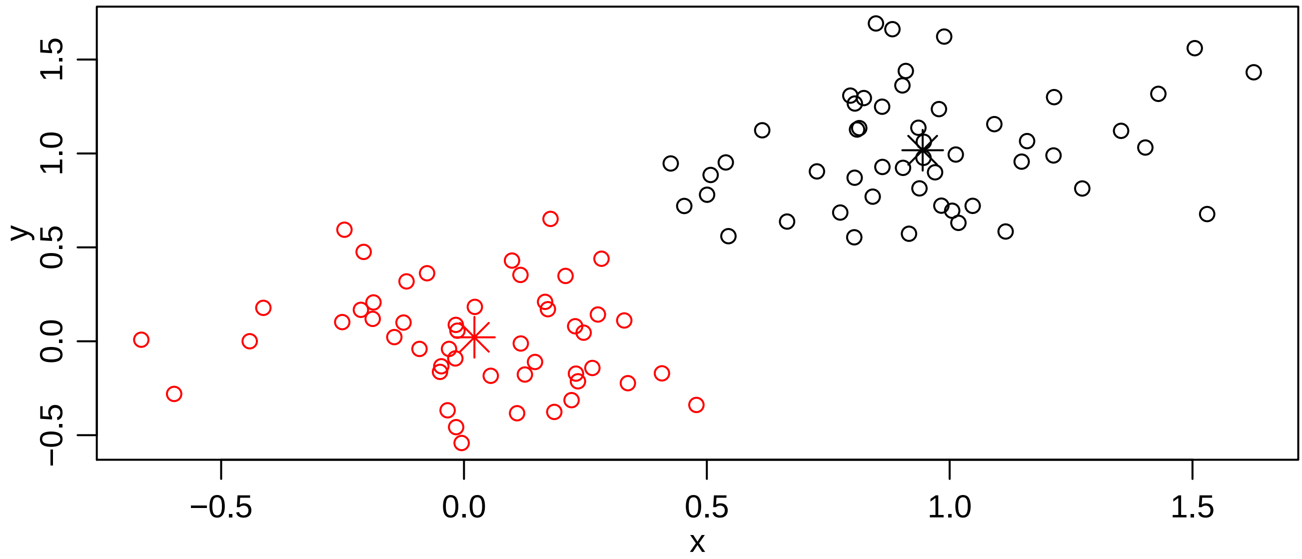


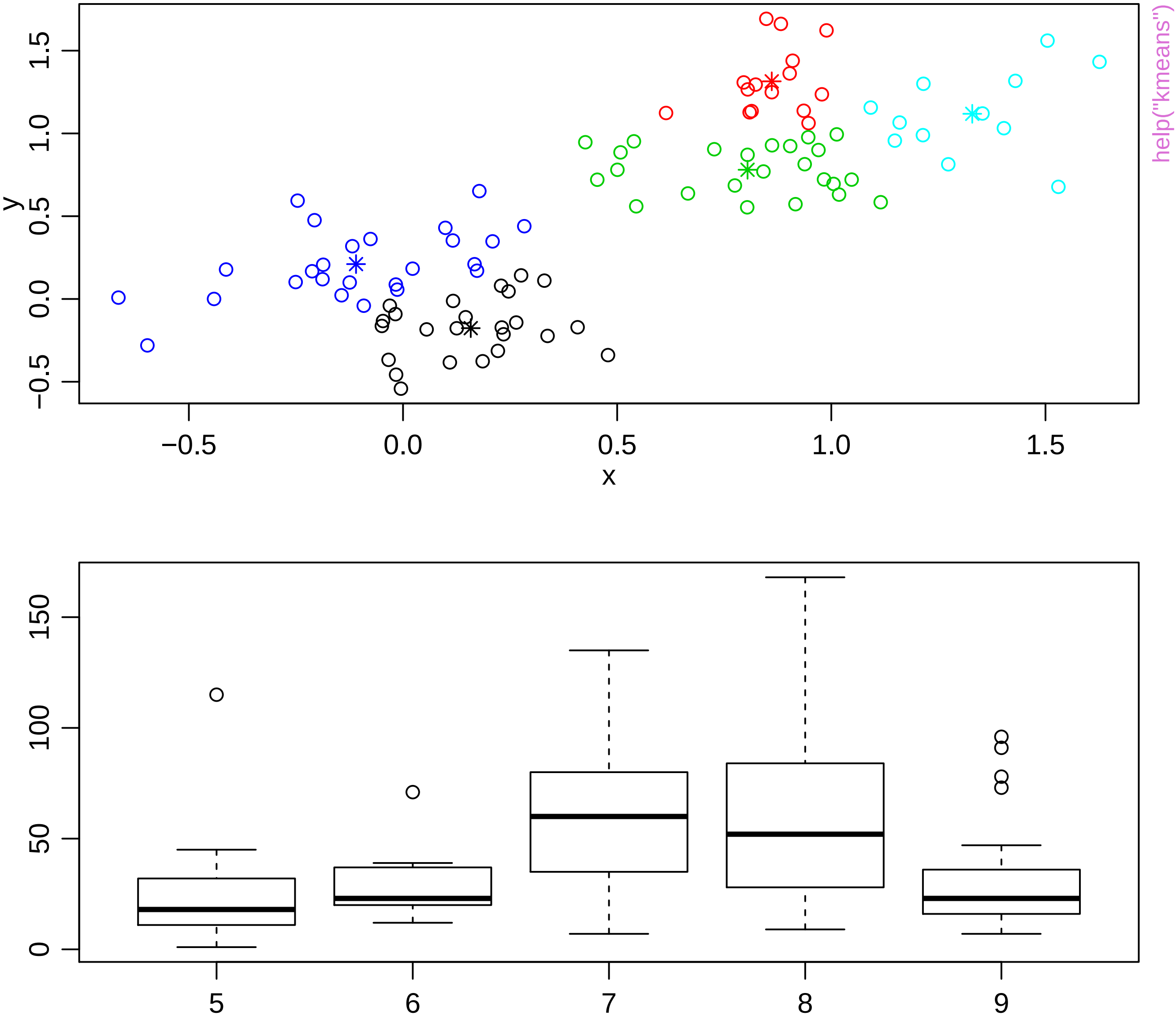
Daniell(10)
W[k]
0.03
0.04
0.05
0.06
−10
−5
0
5
10
k
help("kernel")
x
2000
4000
6000
1992
1993
1994
1995
1996
1997
1998
Time


Fejer(100,6)
W[k]
0.000
0.010
0.020
0.030
−100
−50
0
50
100
k
help("kernel")
mDaniell(7,5,3)
W[k]
0.00
0.02
0.04
0.06
−15
−10
−5
0
5
10
15
k

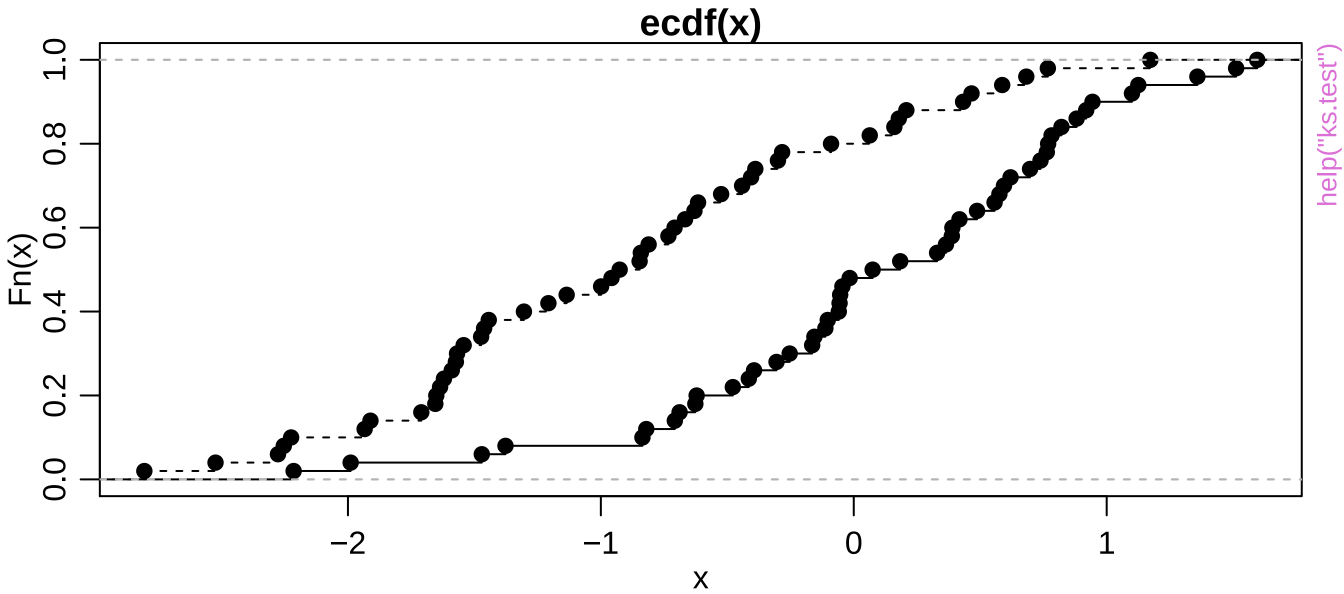

Series: x
Smoothed Periodogram
spectrum
0
2000
4000
6000
0.0
0.1
0.2
0.3
0.4
0.5
frequency
bandwidth = 0.0272

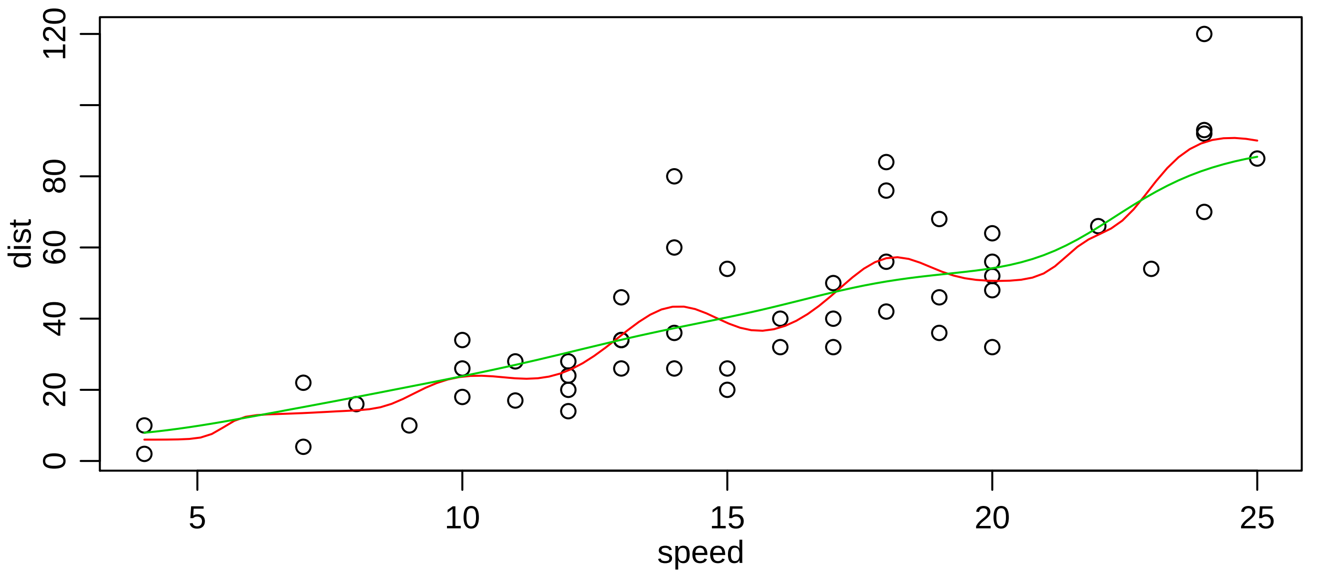
help("kernel")

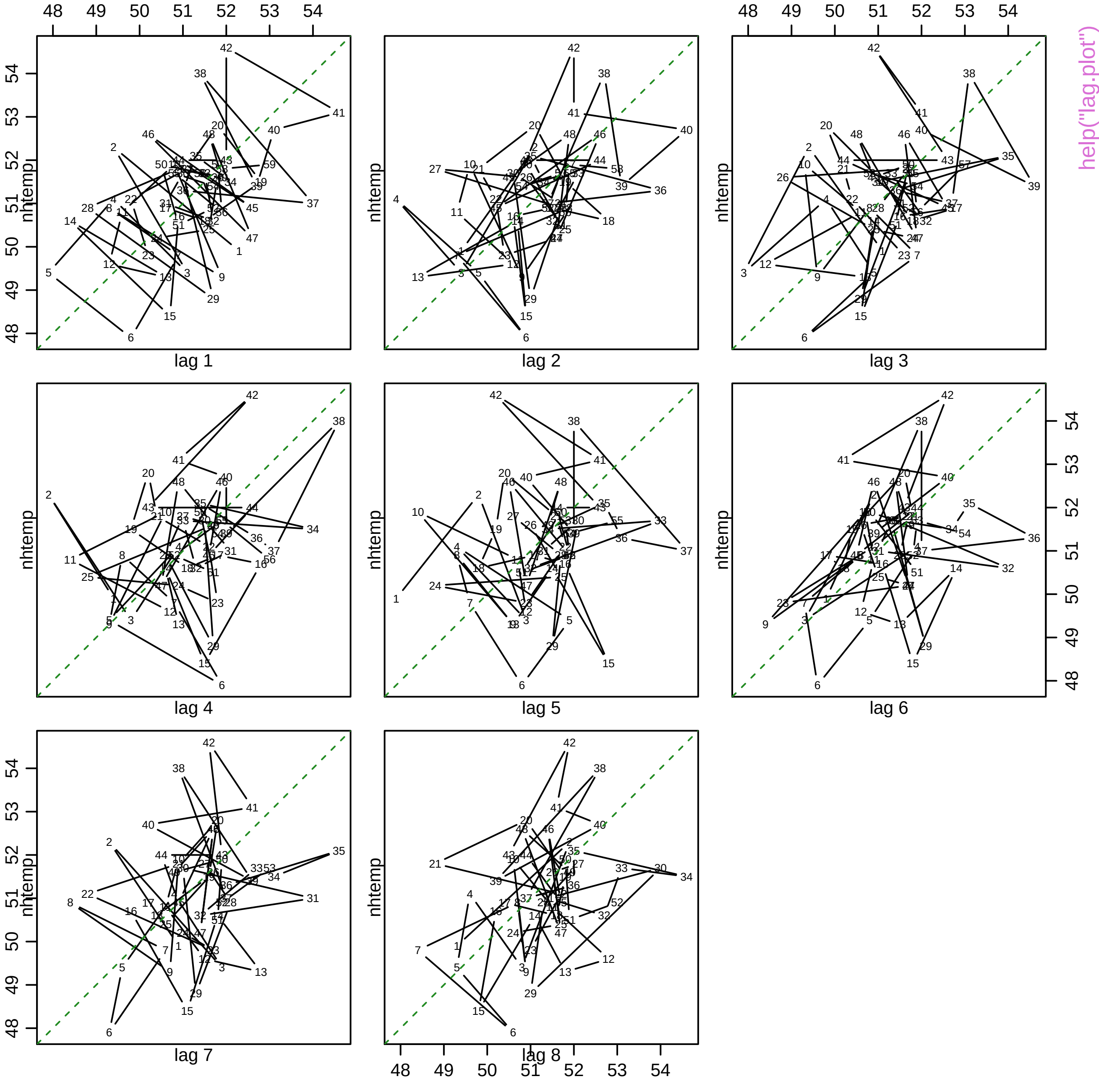

y
−0.5
0.0
0.5
1.0
1.5
−0.5
0.0
0.5
1.0
1.5
x

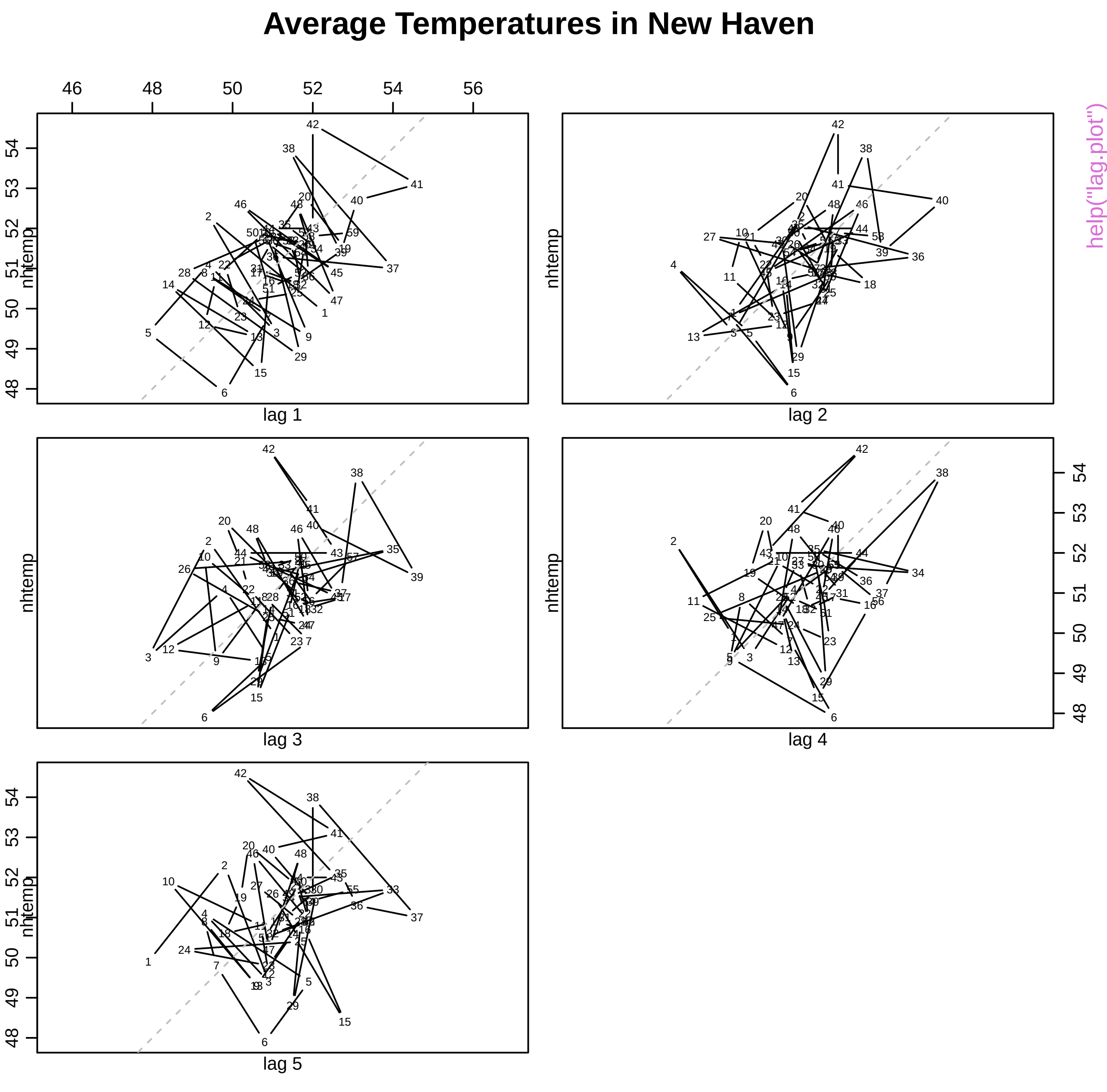


help("kmeans")
x
y
−0.5
0.0
0.5
1.0
1.5
150
100
50
0
5
6
7
8
9

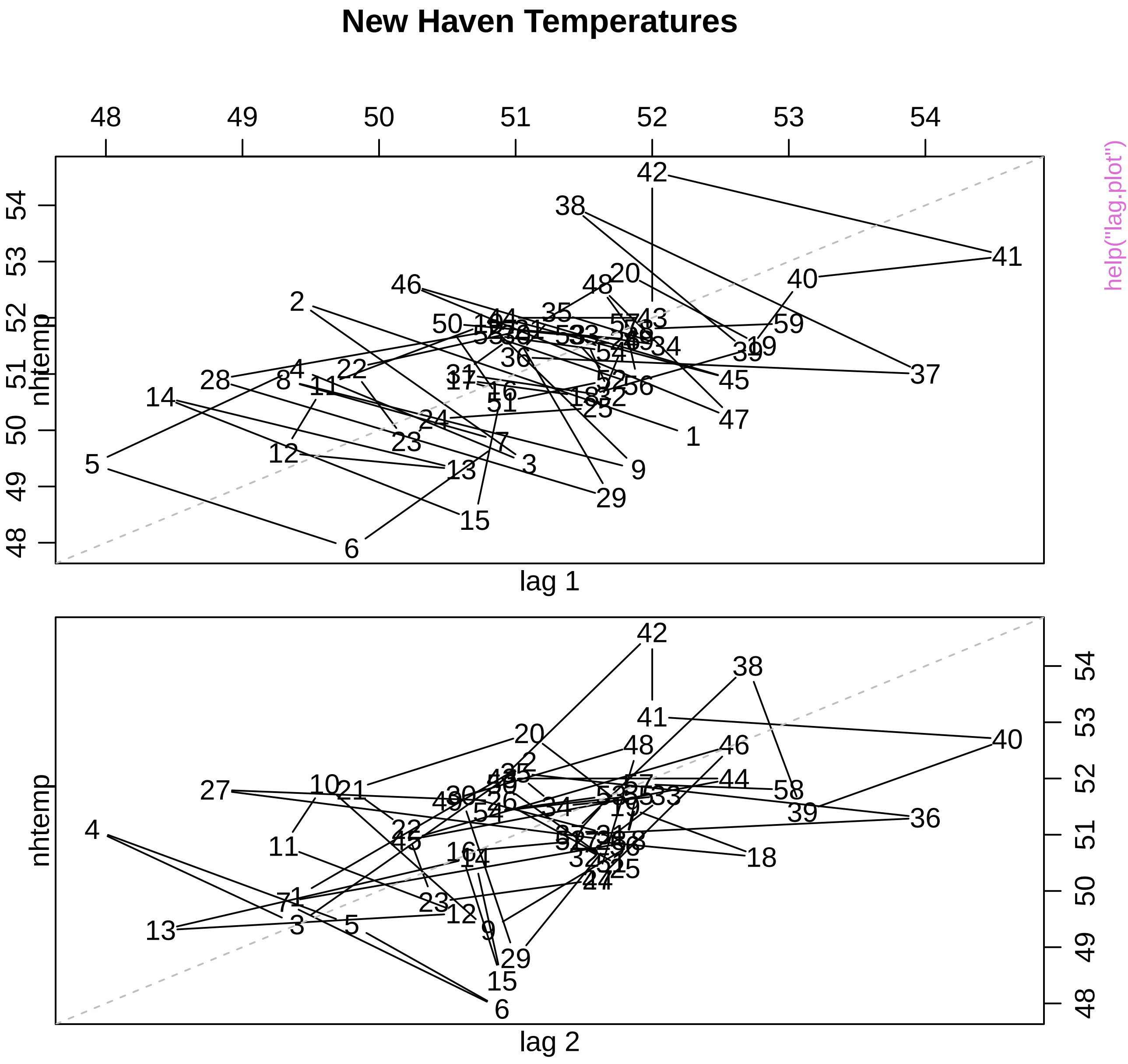

ecdf(x)
Fn(x)
x
help("ks.test")
0.0
0.2
0.4
0.6
0.8
1.0
−2
−1
0
1

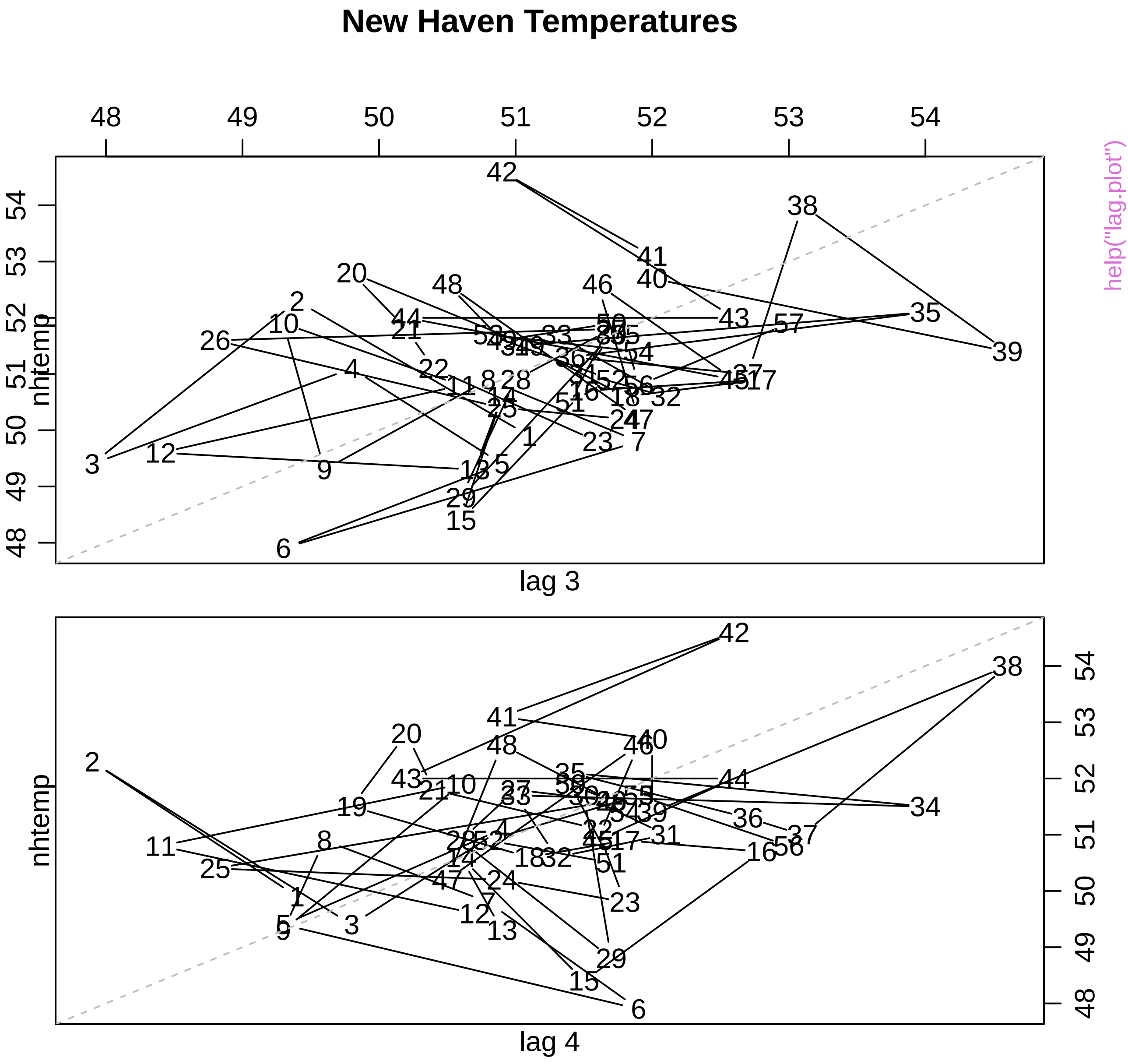

dist
speed
0
20
40
60
80
120
5
10
15
20
25


help("lag.plot")
nhtemp
lag 1
lag 2
lag 3
lag 4
lag 5
lag 6
lag 7
lag 8
48 49 50 51 52 53 54

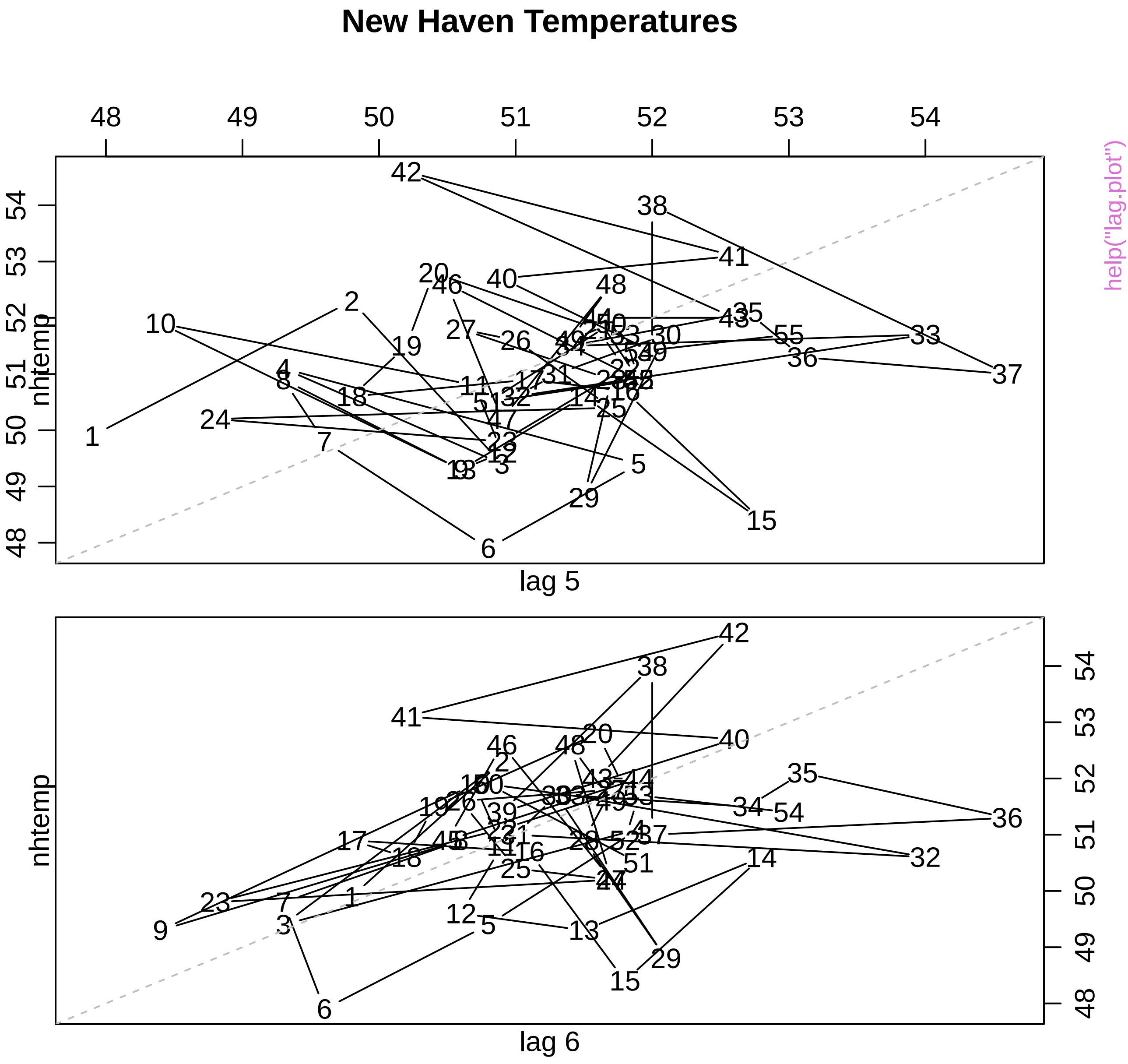


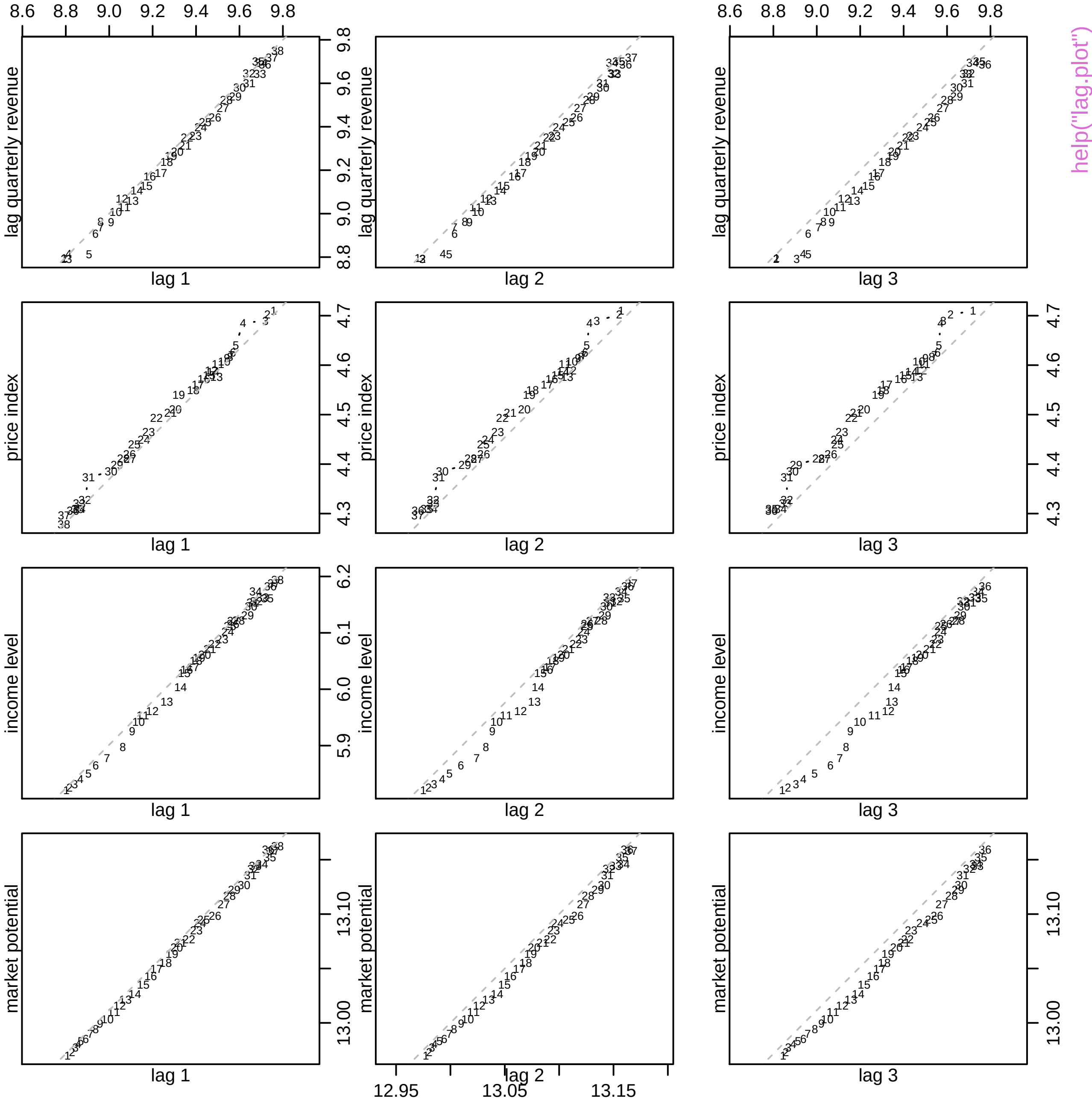
Average Temperatures in New Haven
nhtemp
lag 1
lag 2
lag 3
lag 4
lag 5
help("lag.plot")

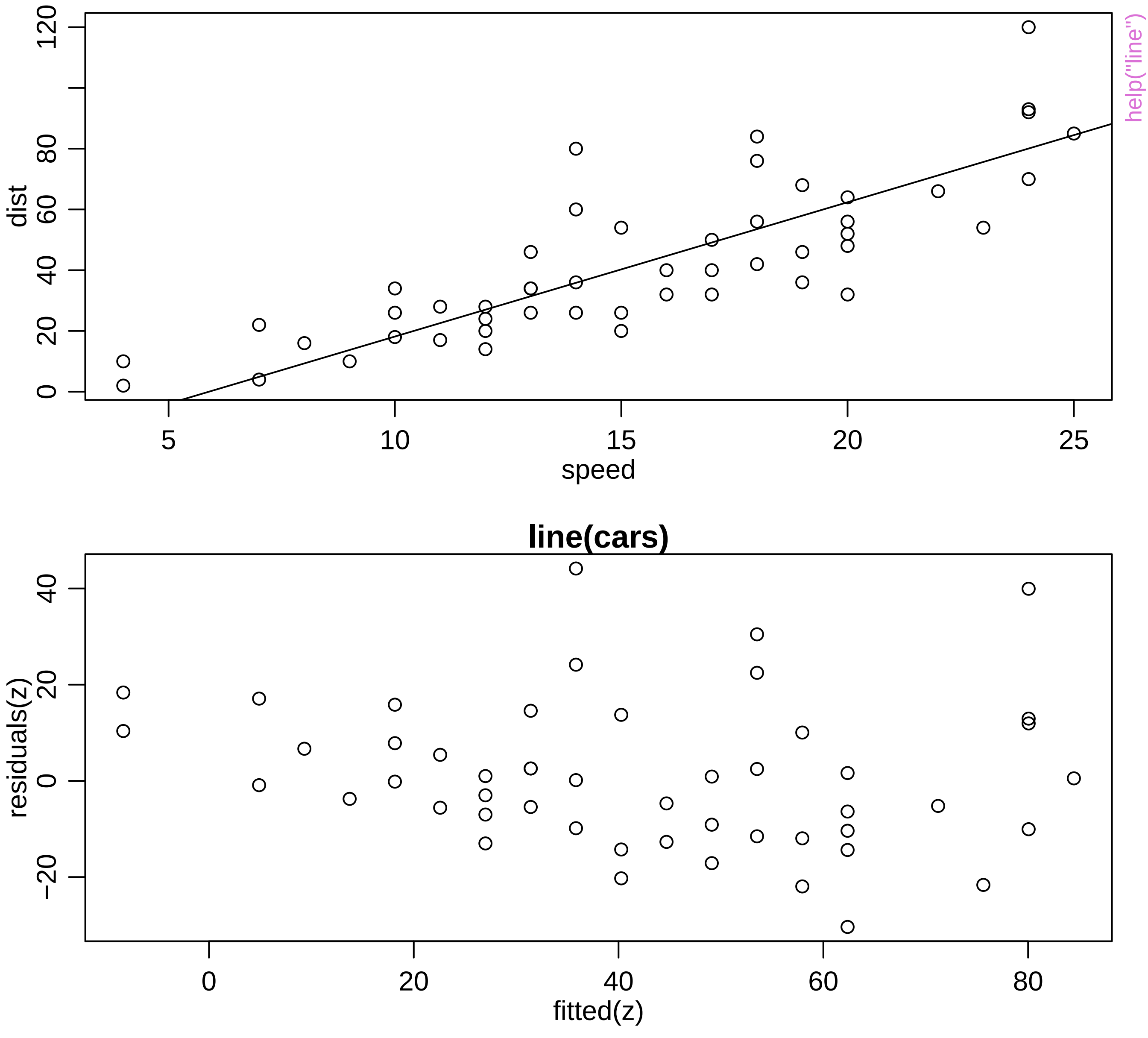

New Haven Temperatures
48
49
50
51
52
53
54
nhtemp
lag 1
lag 2
help("lag.plot")

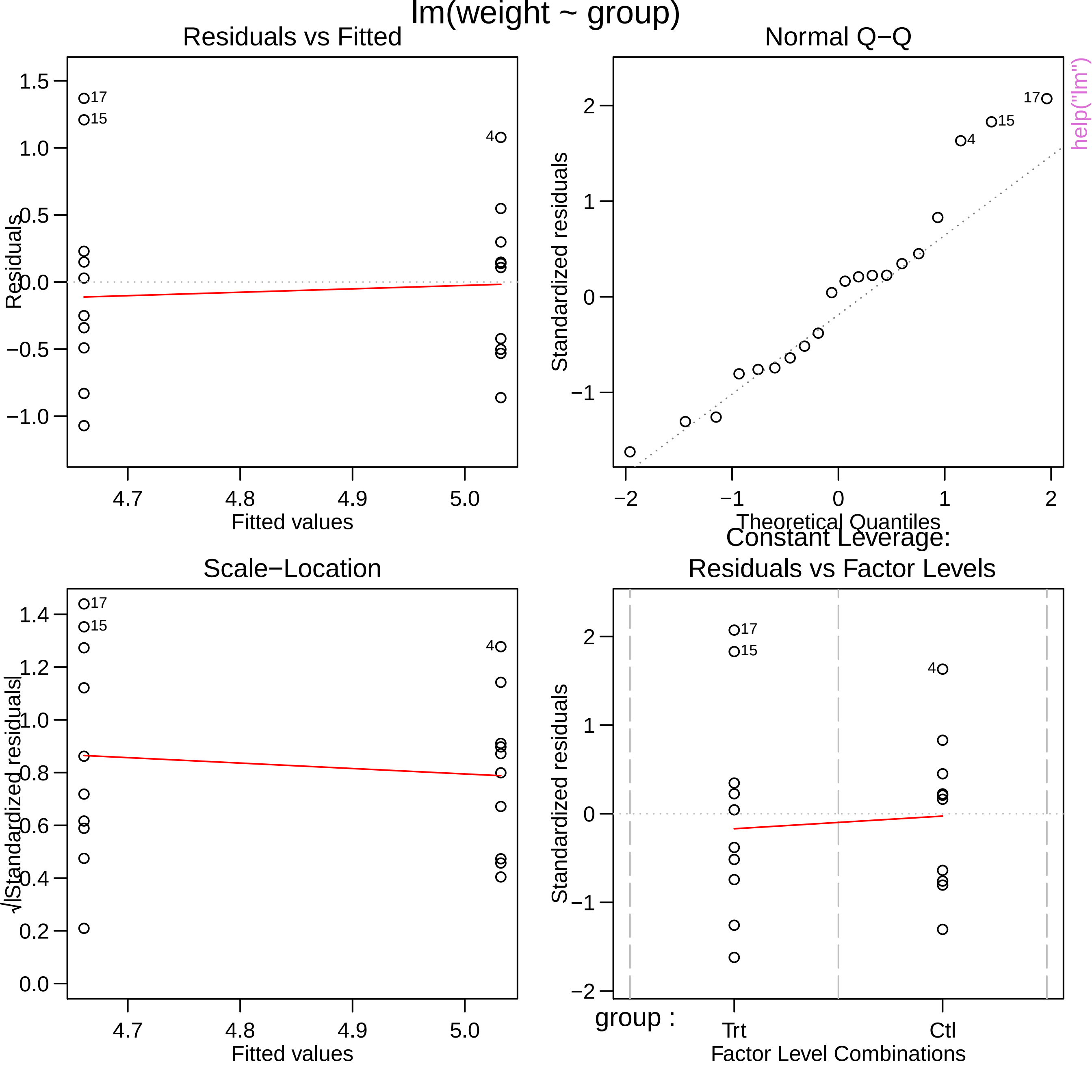


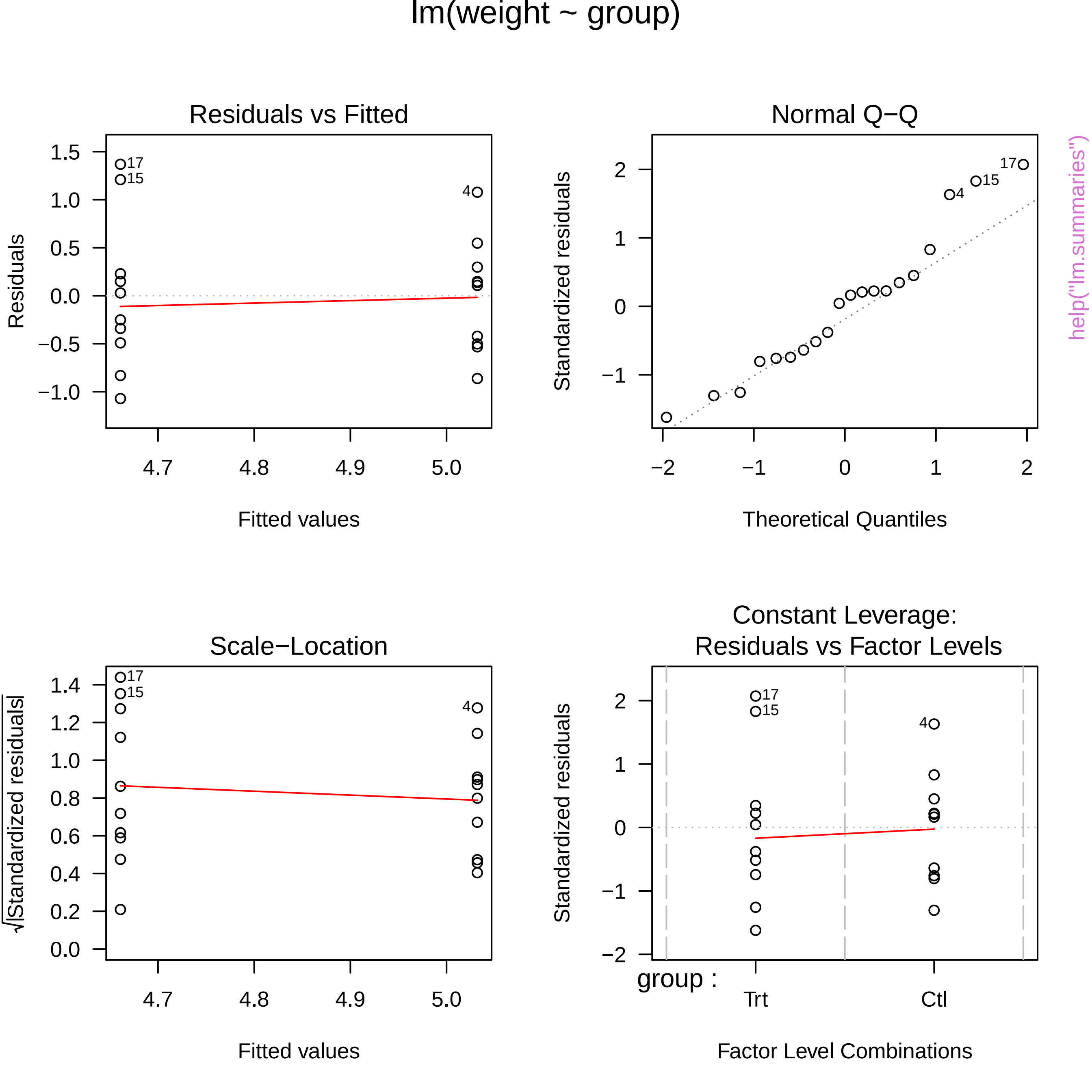
New Haven Temperatures
nhtemp
lag 3
lag 4
help("lag.plot")

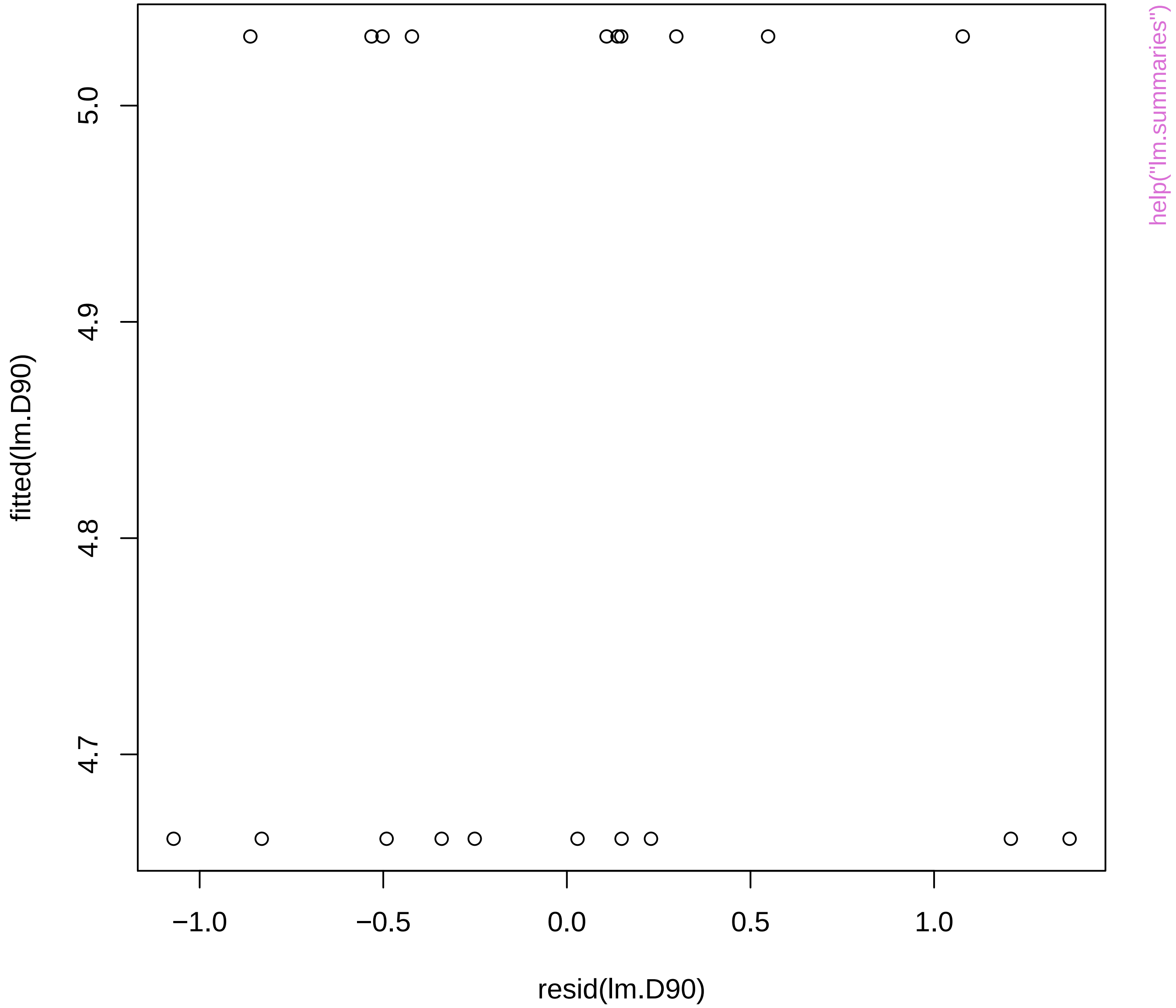

New Haven Temperatures
nhtemp
lag 5
nhtemp
lag 6
help("lag.plot")


8.6
8.8
9.0
9.2
9.4
9.6
9.8
lag quarterly revenue
8.8
9.0
9.2
9.4
9.6
9.8
lag 1
lag 2
lag 3
price index
4.3
4.4
4.5
4.6
4.7
income level
5.9
6.0
6.1
6.2
market potential
13.00
13.10
12.95
13.05
13.15
help("lag.plot")

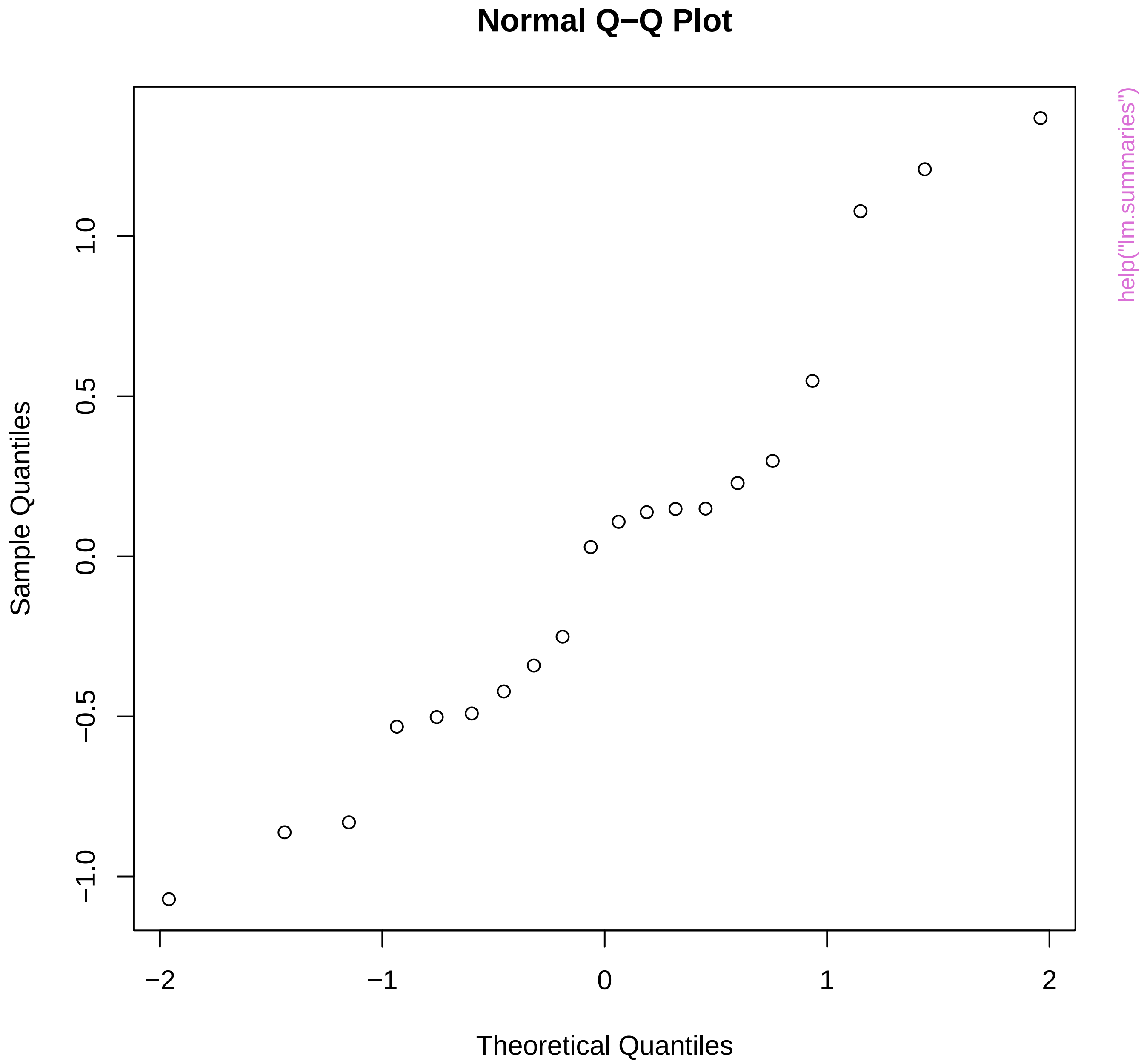

help("line")
dist
speed
line(cars)
residuals(z)
fitted(z)

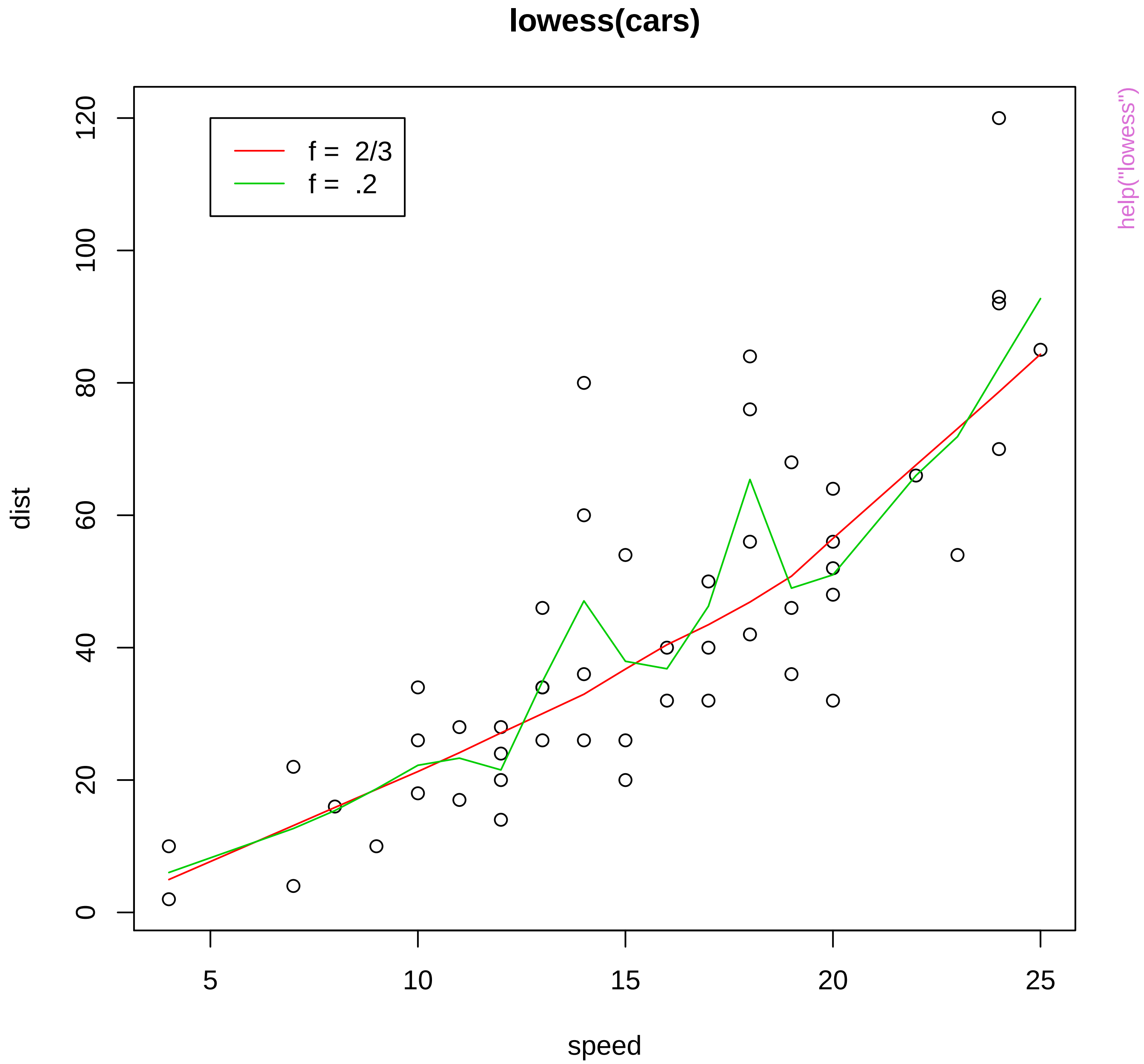

lm(weight ~ group)
Residuals vs Fitted
Residuals
Fitted values
Normal Q−Q
Standardized residuals
Theoretical Quantiles
help("lm")
Scale−Location
√|Standardized residuals|
Fitted values
Constant Leverage:
Residuals vs Factor Levels
Standardized residuals
group :
Trt
Ctl
Factor Level Combinations

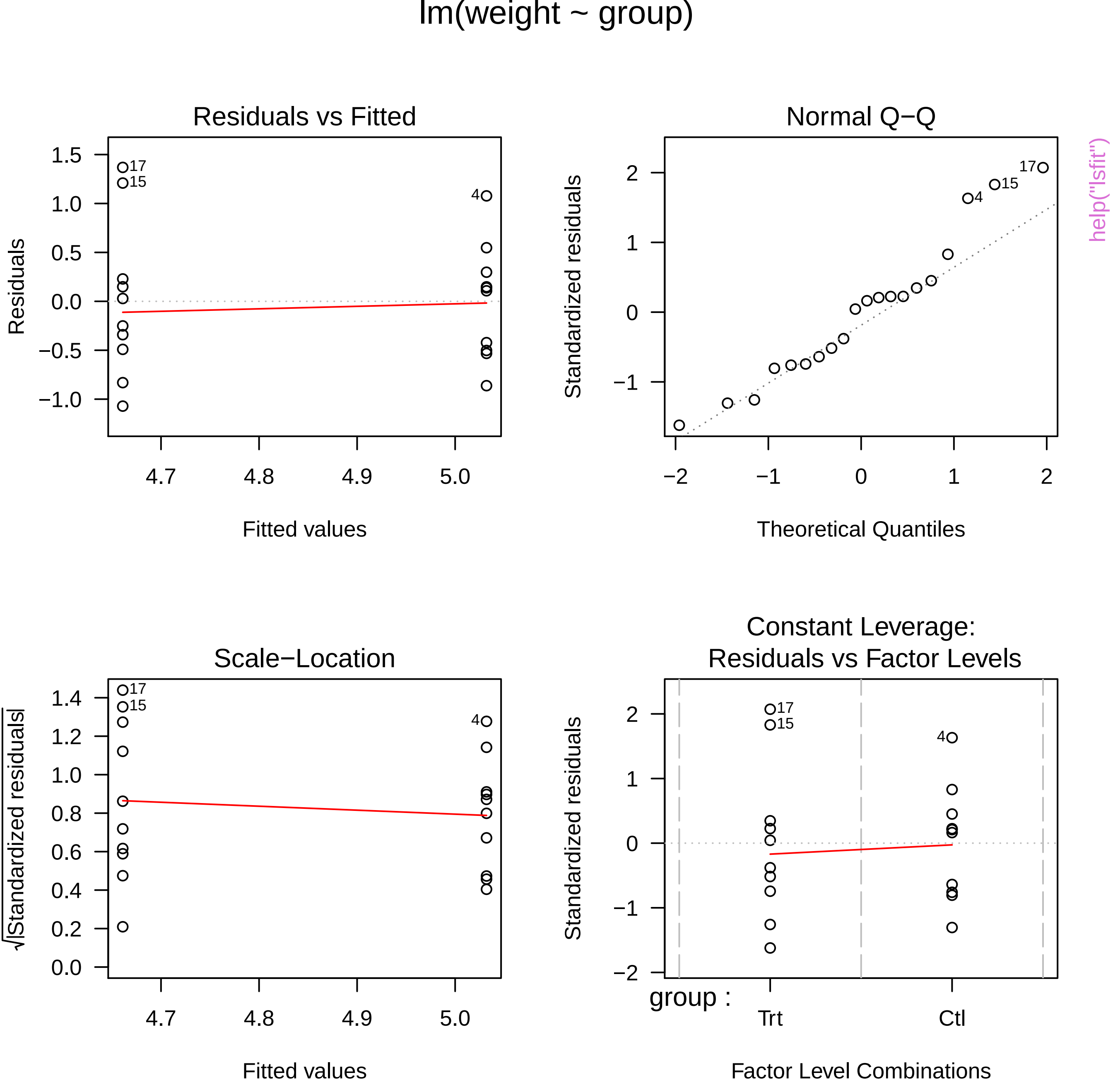

lm(weight ~ group)
Residuals vs Fitted
Residuals
Fitted values
Normal Q−Q
Standardized residuals
Theoretical Quantiles
help("lm.summaries")
Scale−Location
√|Standardized residuals|
Fitted values
Constant Leverage:
Residuals vs Factor Levels
Standardized residuals
group :
Trt
Ctl
Factor Level Combinations

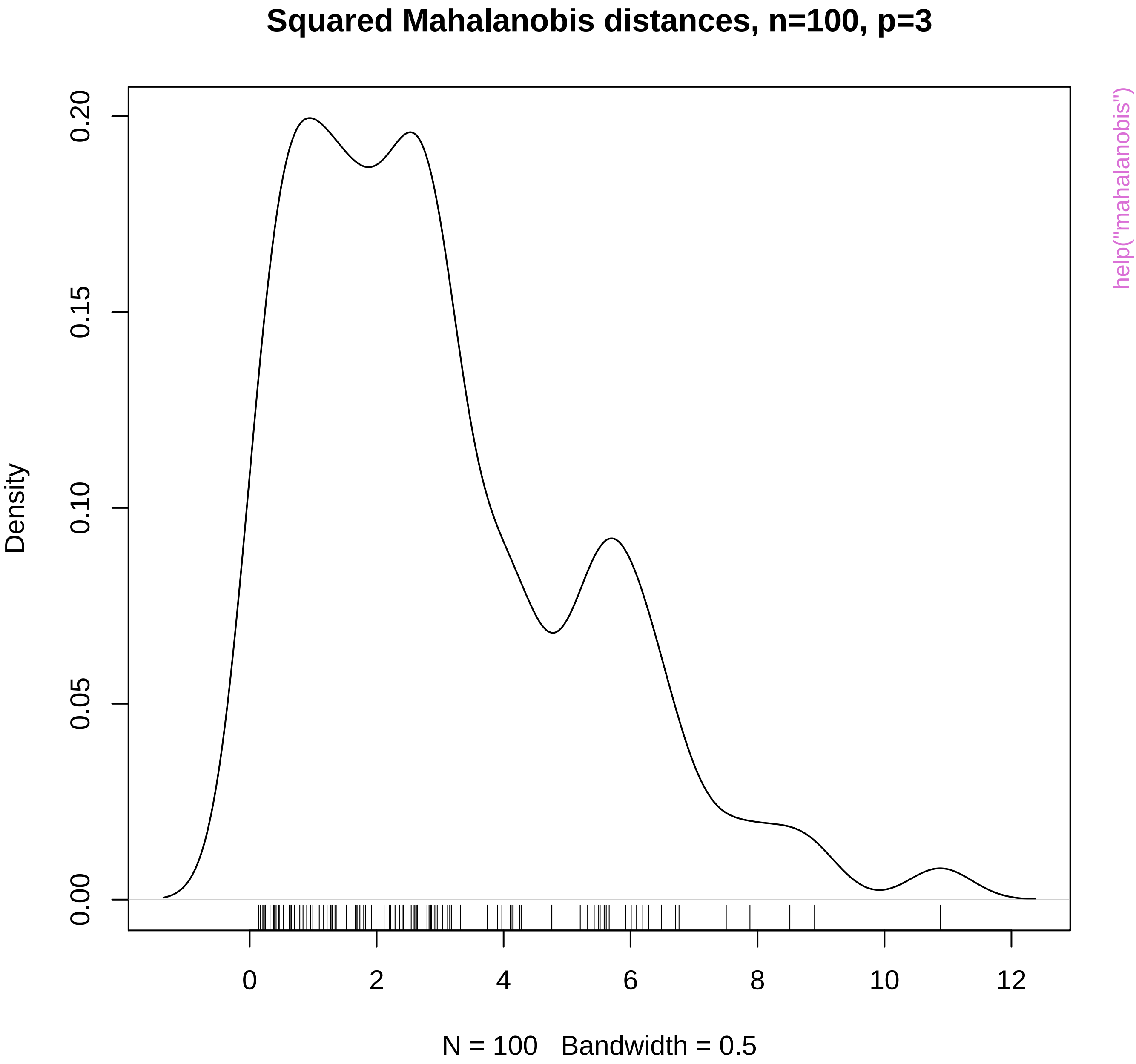


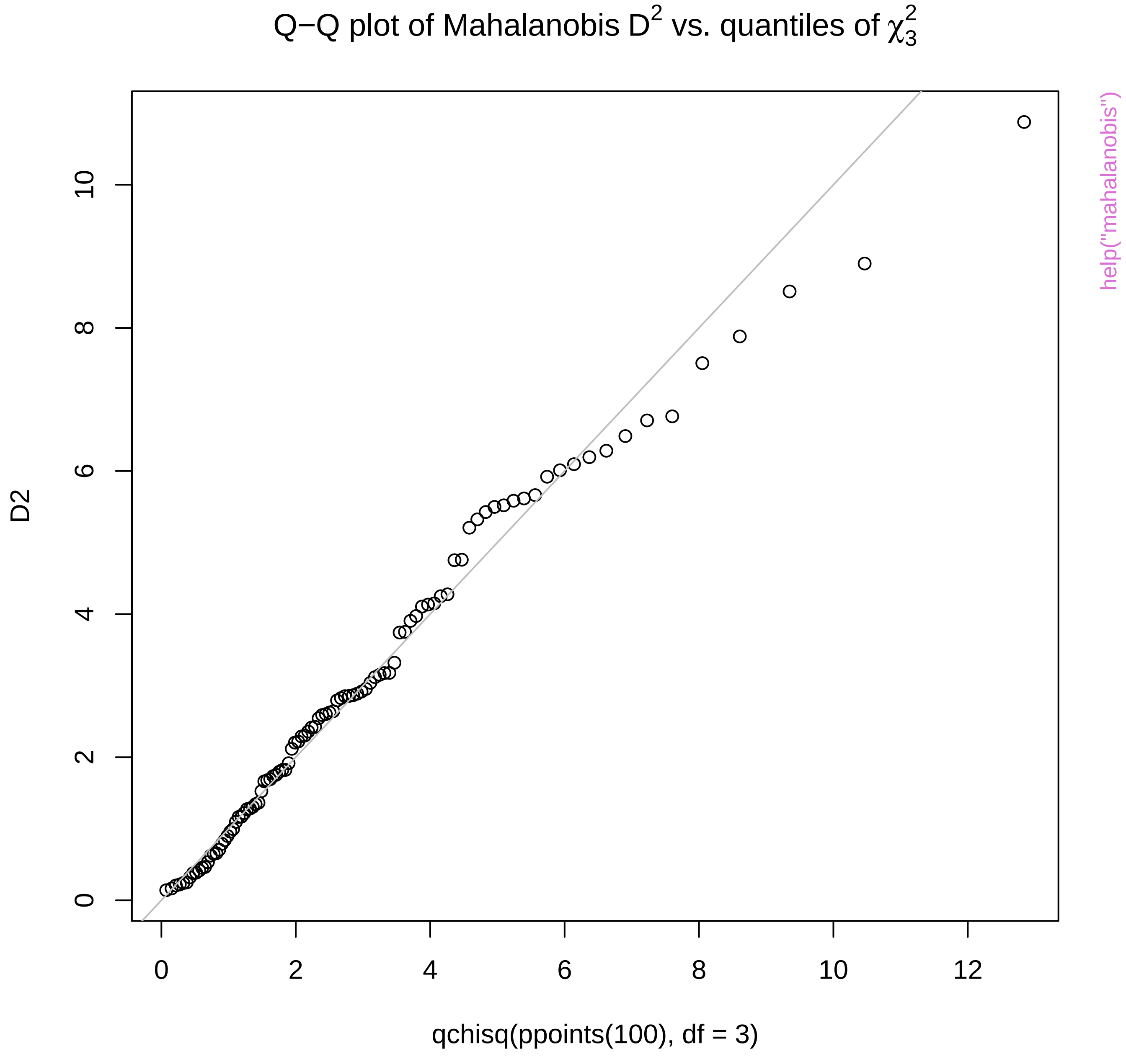
fitted(lm.D90)
5.0
4.9
4.8
4.7
−1.0
−0.5
0.0
0.5
1.0
resid(lm.D90)
help("lm.summaries")


Normal Q−Q Plot
Sample Quantiles
Theoretical Quantiles
−1.0
−0.5
0.0
0.5
1.0
−2
−1
0
1
2
help("lm.summaries")

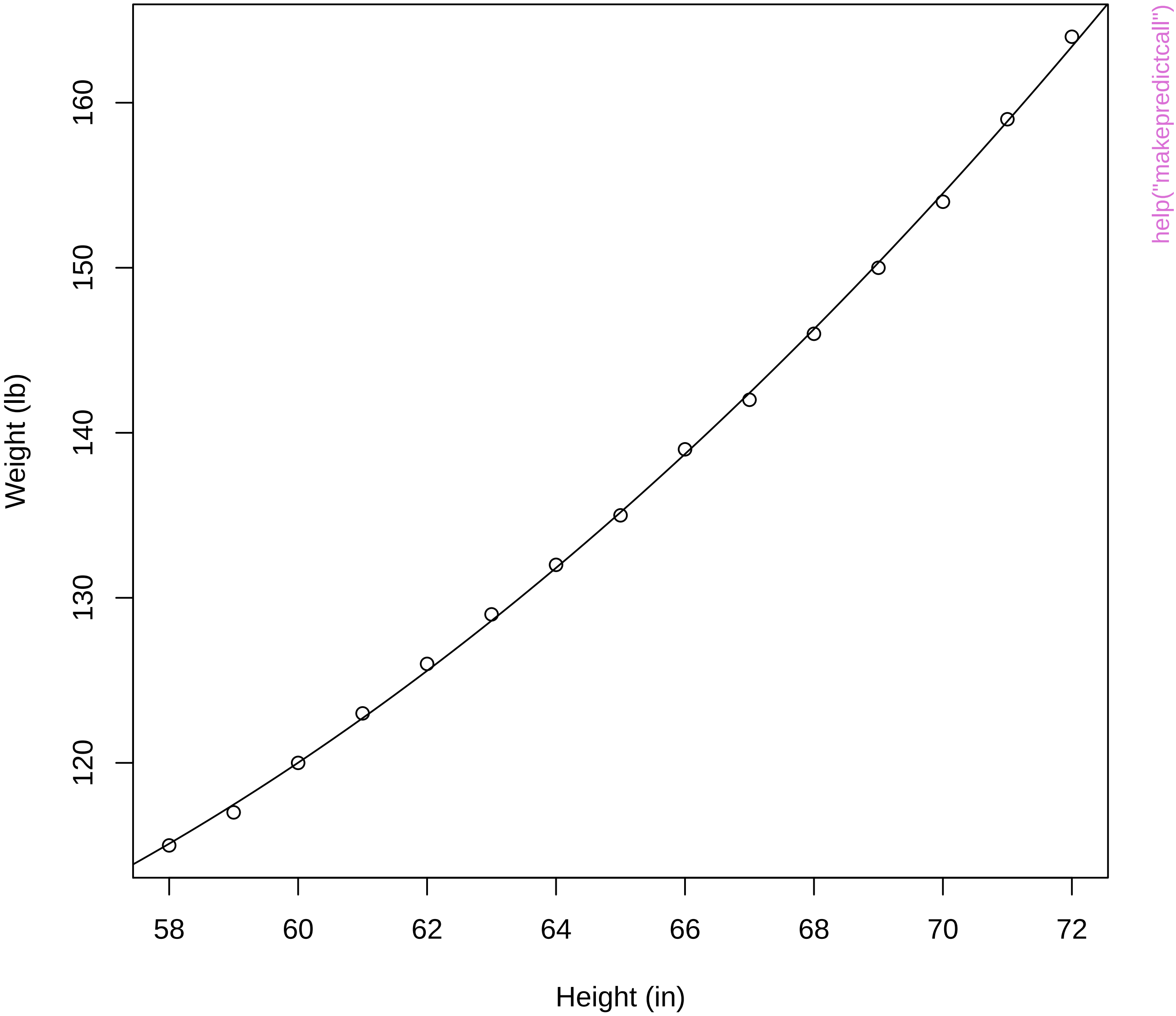

lowess(cars)
f = 2/3
f = .2
0
20
40
60
80
100
120
dist
5
10
15
20
25
speed
help("lowess")


lm(weight ~ group)
Residuals vs Fitted
Residuals
Fitted values
17
15
4
1.5
1.0
0.5
0.0
−0.5
−1.0
4.7
4.8
4.9
5.0
Normal Q−Q
Standardized residuals
Theoretical Quantiles
17
15
4
2
1
0
−1
−2
help("lsfit")
Scale−Location
√|Standardized residuals|
Fitted values
17
15
4
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
4.7
4.8
4.9
5.0
Constant Leverage:
Residuals vs Factor Levels
Standardized residuals
17
15
4
2
1
0
−1
−2
group :
Trt
Ctl
Factor Level Combinations

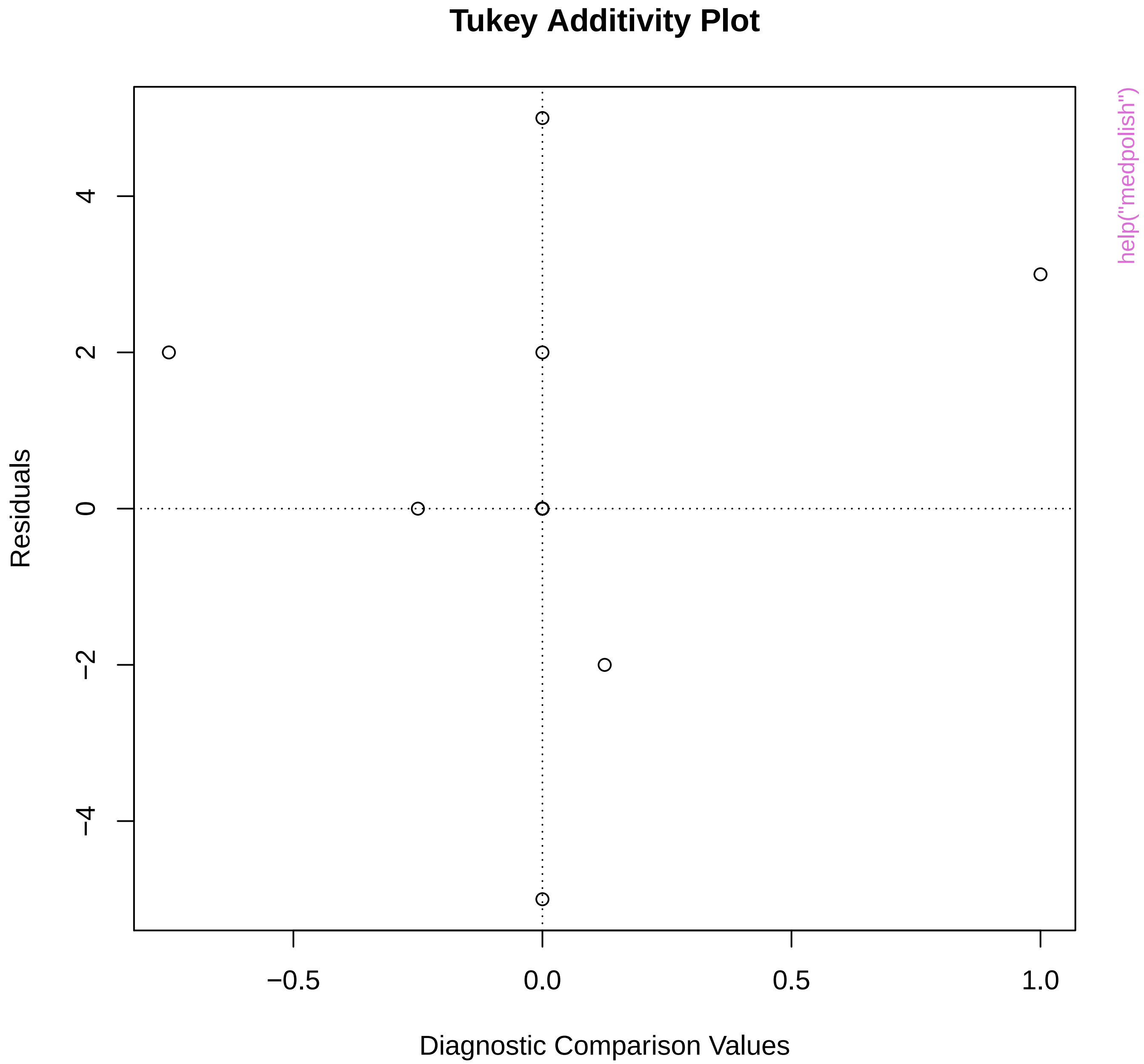

Squared Mahalanobis distances, n=100, p=3
Density
0.00
0.05
0.10
0.15
0.20
0
2
4
6
8
10
12
N = 100   Bandwidth = 0.5
help("mahalanobis")



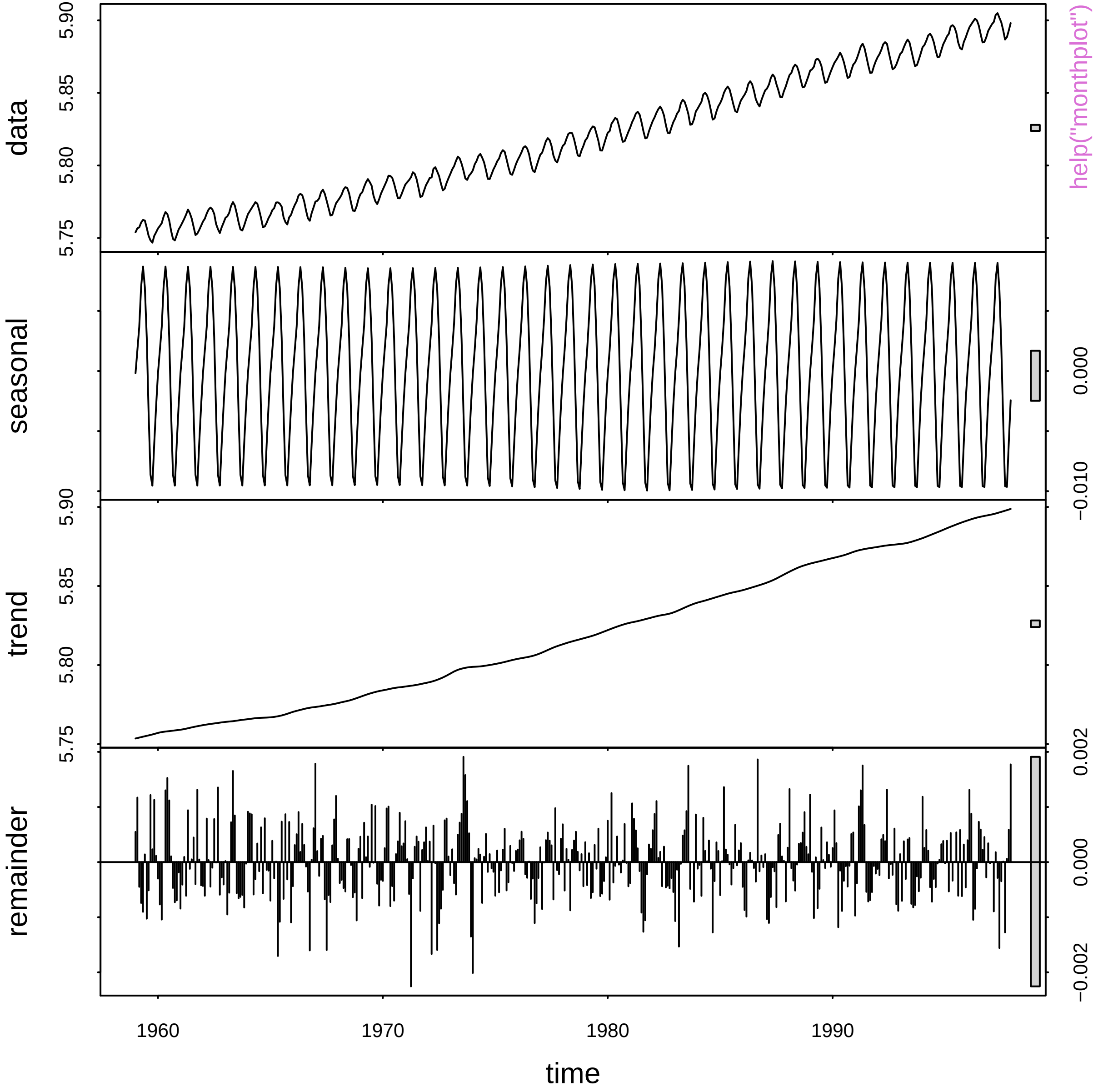
Q−Q plot of Mahalanobis D^2 vs. quantiles of χ^2_3
D2
0
2
4
6
8
10
12
qchisq(ppoints(100), df = 3)
help("mahalanobis")



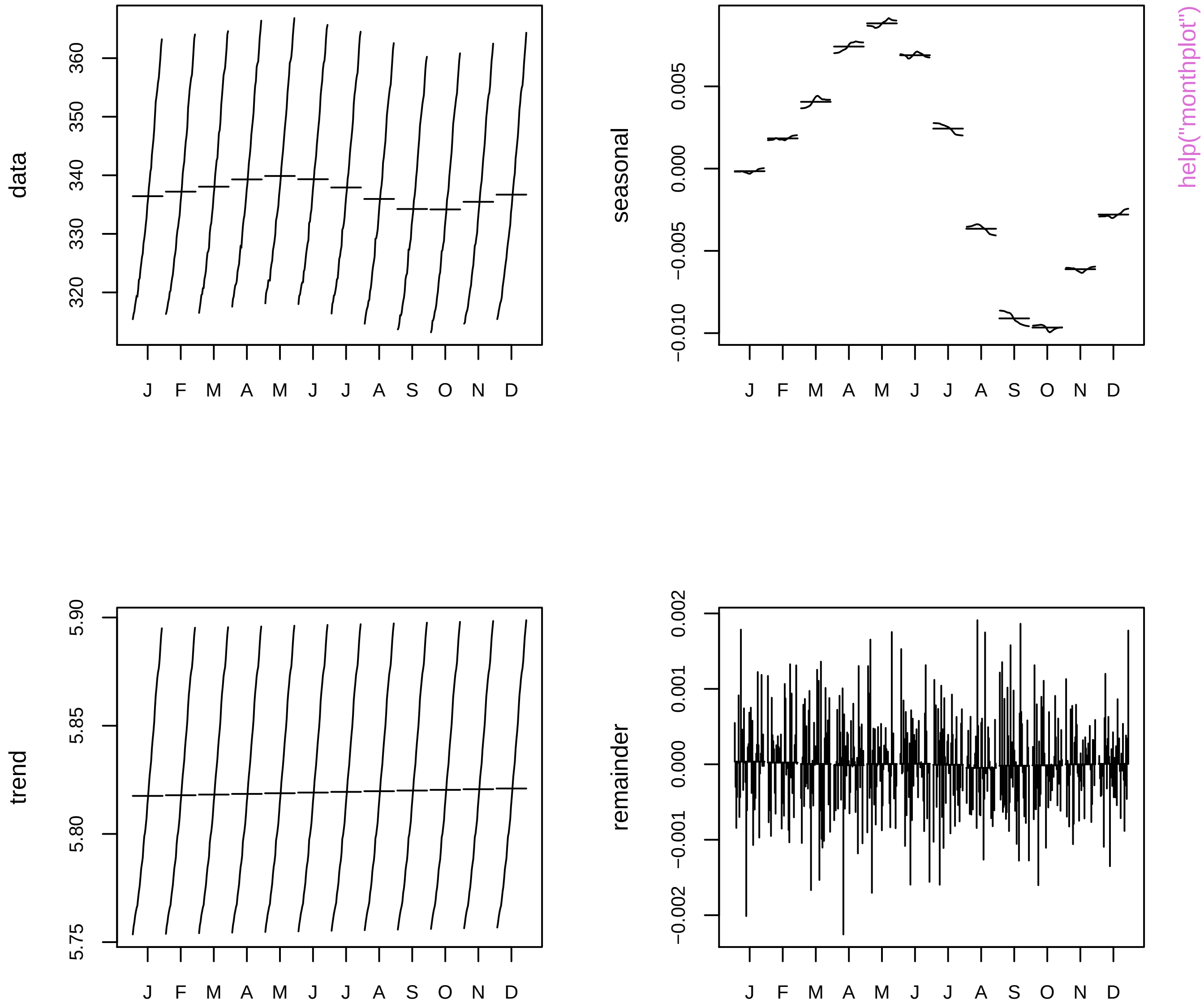
Weight (lb)
120
130
140
150
160
58
60
62
64
66
68
70
72
Height (in)
help("makepredictcall")

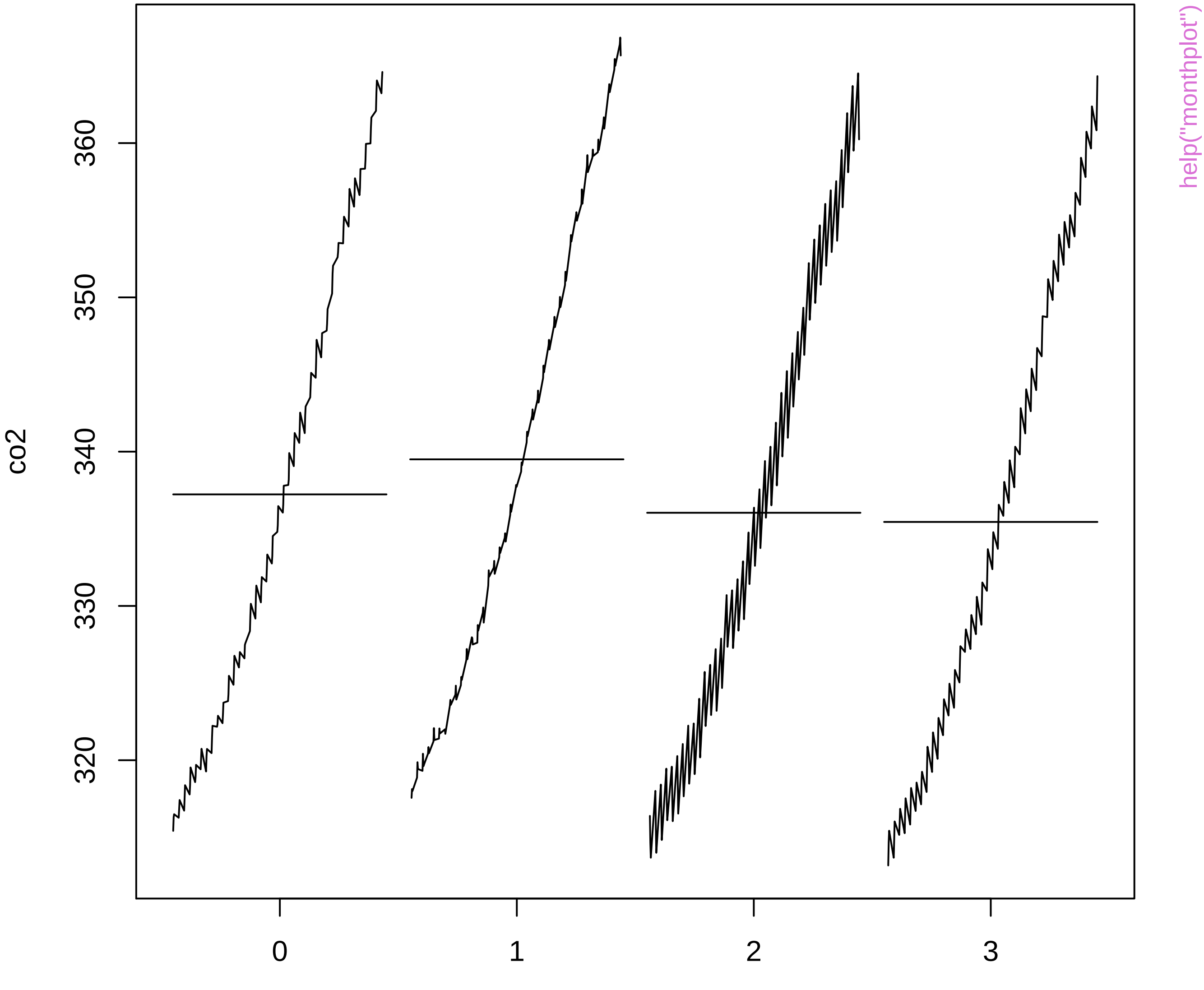


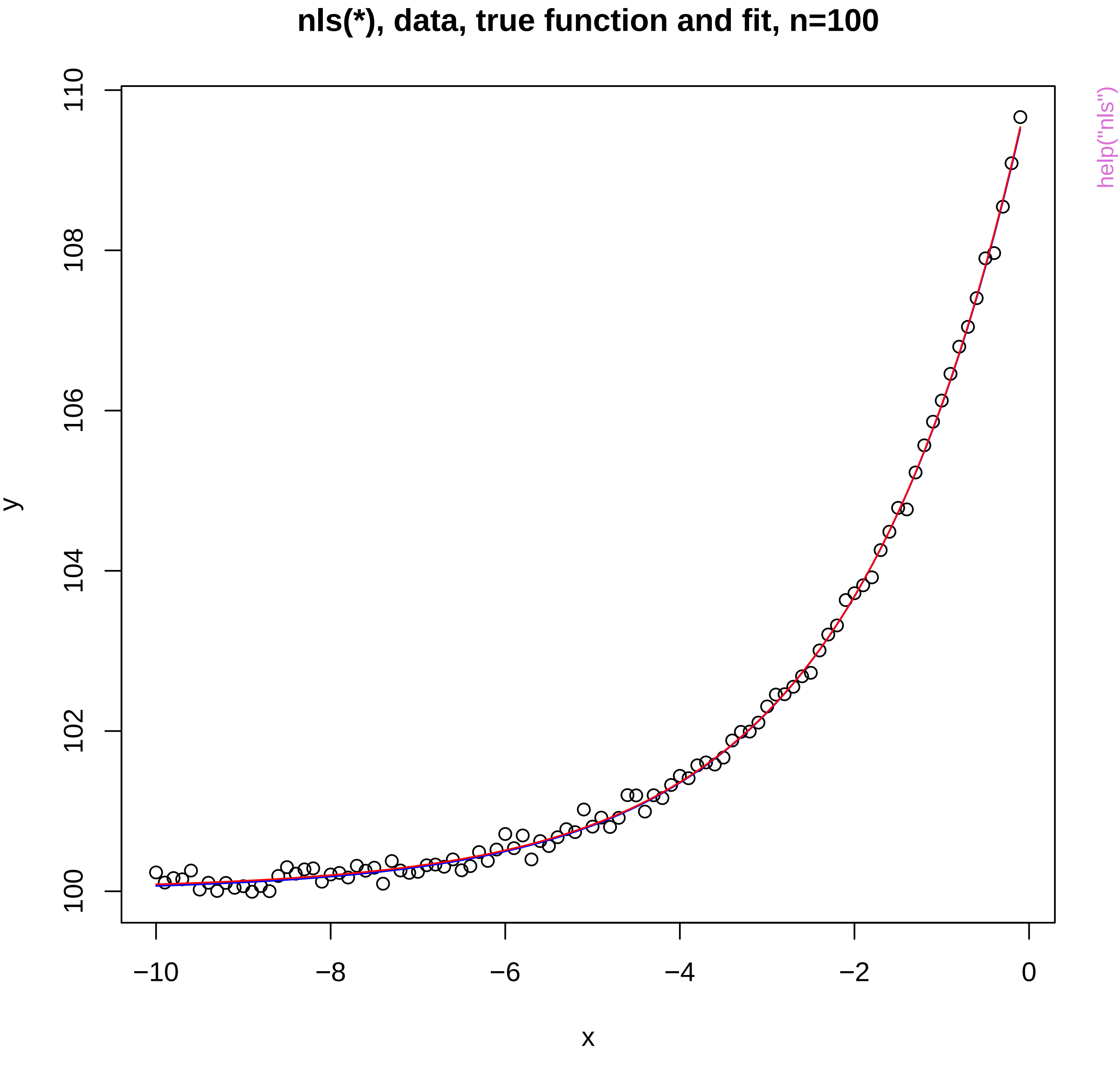
Tukey Additivity Plot
Residuals
Diagnostic Comparison Values
−0.5
0.0
0.5
1.0
−4
−2
0
2
4
help("medpolish")

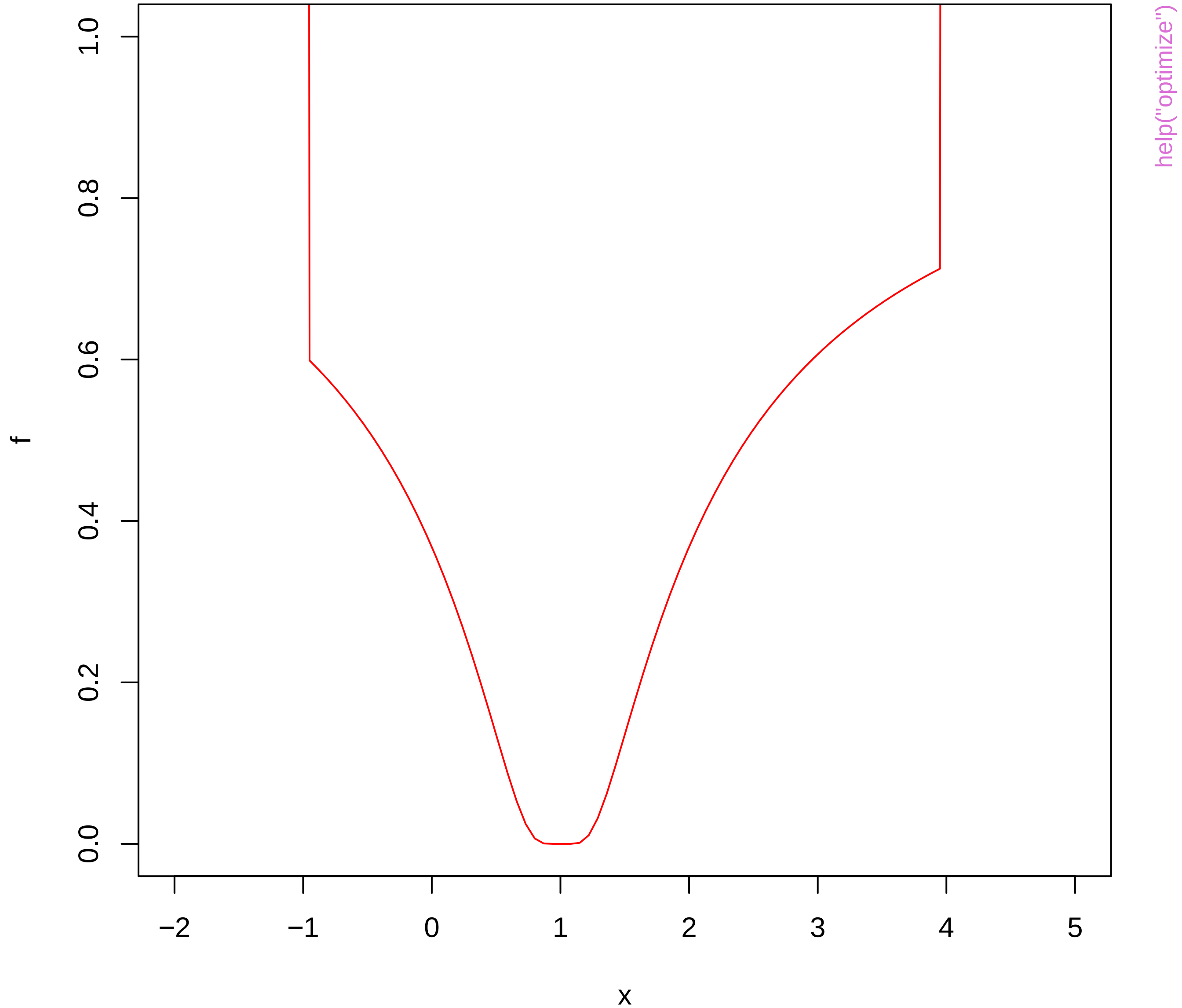


data
seasonal
trend
remainder
5.75
5.80
5.85
5.90
0.000
−0.010
0.002
−0.002
help("monthplot")
1960
1970
1980
1990
time

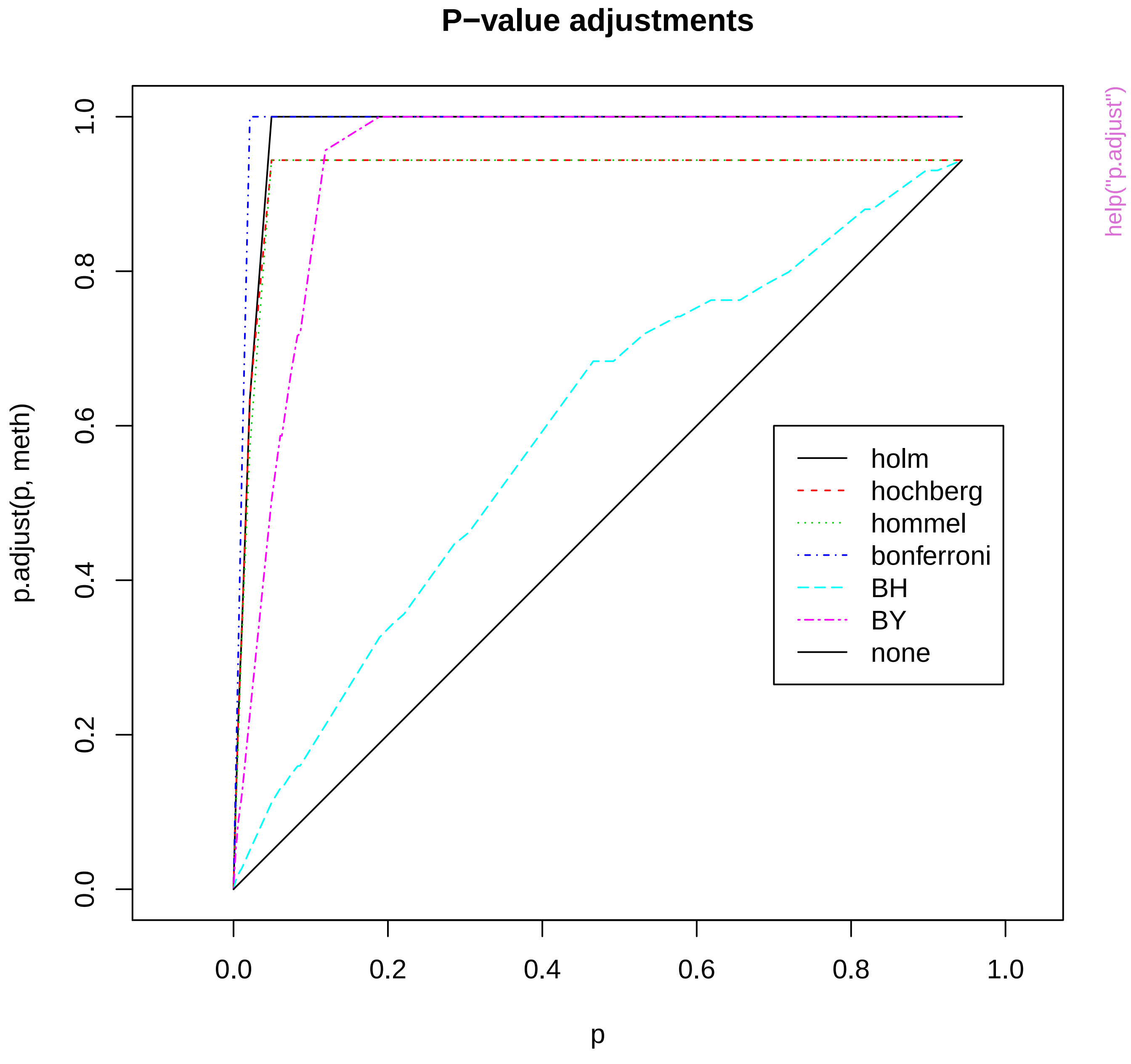

data
320
330
340
350
360
seasonal
−0.010
−0.005
0.000
0.005
help("monthplot")
trend
5.75
5.80
5.85
5.90
remainder
−0.002
−0.001
0.000
0.001
0.002
J F M A M J J A S O N D

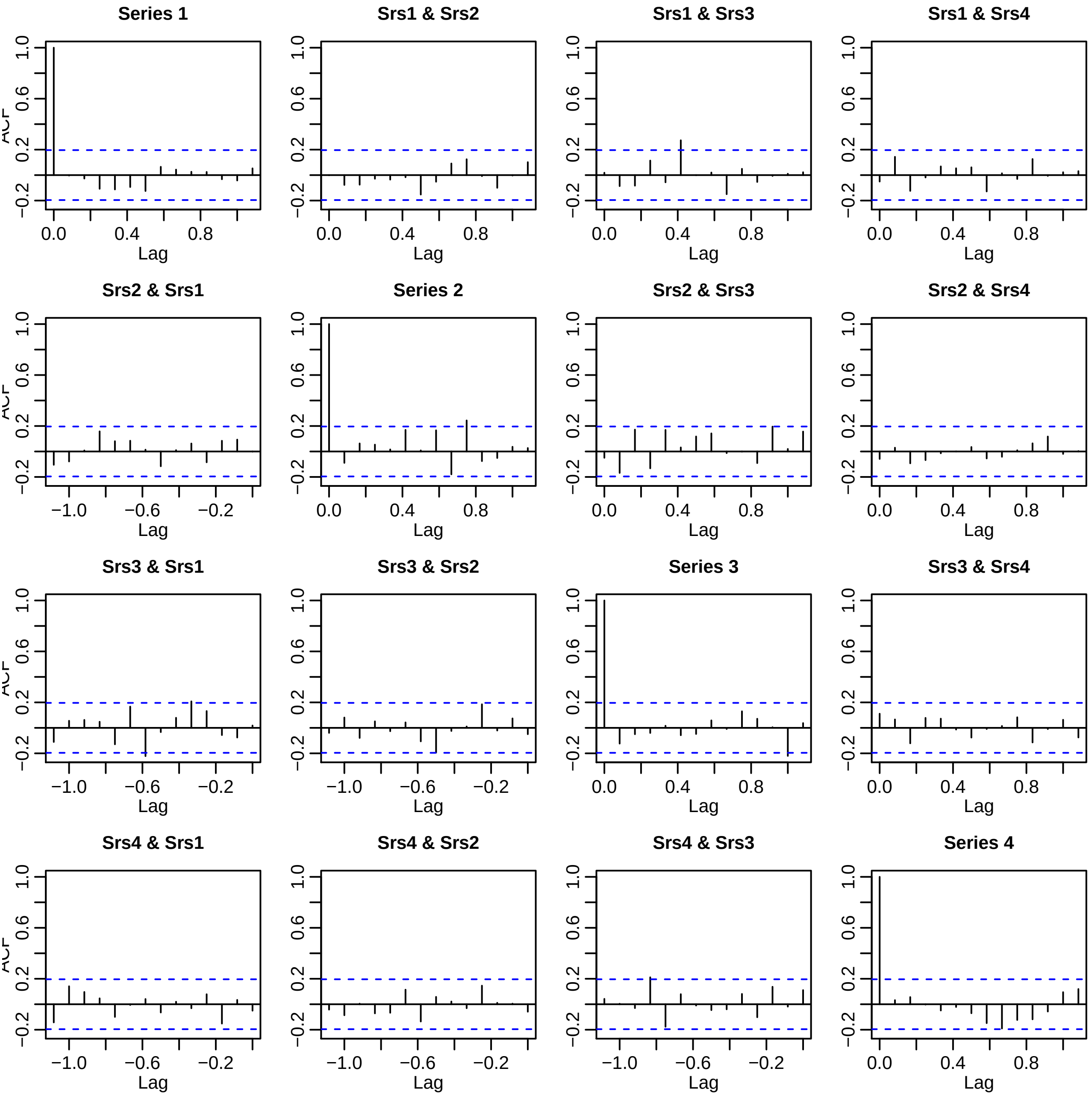

co2
320
330
340
350
360
0
1
2
3
help("monthplot")


nls(*), data, true function and fit, n=100
y
x
100
102
104
106
108
110
−10
−8
−6
−4
−2
0
help("nls")

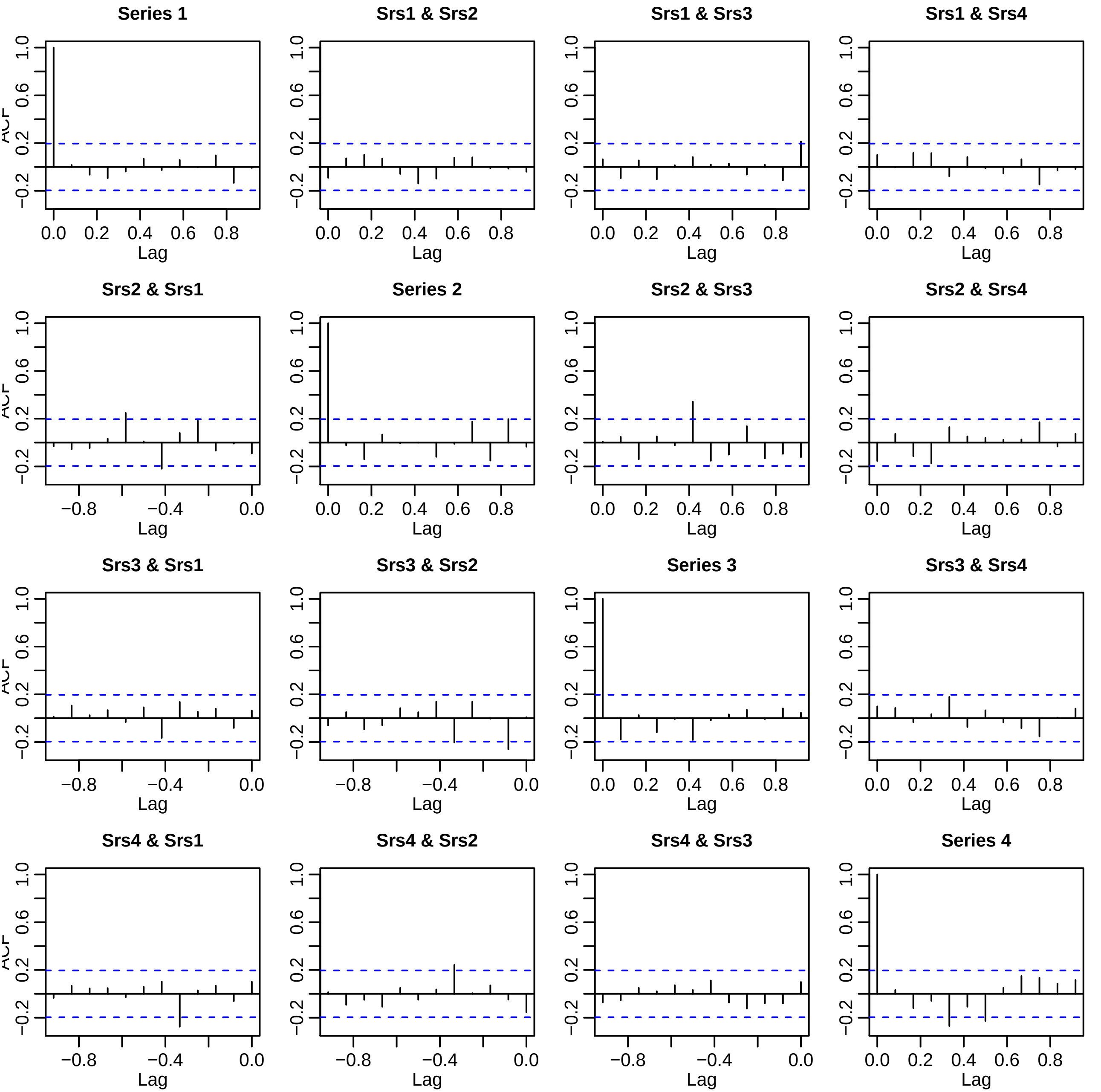


help("optimize")
f
1.0
0.8
0.6
0.4
0.2
0.0
−2
−1
0
1
2
3
4
5
x

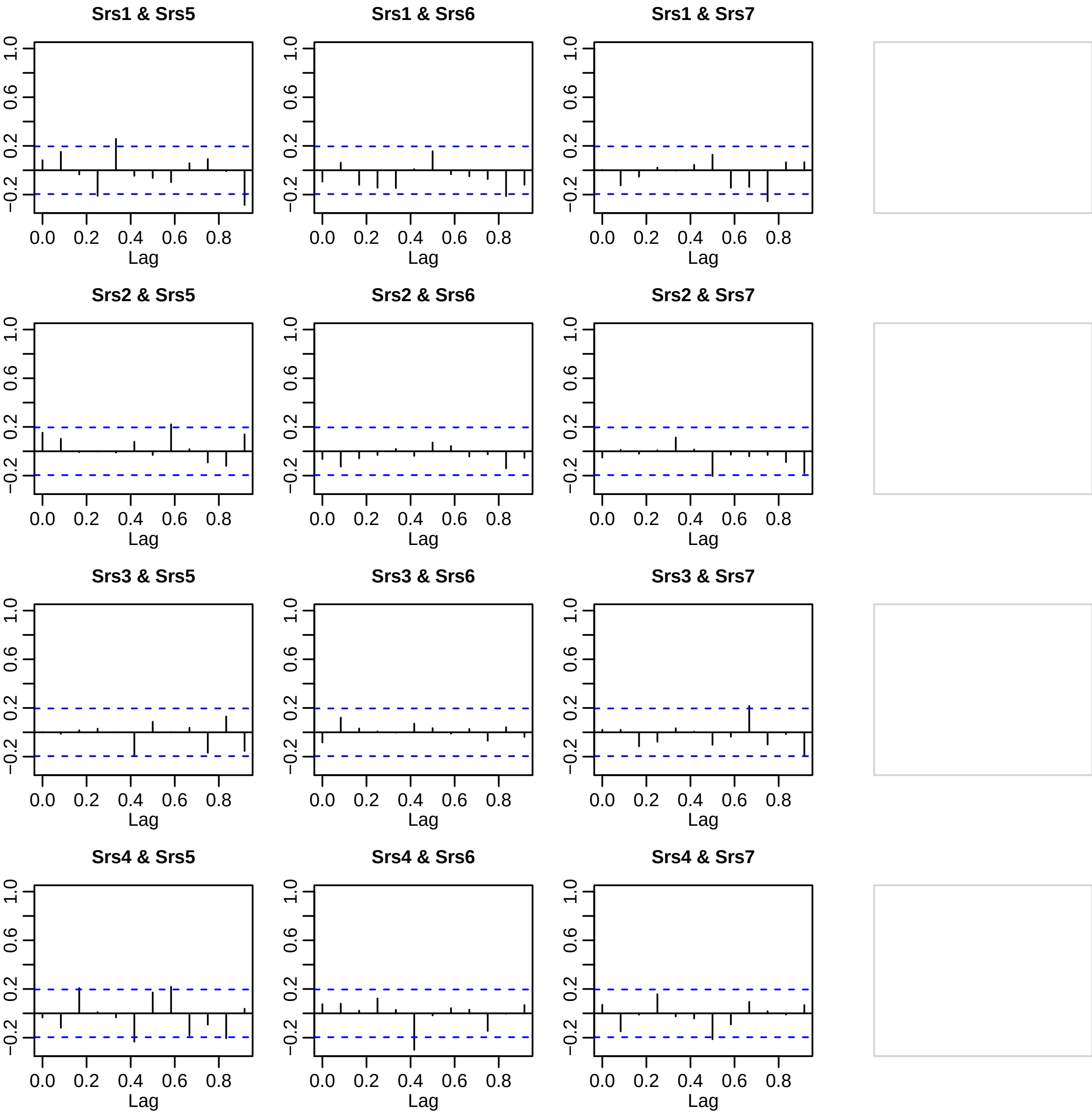

P−value adjustments
p.adjust(p, meth)
p
0.0
0.2
0.4
0.6
0.8
1.0
holm
hochberg
hommel
bonferroni
BH
BY
none
help("p.adjust")


Series 1
Srs1 & Srs2
Srs1 & Srs3
Srs1 & Srs4
Srs2 & Srs1
Series 2
Srs2 & Srs3
Srs2 & Srs4
Srs3 & Srs1
Srs3 & Srs2
Series 3
Srs3 & Srs4
Srs4 & Srs1
Srs4 & Srs2
Srs4 & Srs3
Series 4
ACF
Lag

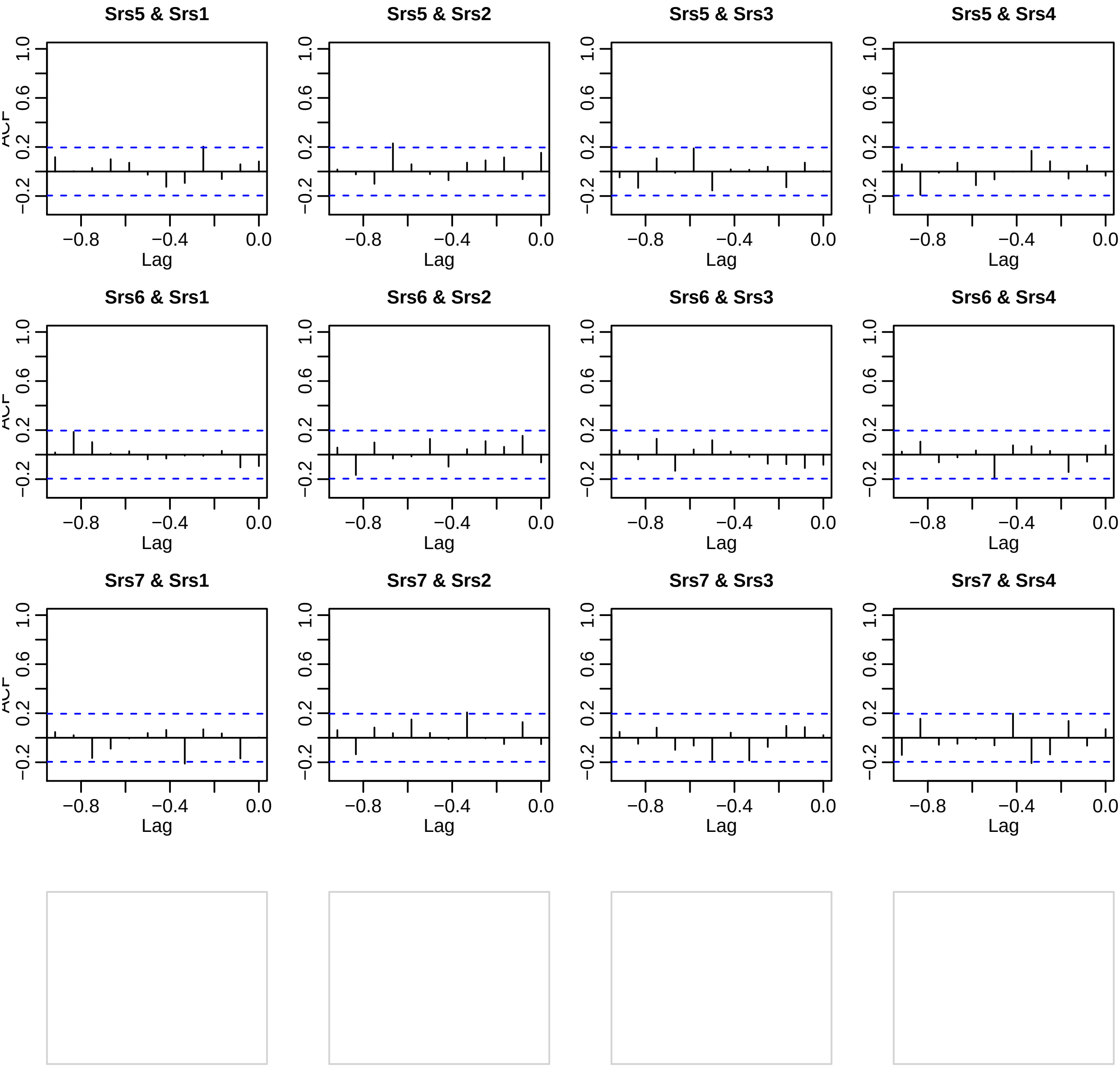

Series 1
Srs1 & Srs2
Srs1 & Srs3
Srs1 & Srs4
Srs1 & Srs5
Srs1 & Srs6
Srs1 & Srs7
Srs2 & Srs1
Series 2
Srs2 & Srs3
Srs2 & Srs4
Srs2 & Srs5
Srs2 & Srs6
Srs2 & Srs7
Srs3 & Srs1
Srs3 & Srs2
Series 3
Srs3 & Srs4
Srs3 & Srs5
Srs3 & Srs6
Srs3 & Srs7
Srs4 & Srs1
Srs4 & Srs2
Srs4 & Srs3
Series 4
Srs4 & Srs5
Srs4 & Srs6
Srs4 & Srs7
Srs5 & Srs1
Srs5 & Srs2
Srs5 & Srs3
Srs5 & Srs4
Series 5
Srs5 & Srs6
Srs5 & Srs7
Srs6 & Srs1
Srs6 & Srs2
Srs6 & Srs3
Srs6 & Srs4
Srs6 & Srs5
Series 6
Srs6 & Srs7
Srs7 & Srs1
Srs7 & Srs2
Srs7 & Srs3
Srs7 & Srs4
Srs7 & Srs5
Srs7 & Srs6
Series 7
ACF
Lag
−0.2
0.2
0.0
0.6
−0.8


Series 1
Srs1 & Srs2
Srs1 & Srs3
Srs1 & Srs4
Srs2 & Srs1
Series 2
Srs2 & Srs3
Srs2 & Srs4
Srs3 & Srs1
Srs3 & Srs2
Series 3
Srs3 & Srs4
Srs4 & Srs1
Srs4 & Srs2
Srs4 & Srs3
Series 4
ACF
Lag
0.0 0.2 0.4 0.6 0.8
−0.8 −0.4 0.0
−0.2 0.2 0.6 1.0

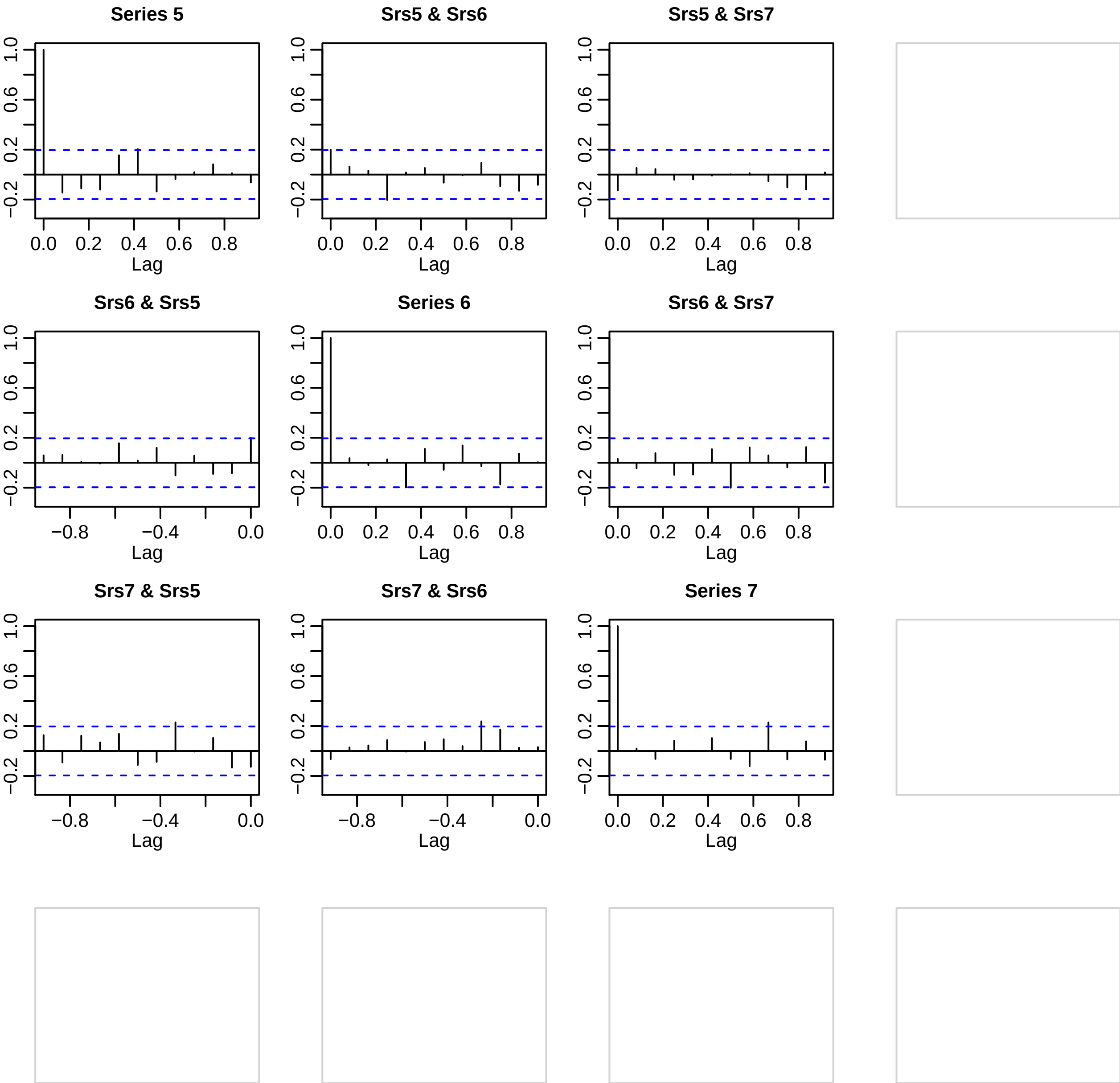
[1 , 1]


Srs1 & Srs5
Srs1 & Srs6
Srs1 & Srs7
Srs2 & Srs5
Srs2 & Srs6
Srs2 & Srs7
Srs3 & Srs5
Srs3 & Srs6
Srs3 & Srs7
Srs4 & Srs5
Srs4 & Srs6
Srs4 & Srs7
−0.2 0.2 0.6 1.0
0.0 0.2 0.4 0.6 0.8
Lag

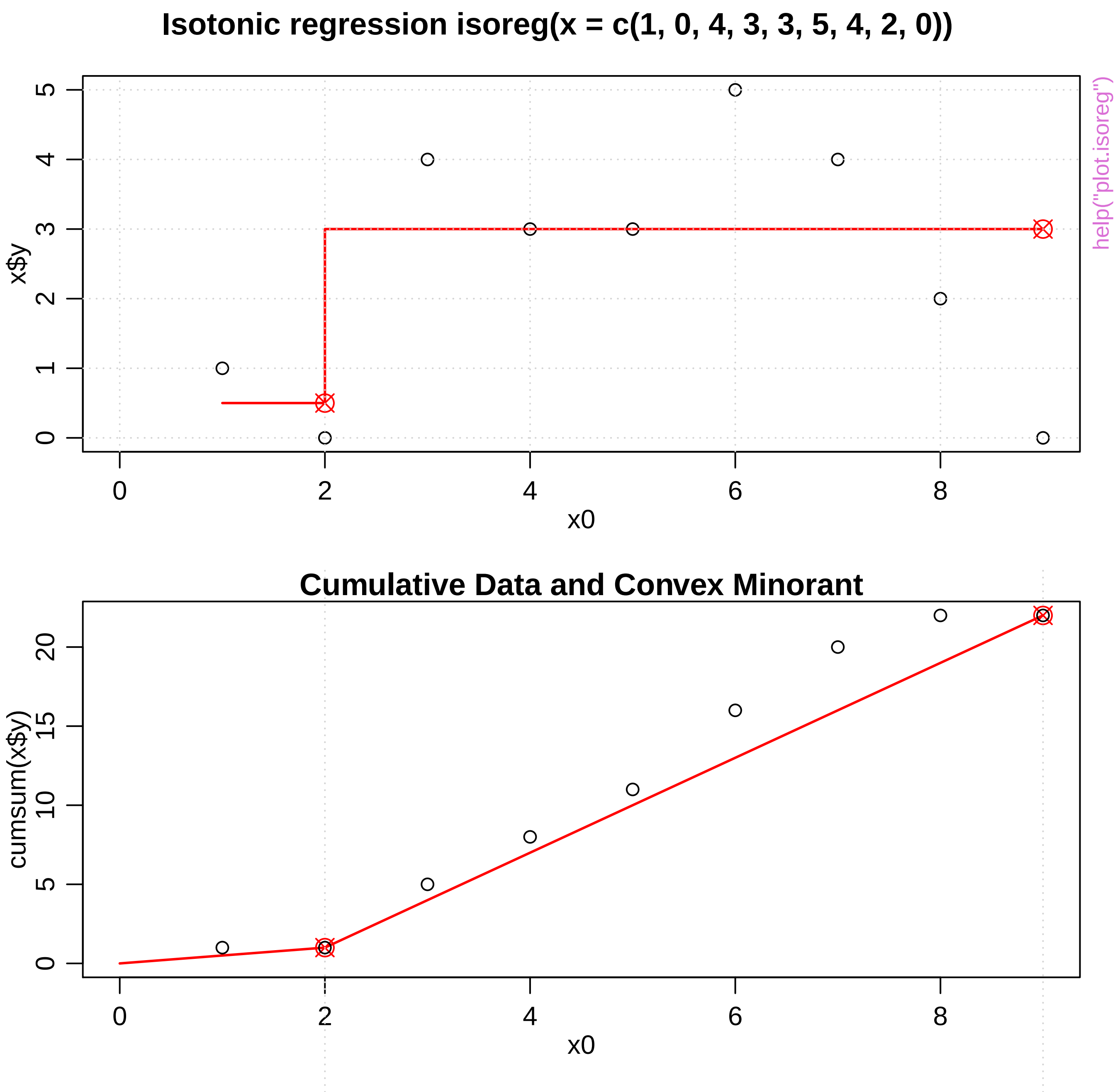
[1 , 2]

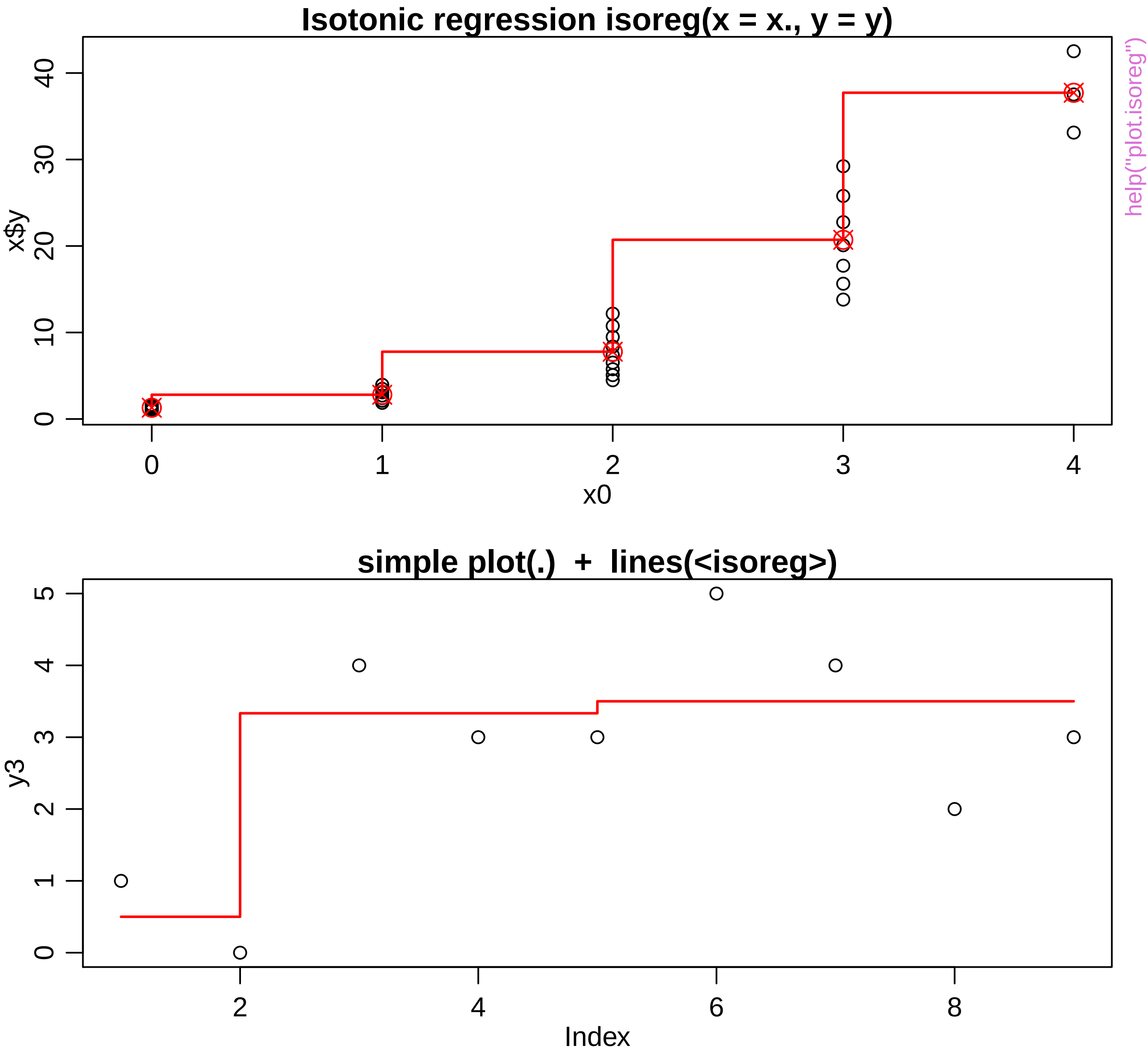

Srs5 & Srs1
Srs5 & Srs2
Srs5 & Srs3
Srs5 & Srs4
Srs6 & Srs1
Srs6 & Srs2
Srs6 & Srs3
Srs6 & Srs4
Srs7 & Srs1
Srs7 & Srs2
Srs7 & Srs3
Srs7 & Srs4
−0.2 0.2 0.6 1.0
−0.8 −0.4 0.0
Lag

[2 , 1]

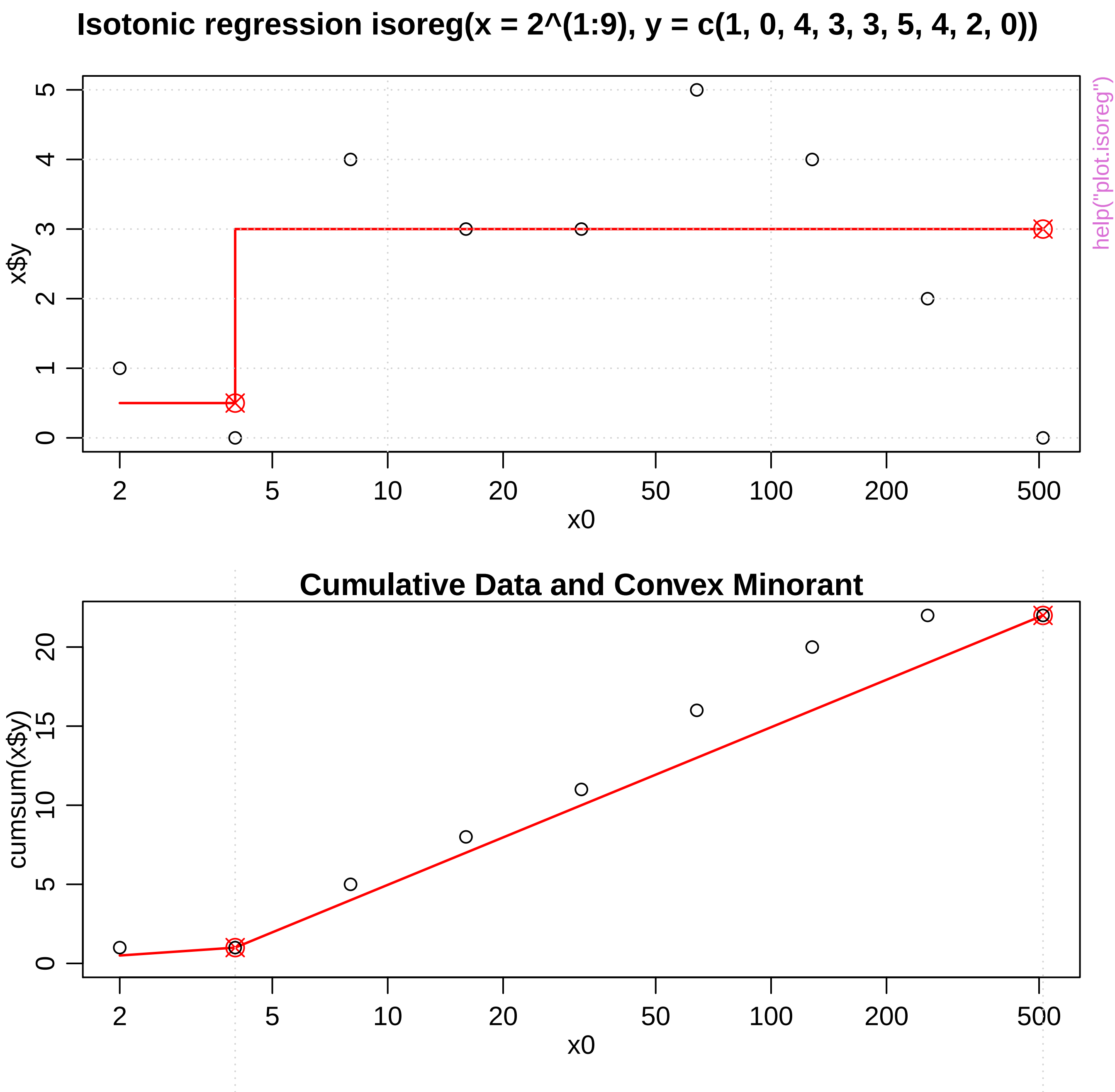

Series 5
Srs5 & Srs6
Srs5 & Srs7
Srs6 & Srs5
Series 6
Srs6 & Srs7
Srs7 & Srs5
Srs7 & Srs6
Series 7
−0.2
0.2
0.6
1.0
0.0
0.2
0.4
0.6
0.8
−0.8
−0.4
Lag

[2 , 2]

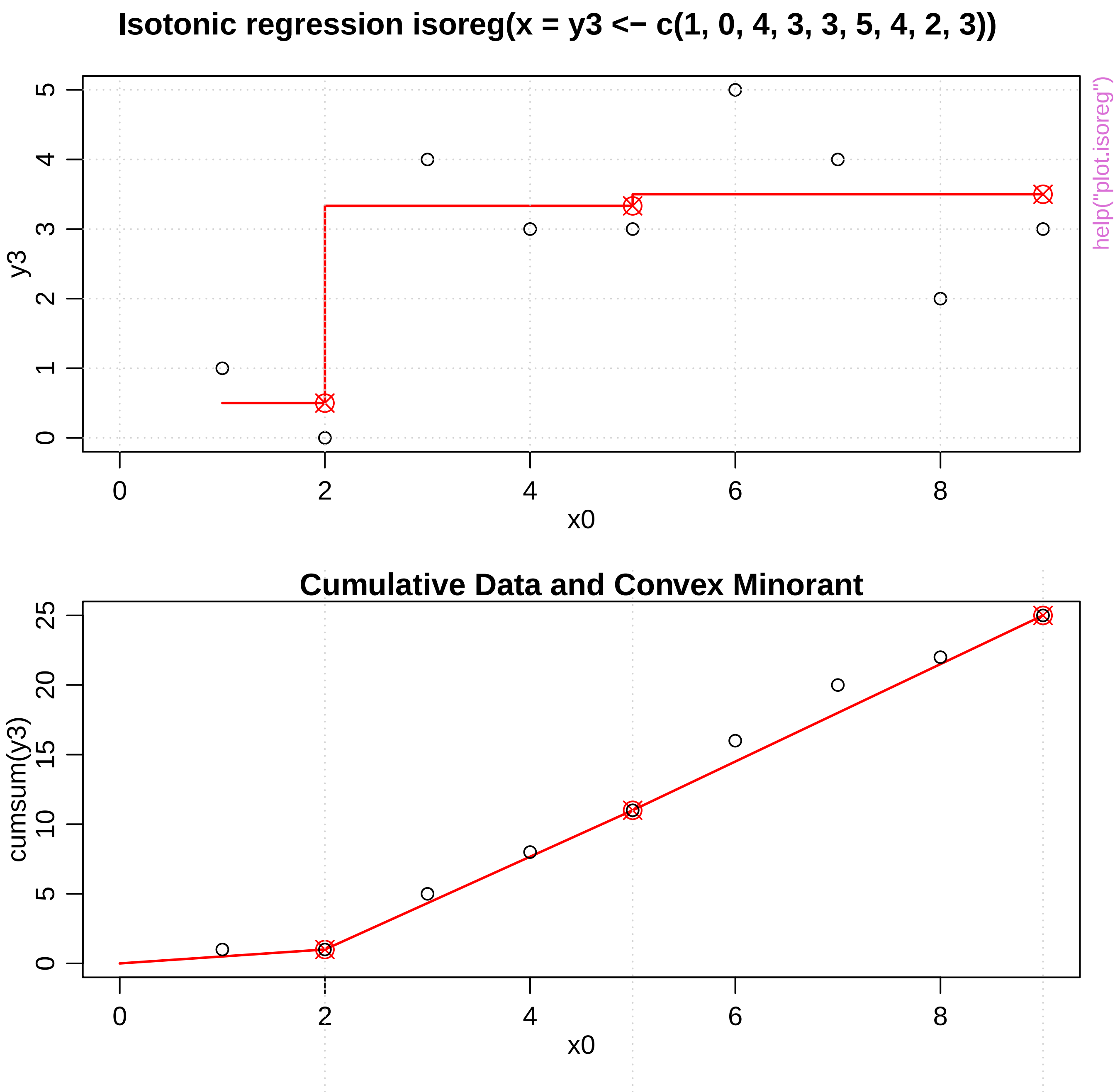

Isotonic regression isoreg(x = c(1, 0, 4, 3, 3, 5, 4, 2, 0))
x$y
x0
help("plot.isoreg")
Cumulative Data and Convex Minorant
cumsum(x$y)
x0



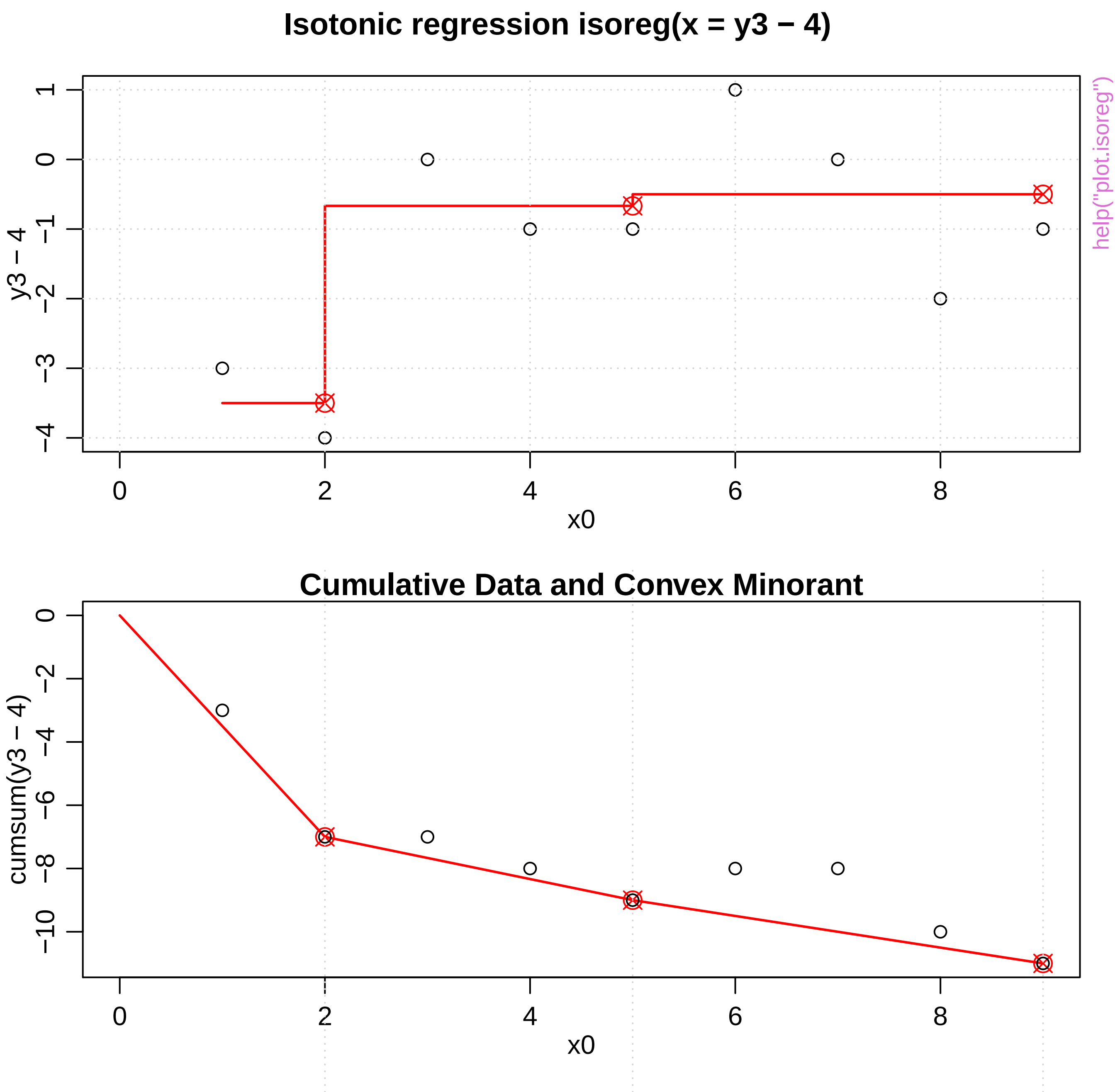
Isotonic regression isoreg(x = x., y = y)
x$y
0
10
20
30
40
0
1
2
3
4
x0
help("plot.isoreg")
simple plot(.) + lines(<isoreg>)
y3
0
1
2
3
4
5
2
4
6
8
Index

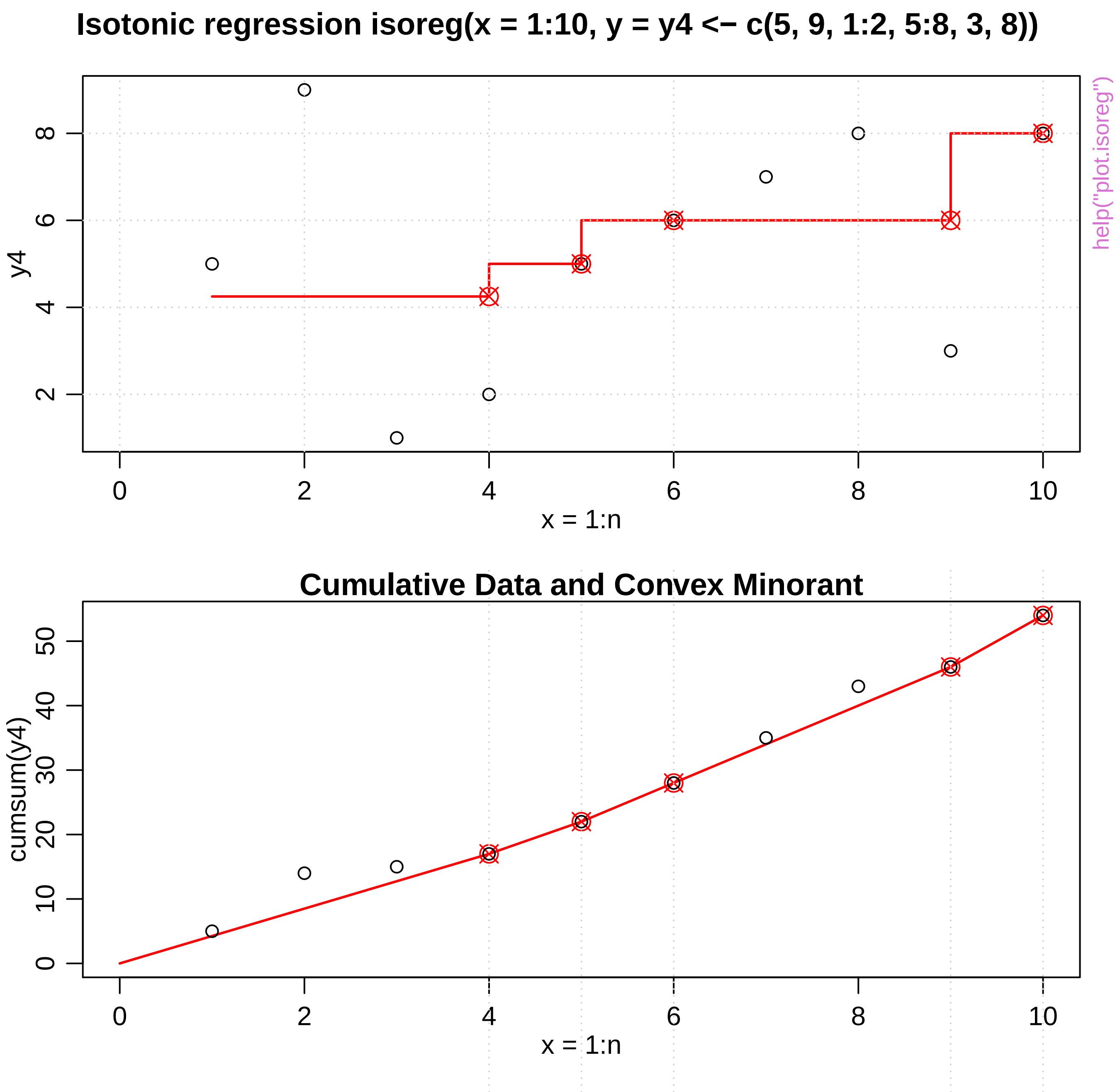


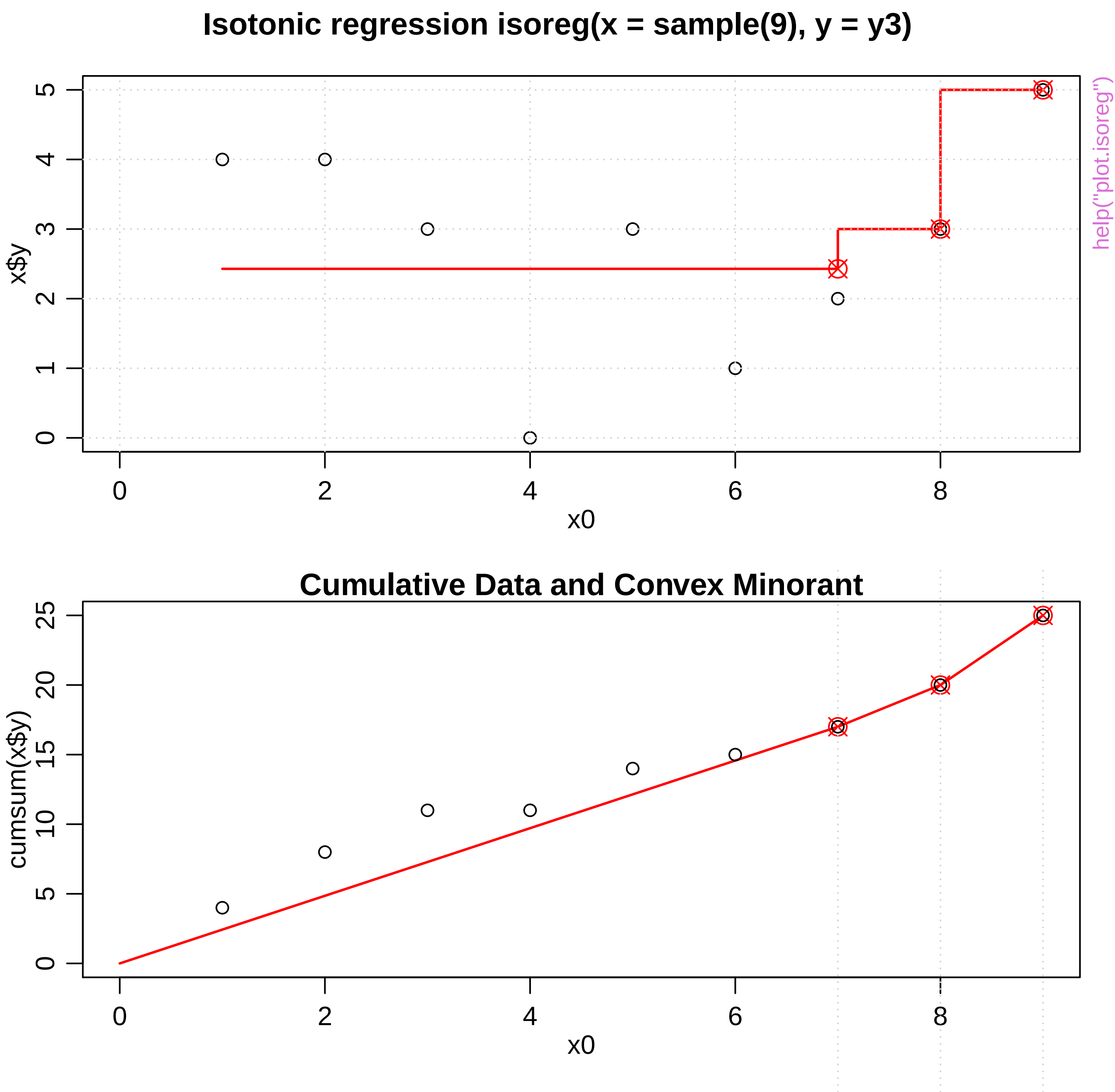
Isotonic regression isoreg(x = 2^(1:9), y = c(1, 0, 4, 3, 3, 5, 4, 2, 0))
x$y
x0
help("plot.isoreg")
Cumulative Data and Convex Minorant
cumsum(x$y)
x0



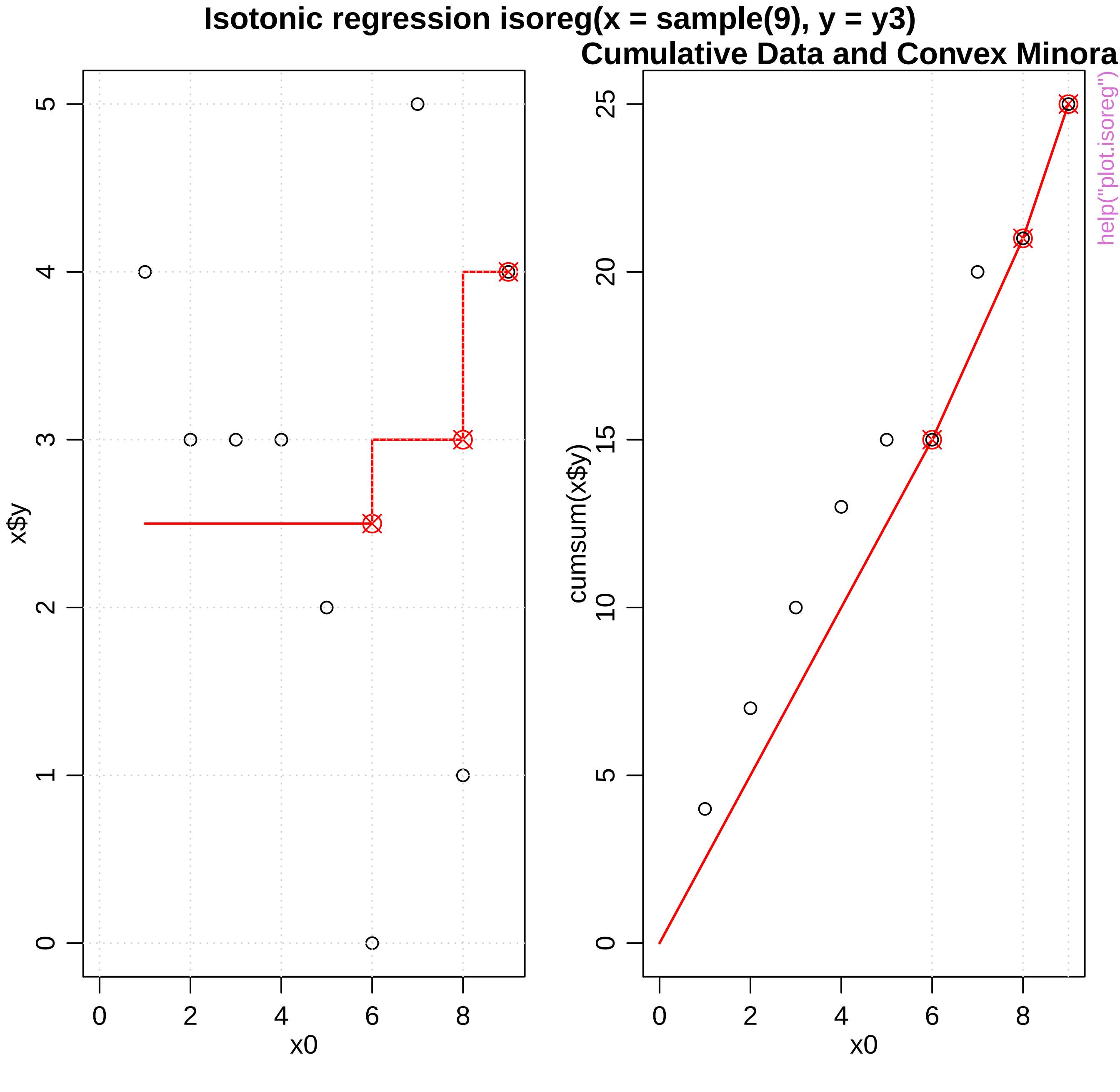
Isotonic regression isoreg(x = y3 <− c(1, 0, 4, 3, 3, 5, 4, 2, 3))
y3
x0
help("plot.isoreg")
Cumulative Data and Convex Minorant
cumsum(y3)
x0


Isotonic regression isoreg(x = y3 − 4)
help("plot.isoreg")
y3 − 4
x0
Cumulative Data and Convex Minorant
cumsum(y3 − 4)
x0

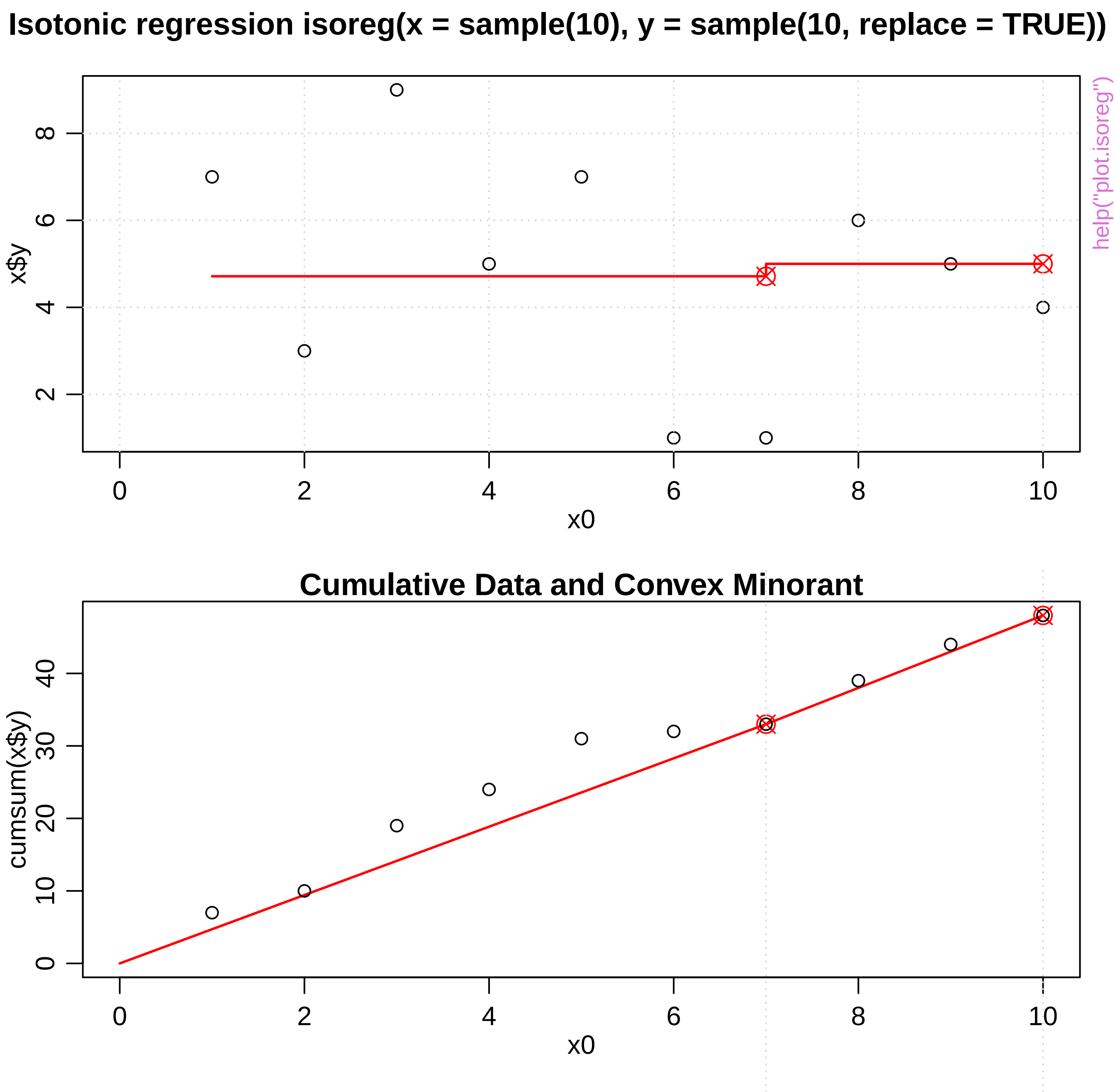

Isotonic regression isoreg(x = 1:10, y = y4 <− c(5, 9, 1:2, 5:8, 3, 8))
y4
8
6
4
2
0
2
4
6
8
10
x = 1:n
help("plot.isoreg")
Cumulative Data and Convex Minorant
cumsum(y4)
50
40
30
20
10
0
0
2
4
6
8
10
x = 1:n

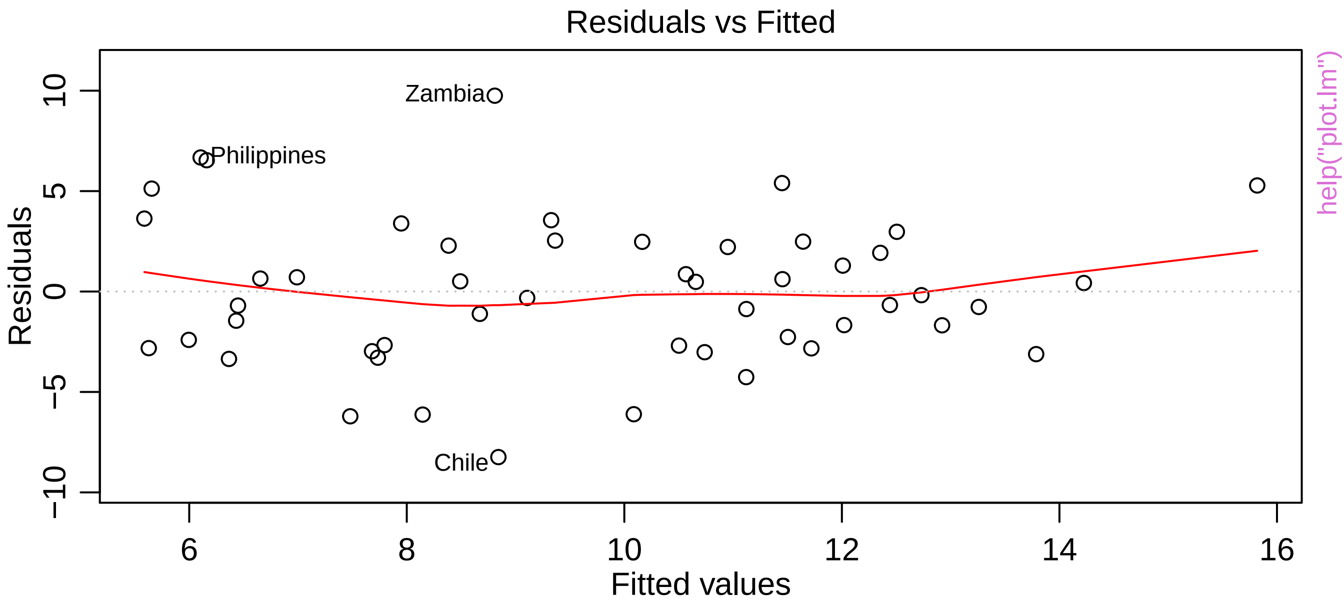


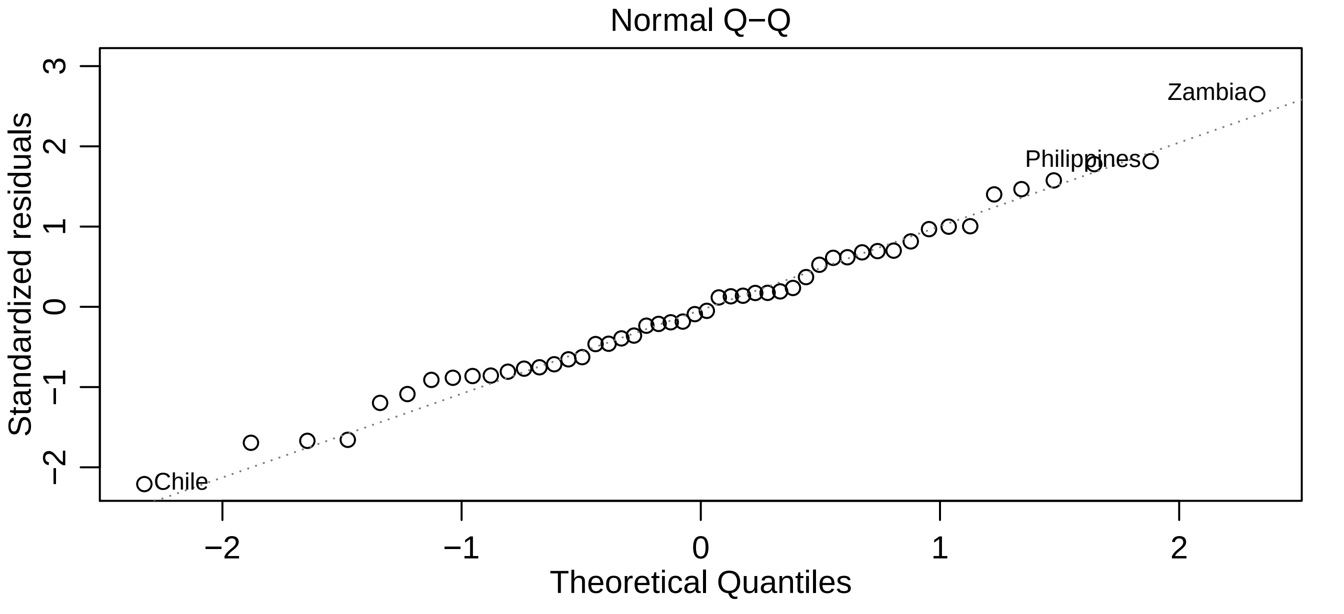
Isotonic regression isoreg(x = sample(9), y = y3)
x$y
x0
0
1
2
3
4
5
0
2
4
6
8
help("plot.isoreg")
Cumulative Data and Convex Minorant
cumsum(x$y)
x0
0
5
10
15
20
25
0
2
4
6
8

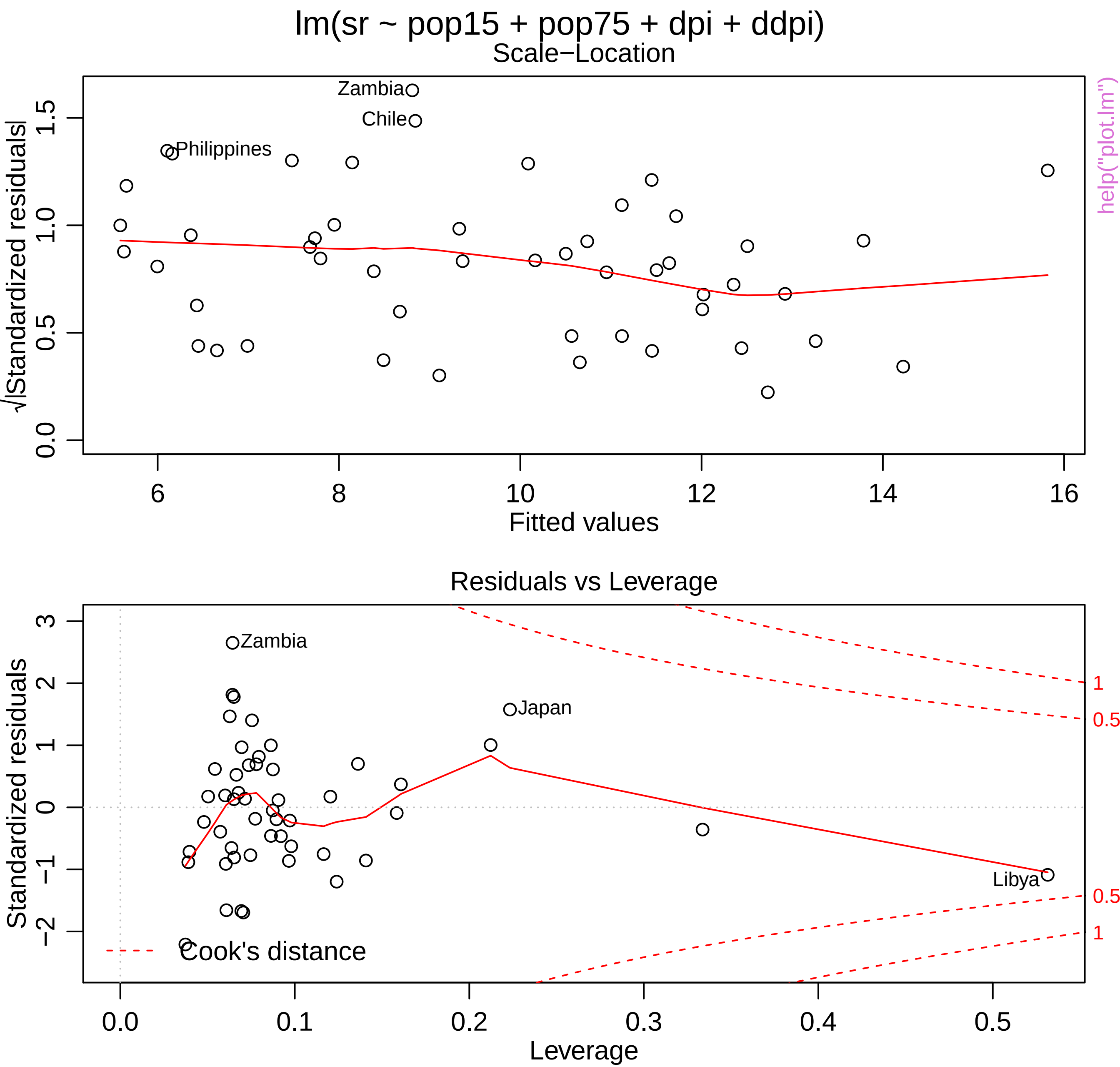


Isotonic regression isoreg(x = sample(9), y = y3)
Cumulative Data and Convex Minora
x$y
x0
cumsum(x$y)
x0
help("plot.isoreg")
0
1
2
3
4
5
0
2
4
6
8
0
5
10
15
20
25
0
2
4
6
8

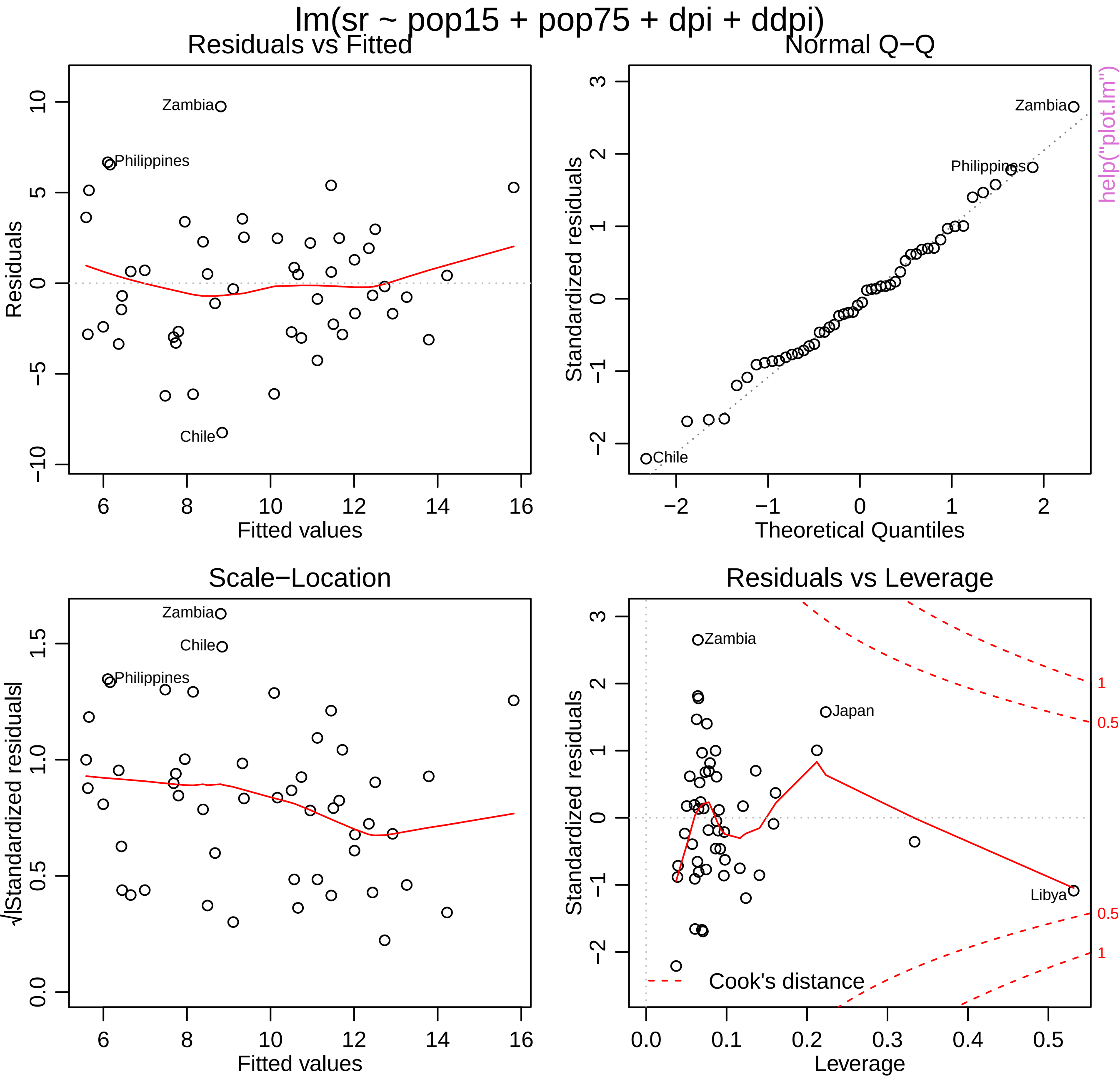

Isotonic regression isoreg(x = sample(10), y = sample(10, replace = TRUE))
help("plot.isoreg")
x$y
8
6
4
2
0
2
4
6
8
10
x0
Cumulative Data and Convex Minorant
cumsum(x$y)
40
30
20
10
0
0
2
4
6
8
10
x0


Residuals vs Fitted
Residuals
Fitted values
Zambia
Philippines
Chile
help("plot.lm")

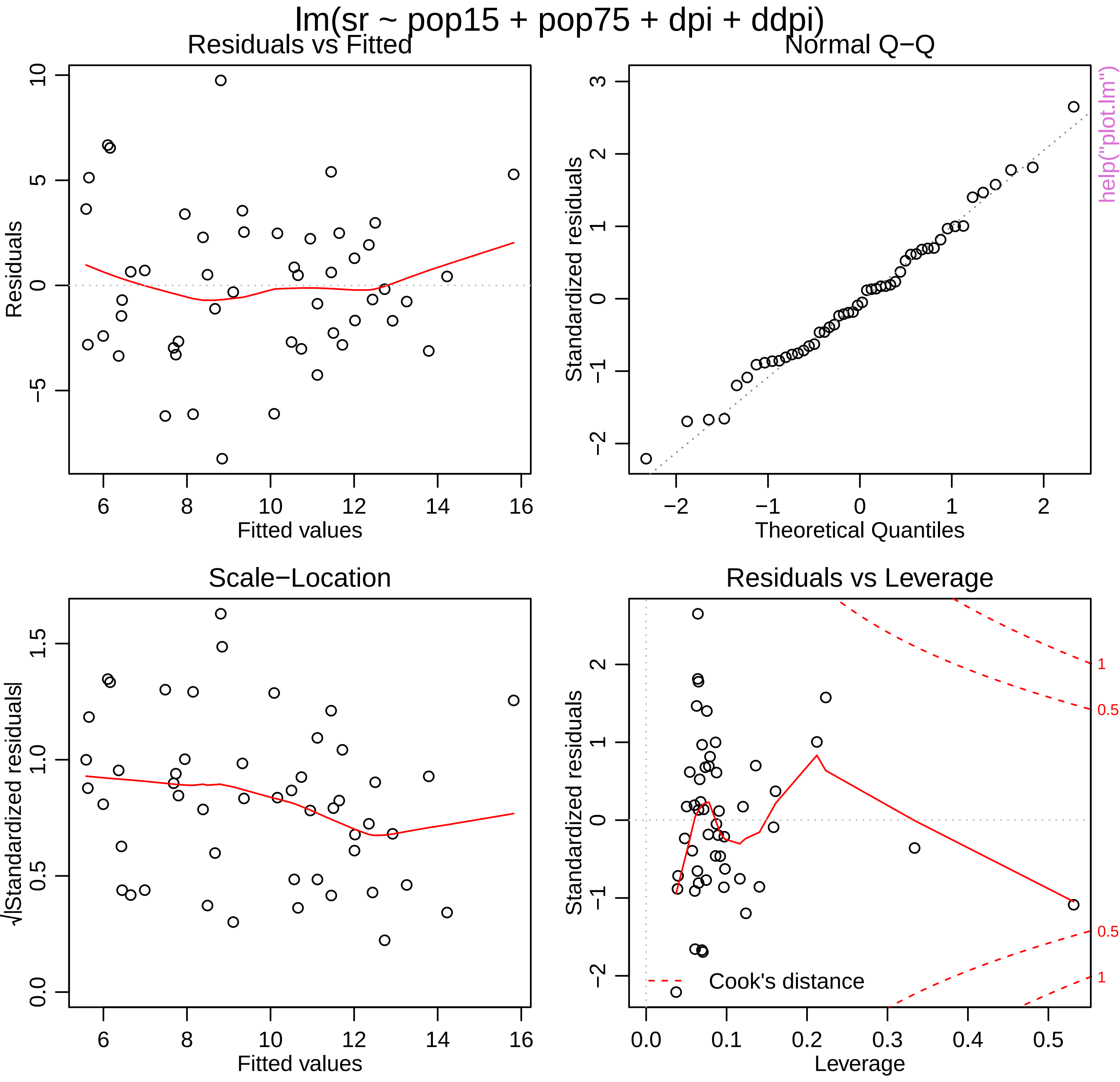

Normal Q−Q
Standardized residuals
Theoretical Quantiles
Zambia
Philippines
Chile



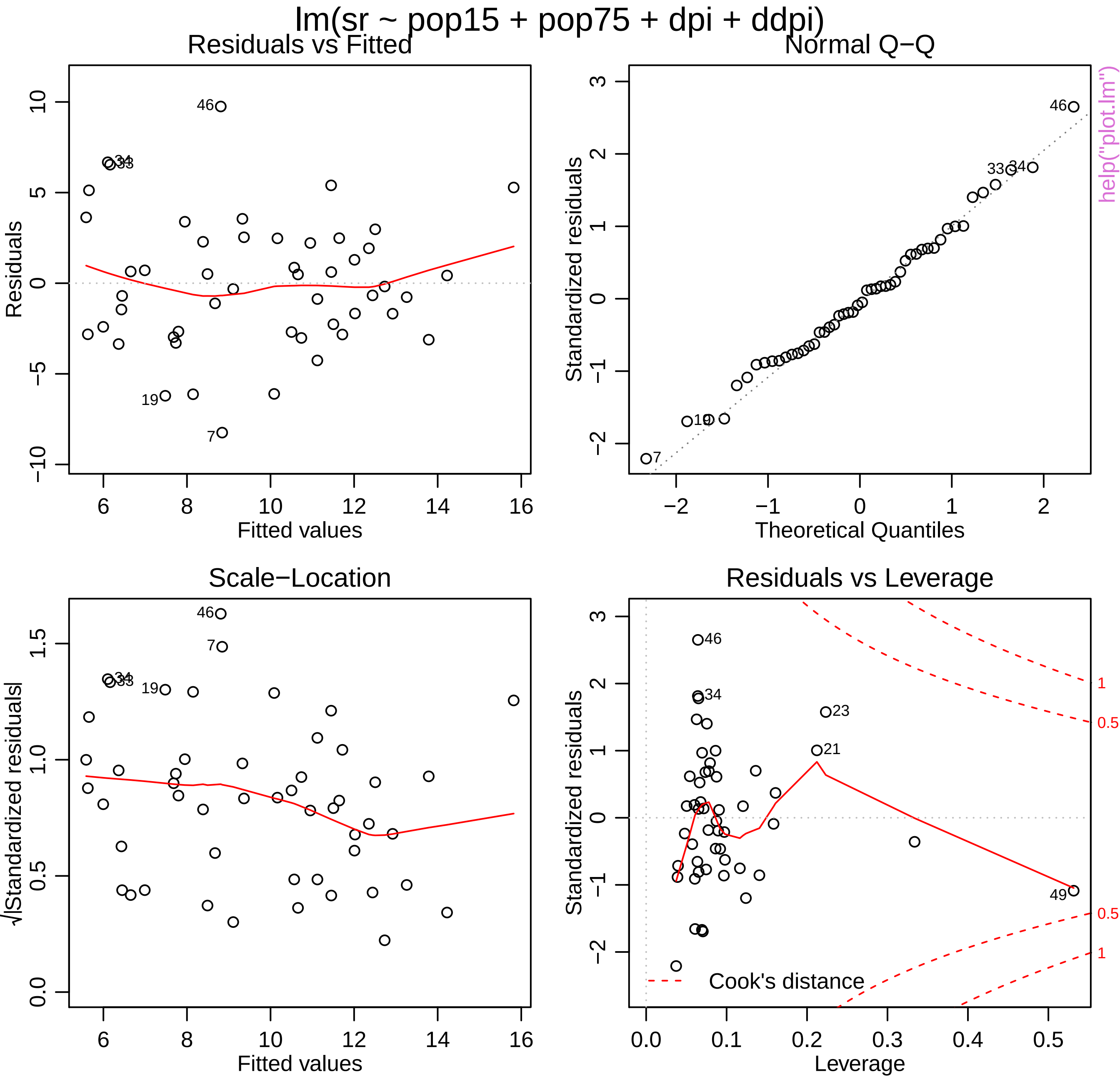
lm(sr ~ pop15 + pop75 + dpi + ddpi)
Scale−Location
Zambia
Chile
Philippines
√|Standardized residuals|
0.0
0.5
1.0
1.5
6
8
10
12
14
16
Fitted values
help("plot.lm")
Residuals vs Leverage
Zambia
Japan
Libya
Standardized residuals
−2
−1
0
1
2
3
1
0.5
0.5
1
Cook's distance
0.0
0.1
0.2
0.3
0.4
0.5
Leverage



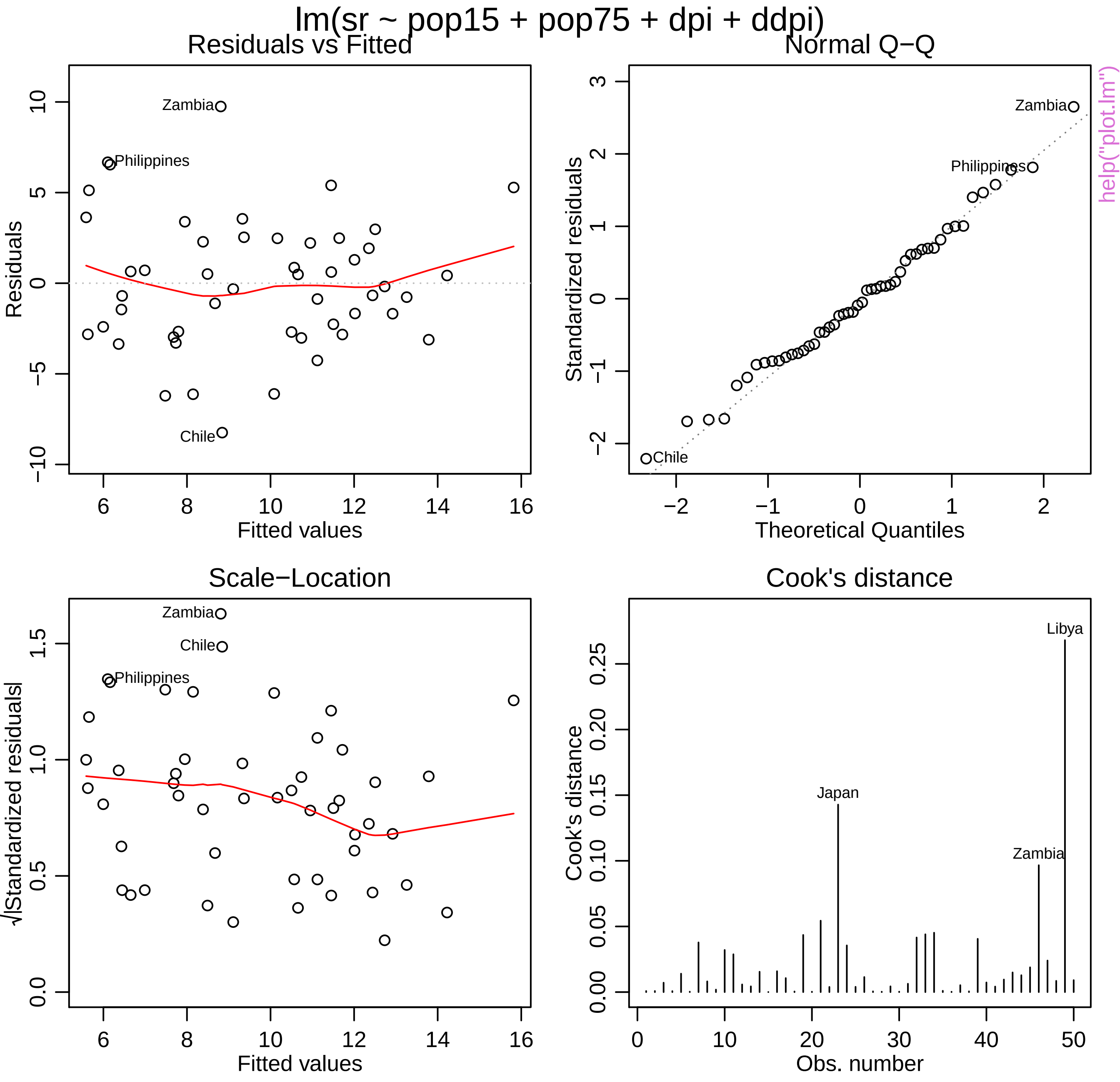
lm(sr ~ pop15 + pop75 + dpi + ddpi)
Residuals vs Fitted
Residuals
Fitted values
Zambia
Philippines
Chile
Normal Q−Q
Standardized residuals
Theoretical Quantiles
Zambia
Philippines
Chile
help("plot.lm")
Scale−Location
√|Standardized residuals|
Fitted values
Zambia
Chile
Philippines
Residuals vs Leverage
Standardized residuals
Leverage
Zambia
Japan
Libya
Cook's distance
1
0.5
0.5
1

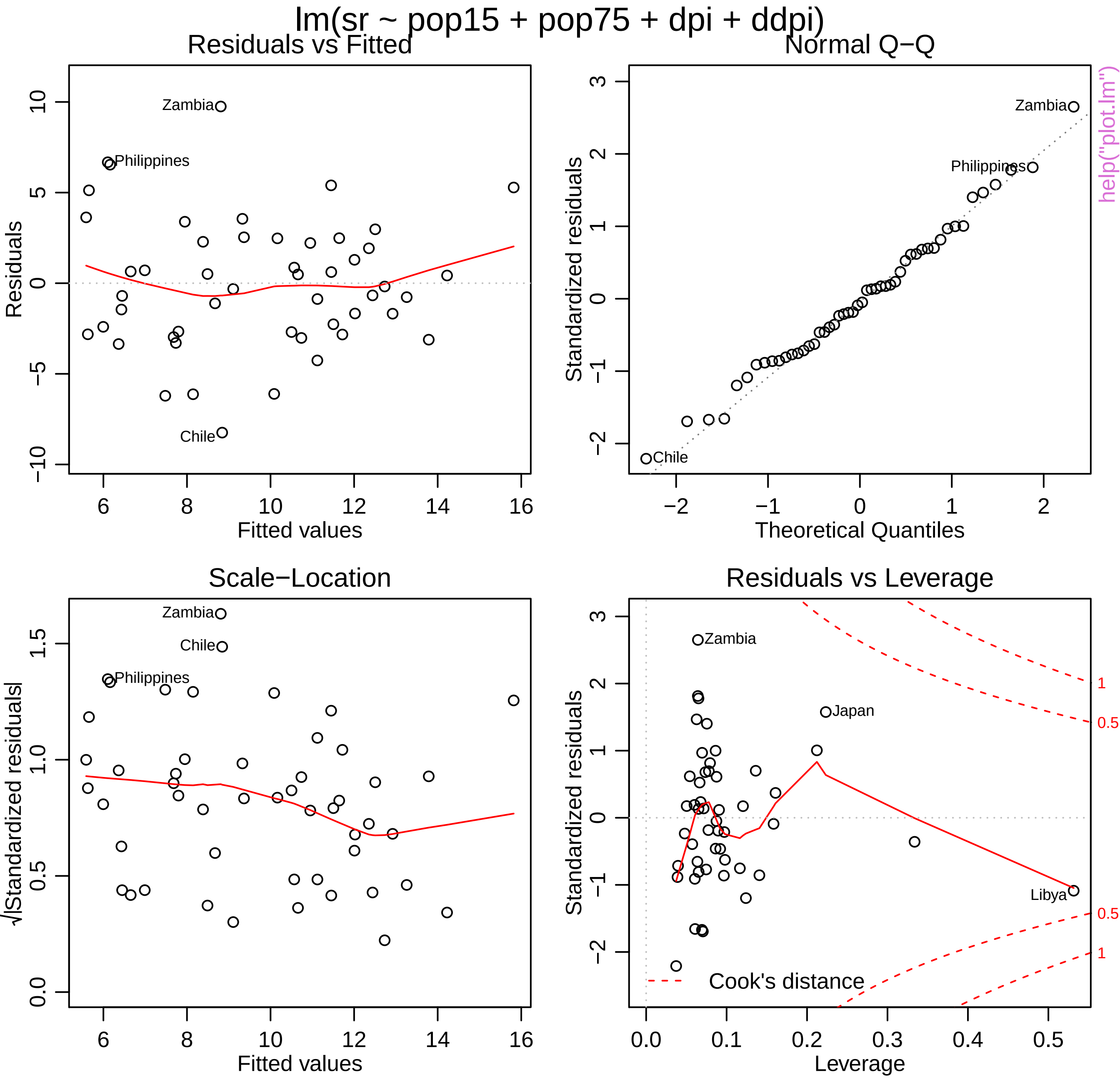


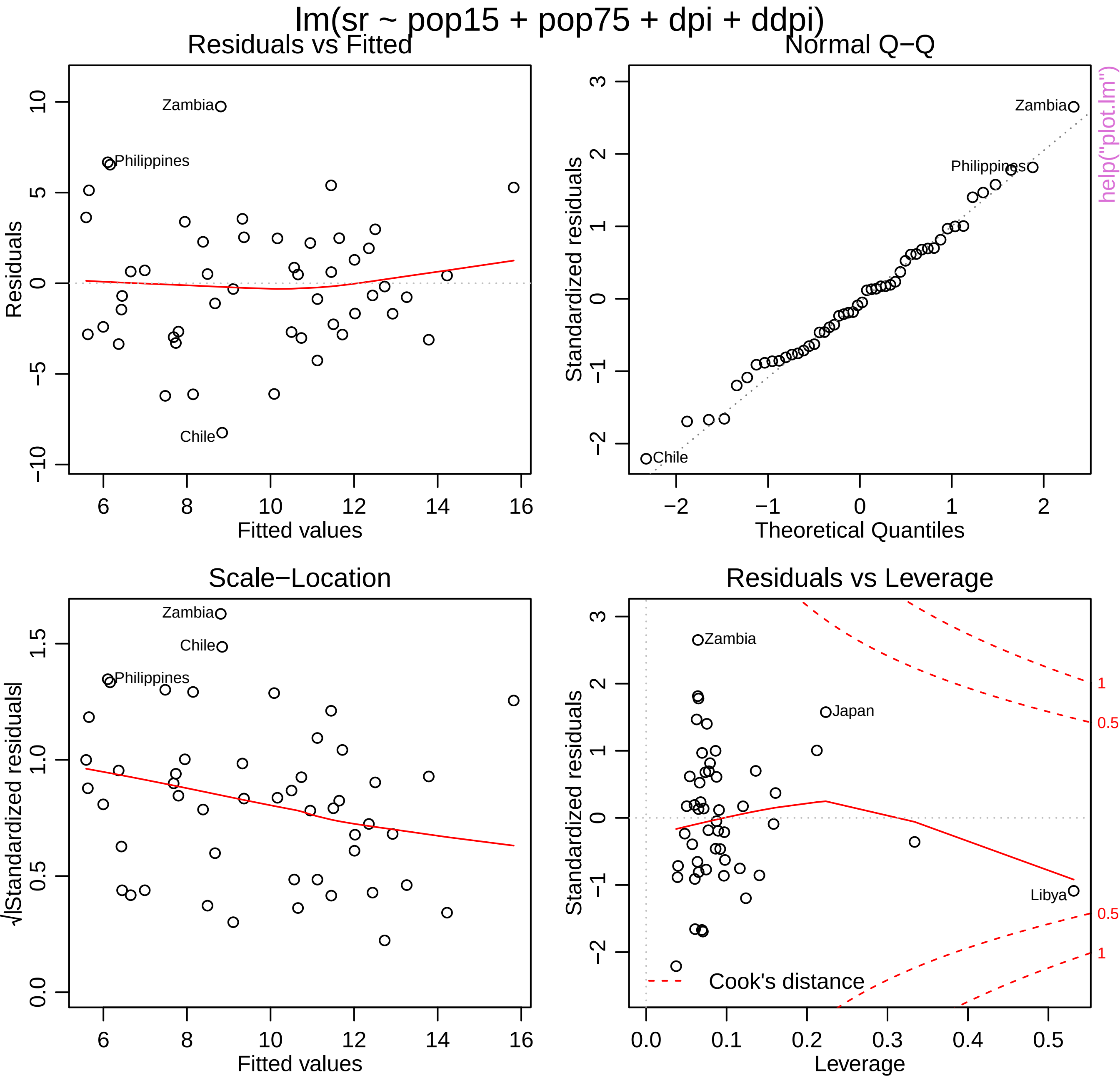
lm(sr ~ pop15 + pop75 + dpi + ddpi)
Residuals vs Fitted
Residuals
Fitted values
Normal Q−Q
Standardized residuals
Theoretical Quantiles
help("plot.lm")
Scale−Location
√|Standardized residuals|
Fitted values
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance



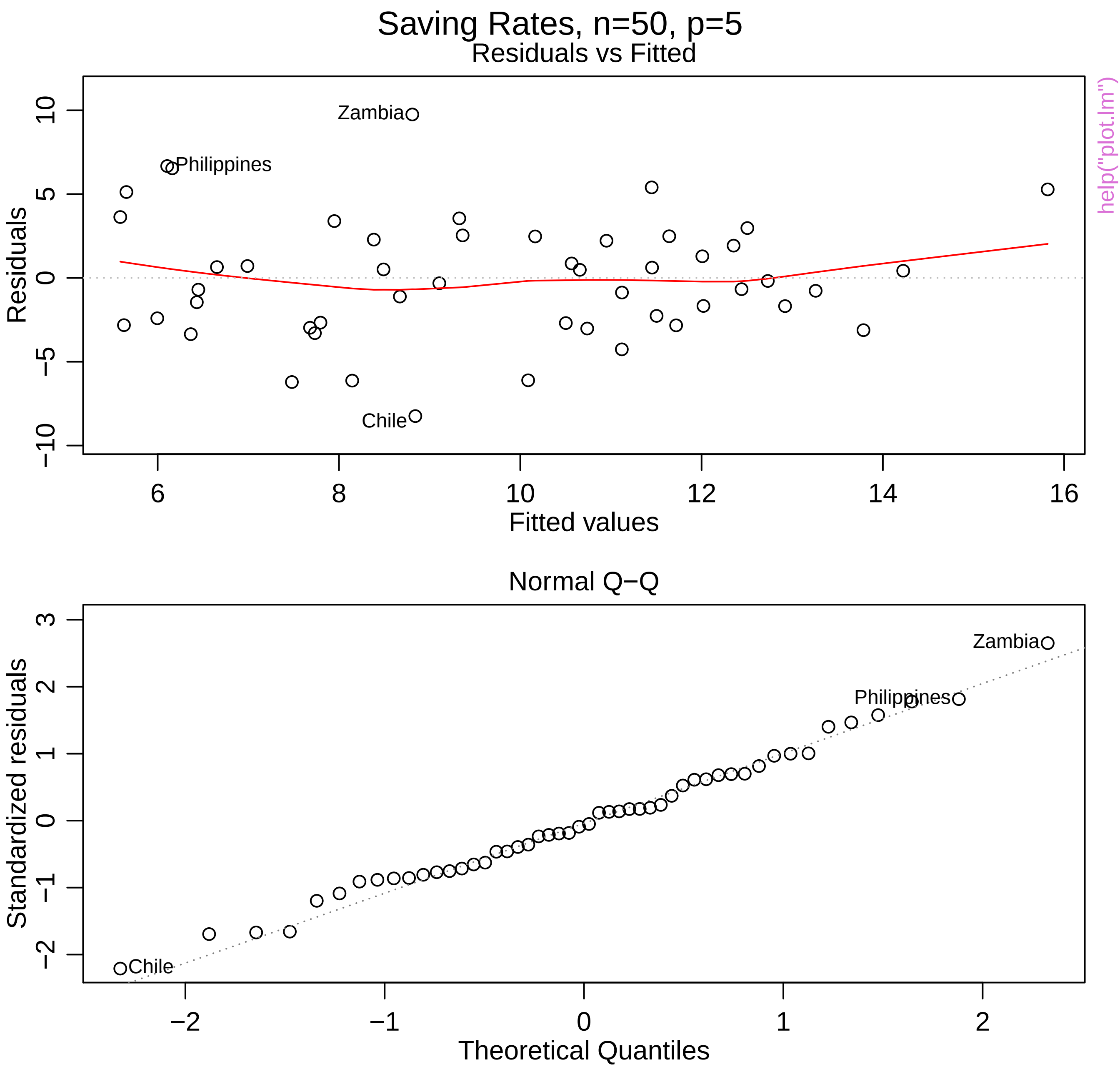
lm(sr ~ pop15 + pop75 + dpi + ddpi)
Residuals vs Fitted
Residuals
Fitted values
Normal Q−Q
Standardized residuals
Theoretical Quantiles
help("plot.lm")
Scale−Location
√|Standardized residuals|
Fitted values
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance


lm(sr ~ pop15 + pop75 + dpi + ddpi)
Residuals vs Fitted
Residuals
Fitted values
Zambia
Philippines
Chile
Normal Q−Q
Standardized residuals
Theoretical Quantiles
help("plot.lm")
Scale−Location
√|Standardized residuals|
Cook's distance
Obs. number
Libya
Japan

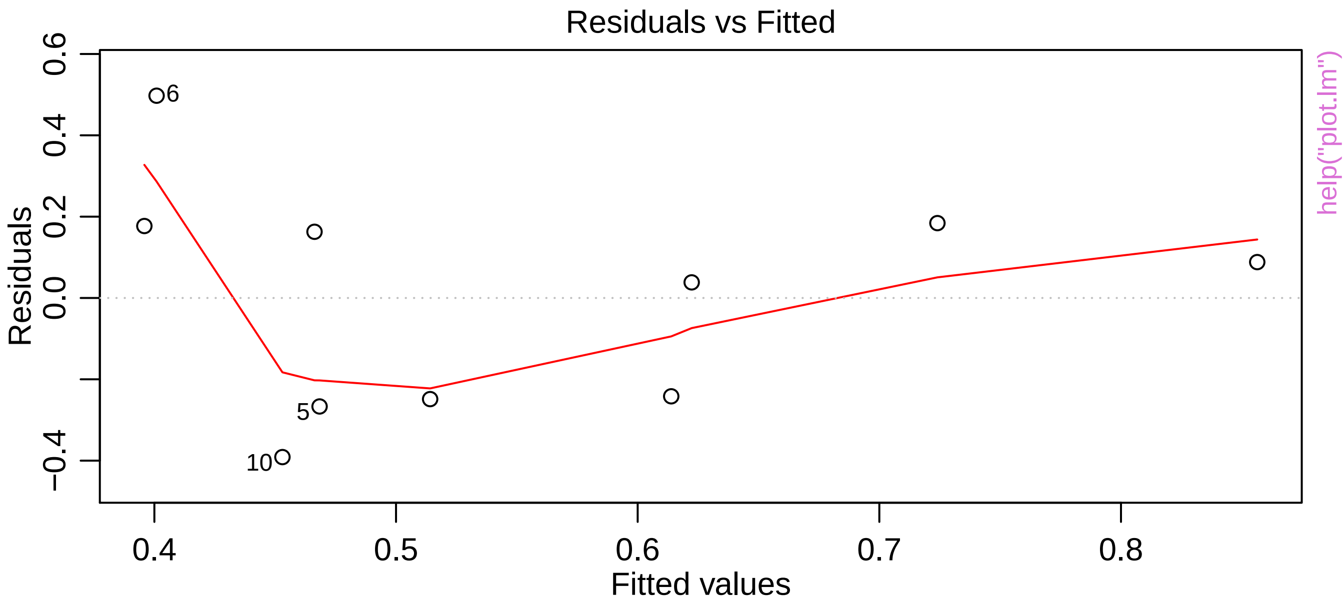

lm(sr ~ pop15 + pop75 + dpi + ddpi)
Residuals vs Fitted
Residuals
Fitted values
Zambia
Philippines
Chile
Normal Q−Q
Standardized residuals
Theoretical Quantiles
Zambia
Philippines
Chile
help("plot.lm")
Scale−Location
√|Standardized residuals|
Fitted values
Zambia
Chile
Philippines
Residuals vs Leverage
Standardized residuals
Leverage
Zambia
Japan
Libya
Cook's distance
1
0.5
0.5
1



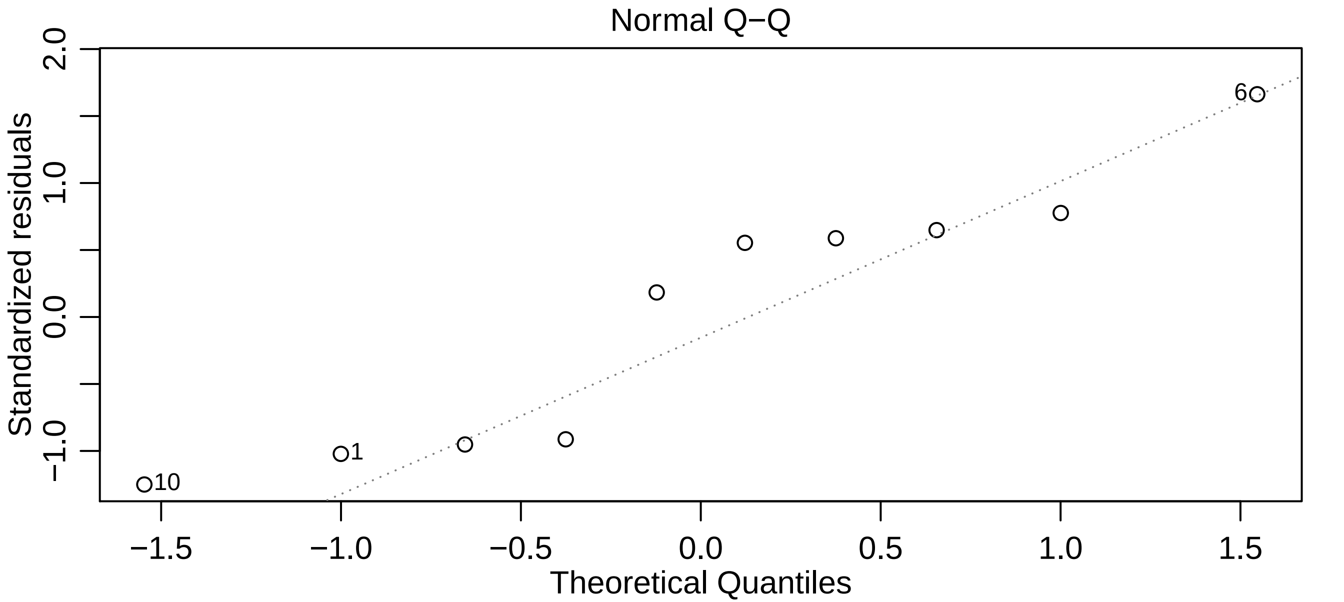
lm(sr ~ pop15 + pop75 + dpi + ddpi)
Residuals vs Fitted
Residuals
Fitted values
Zambia
Philippines
Chile
Normal Q−Q
Standardized residuals
Theoretical Quantiles
help("plot.lm")
Scale−Location
√|Standardized residuals|
Residuals vs Leverage
Leverage
Japan
Libya
Cook's distance



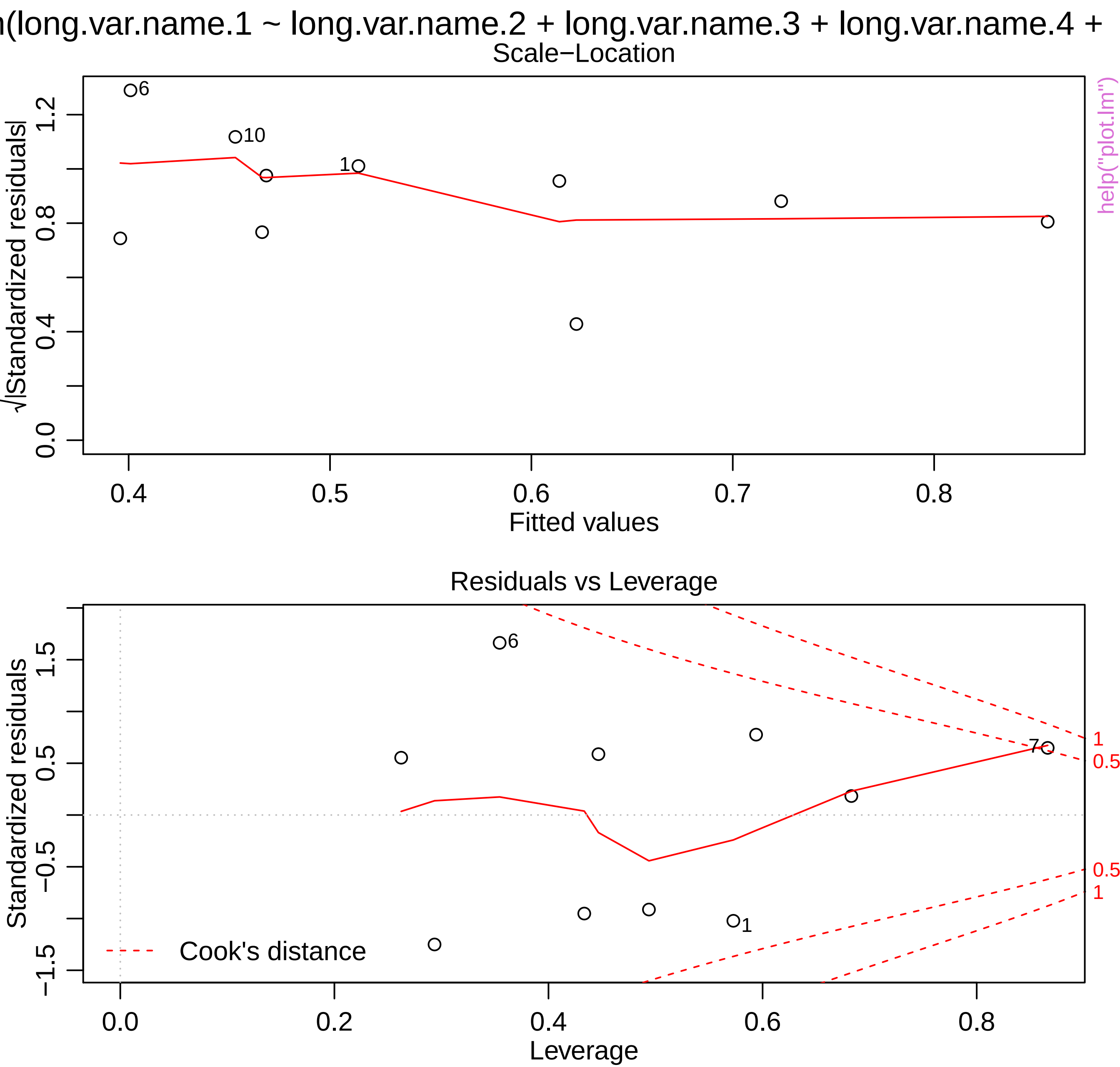
Saving Rates, n=50, p=5
Residuals vs Fitted
Zambia
Philippines
Chile
Residuals
Fitted values
help("plot.lm")
Normal Q−Q
Zambia
Philippines
Chile
Standardized residuals
Theoretical Quantiles



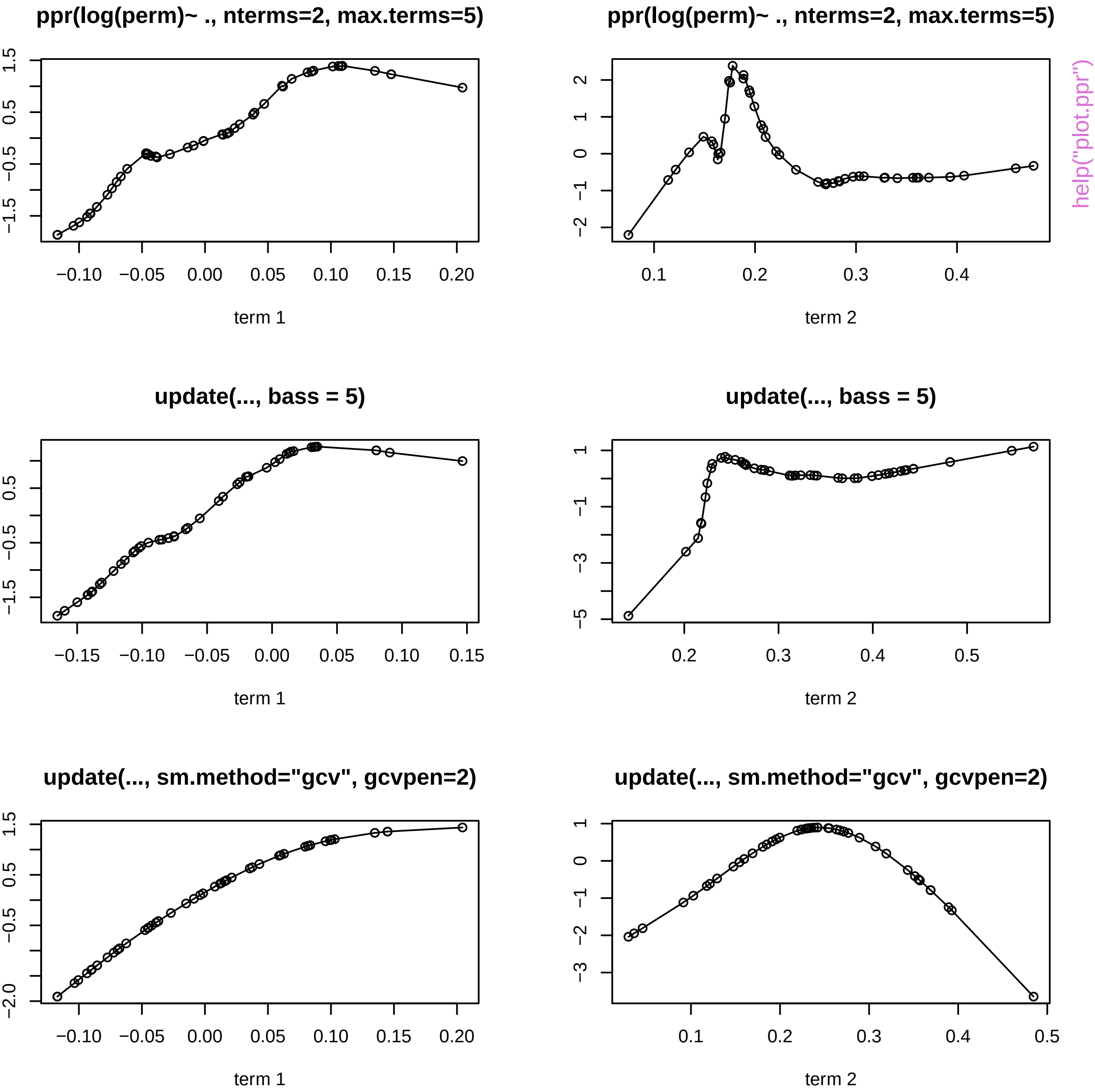
Residuals vs Fitted
Residuals
Fitted values
0.6
0.4
0.2
0.0
−0.4
0.4
0.5
0.6
0.7
0.8
6
5
10
help("plot.lm")



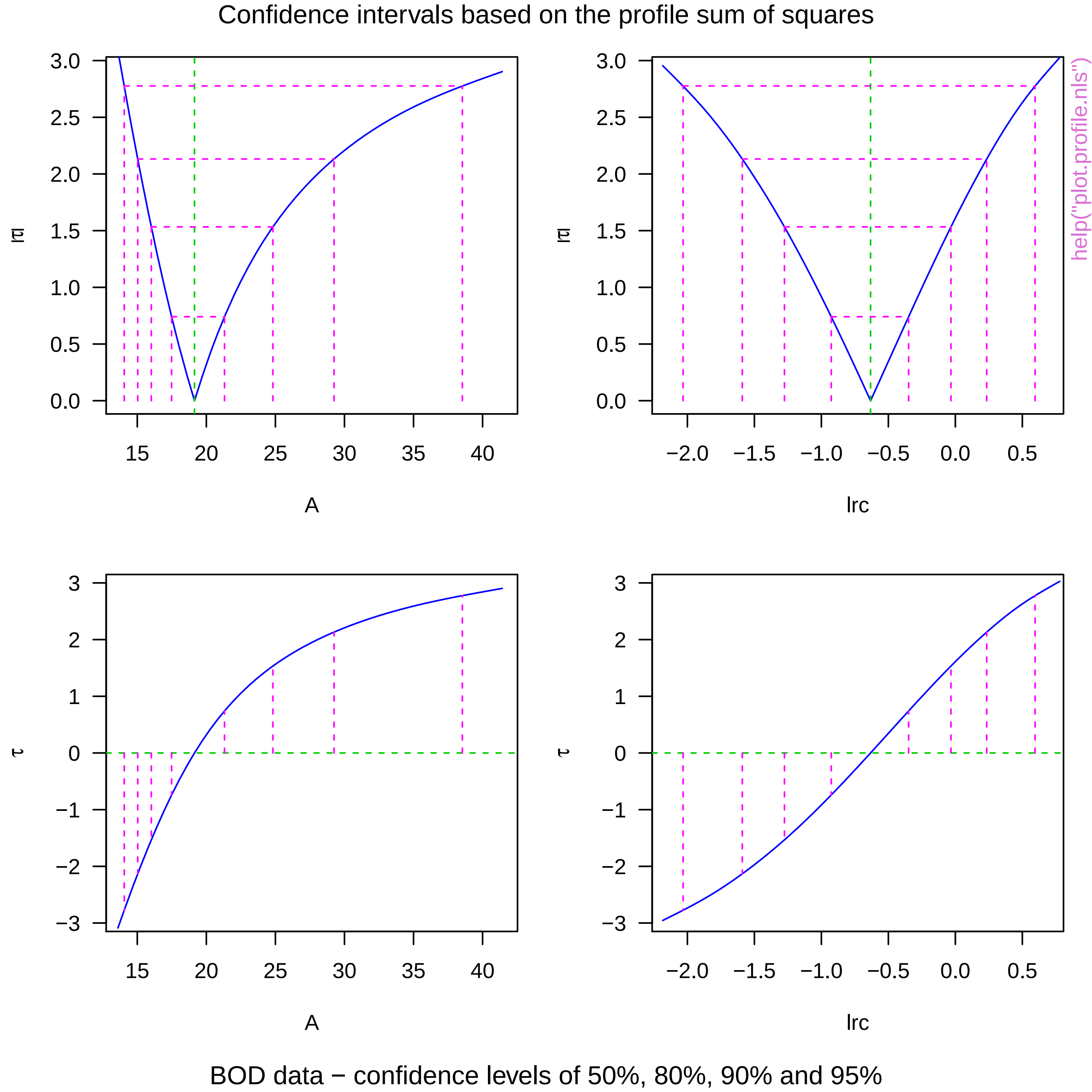
Normal Q−Q
Standardized residuals
Theoretical Quantiles
2.0
1.0
0.0
−1.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
6
1
10



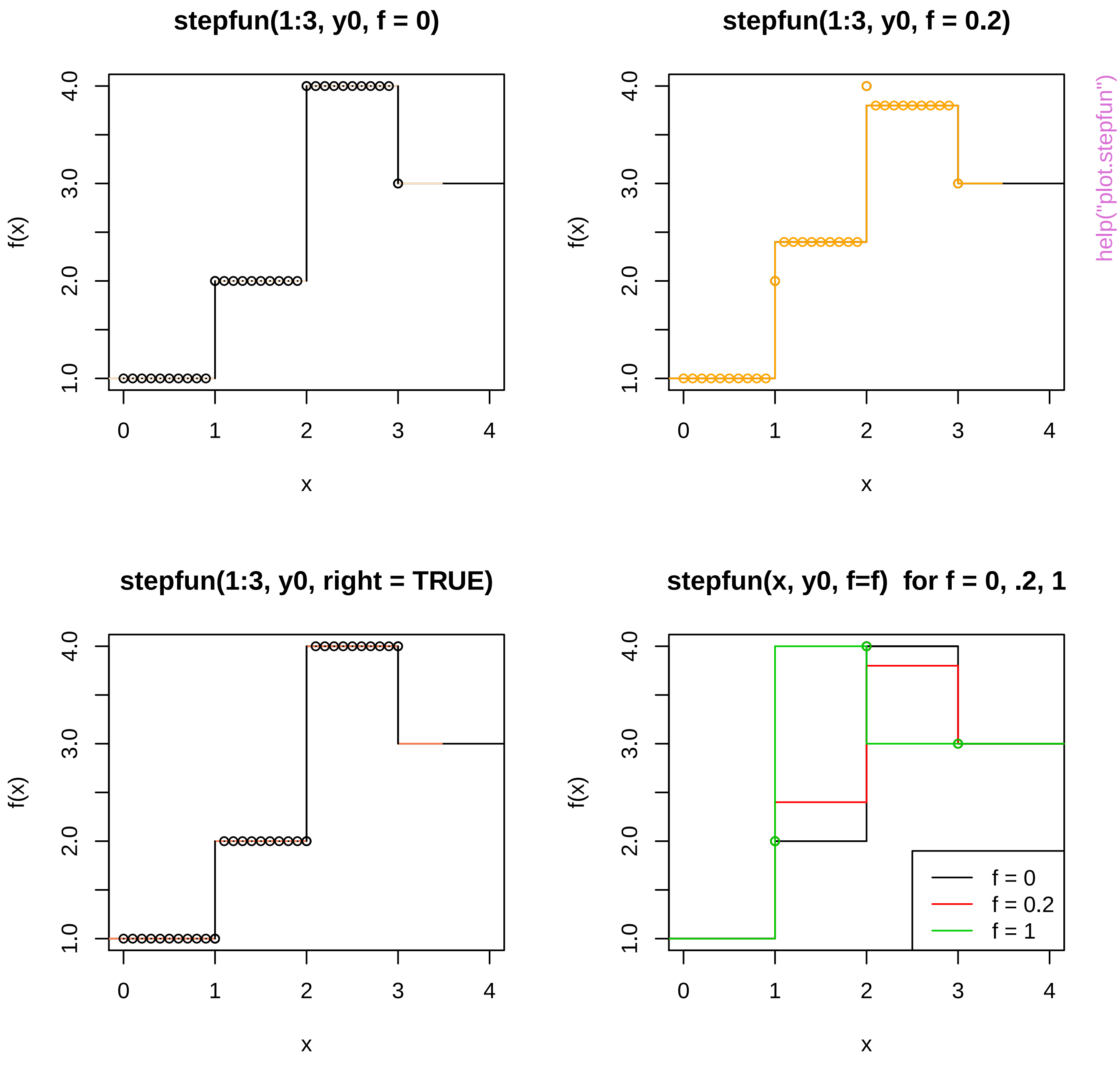
n(long.var.name.1 ~ long.var.name.2 + long.var.name.3 + long.var.name.4 +
Scale−Location
√|Standardized residuals|
Fitted values
help("plot.lm")
6
10
1
0.0
0.4
0.8
1.2
0.4
0.5
0.6
0.7
0.8
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
6
7
1
1
0.5
0.5
1
−1.5
−0.5
0.5
1.5
0.0
0.2
0.4
0.6
0.8

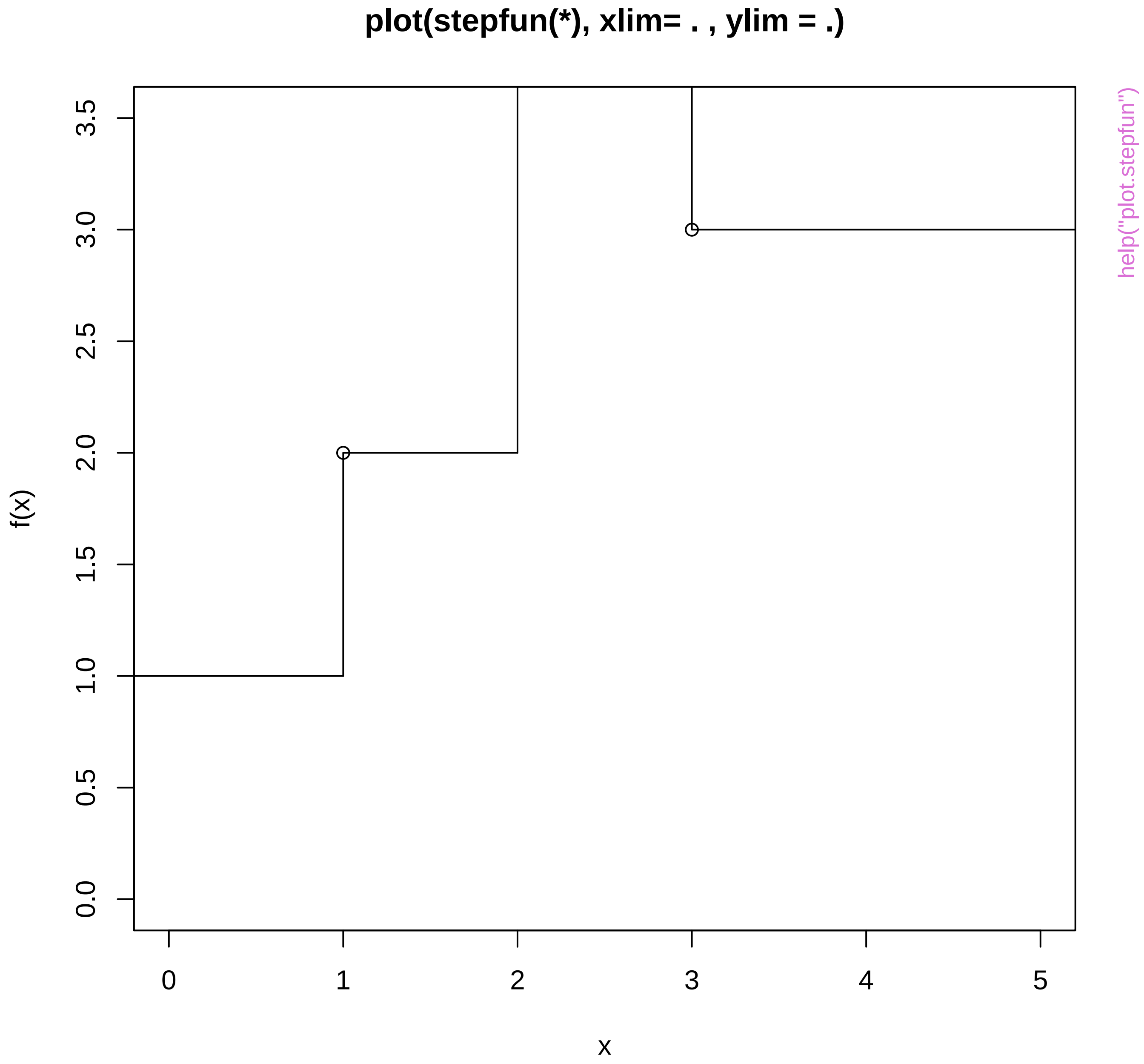


ppr(log(perm)~ ., nterms=2, max.terms=5)
ppr(log(perm)~ ., nterms=2, max.terms=5)
update(..., bass = 5)
update(..., bass = 5)
update(..., sm.method="gcv", gcvpen=2)
update(..., sm.method="gcv", gcvpen=2)
term 1
term 2
help("plot.ppr")

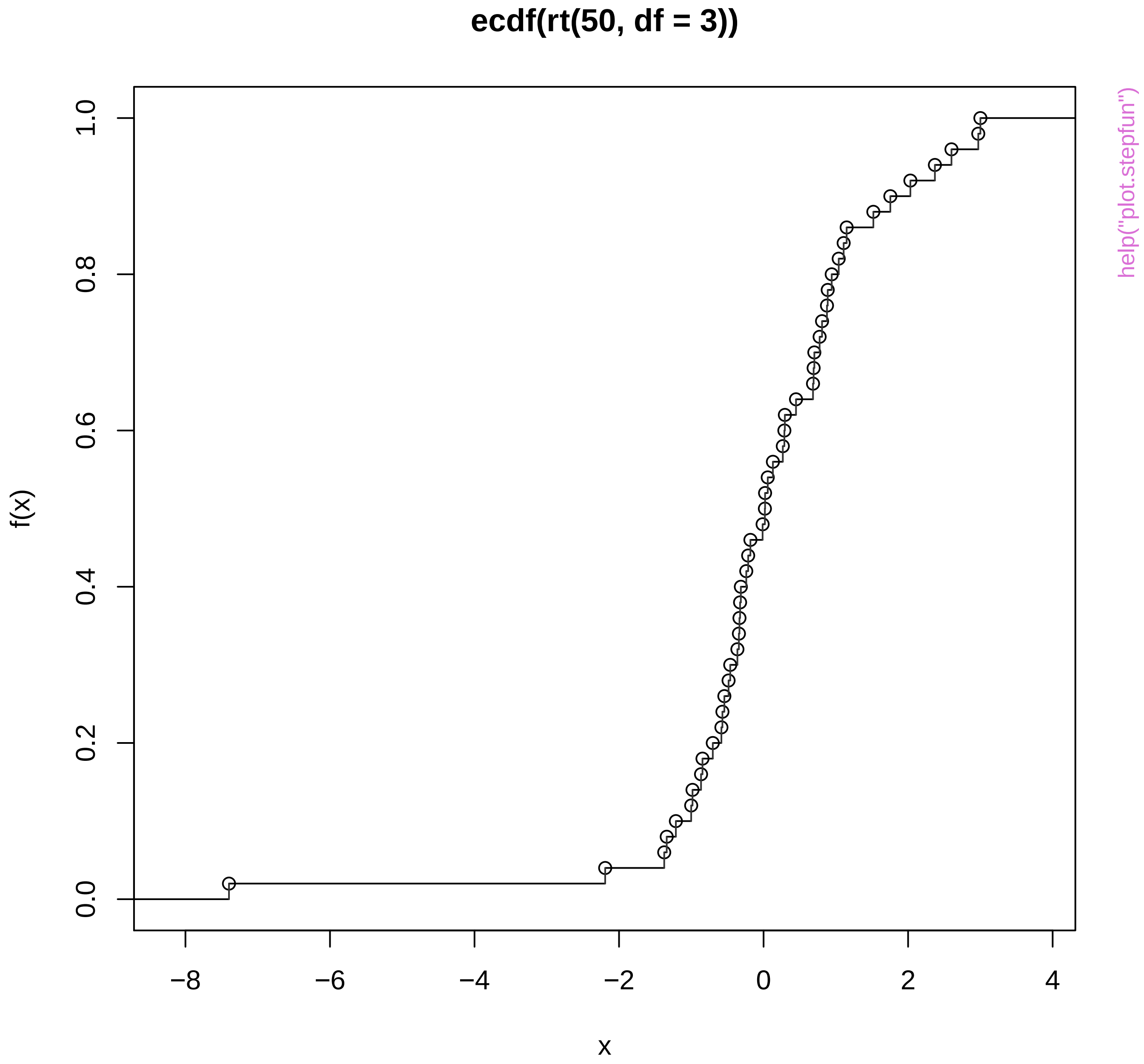


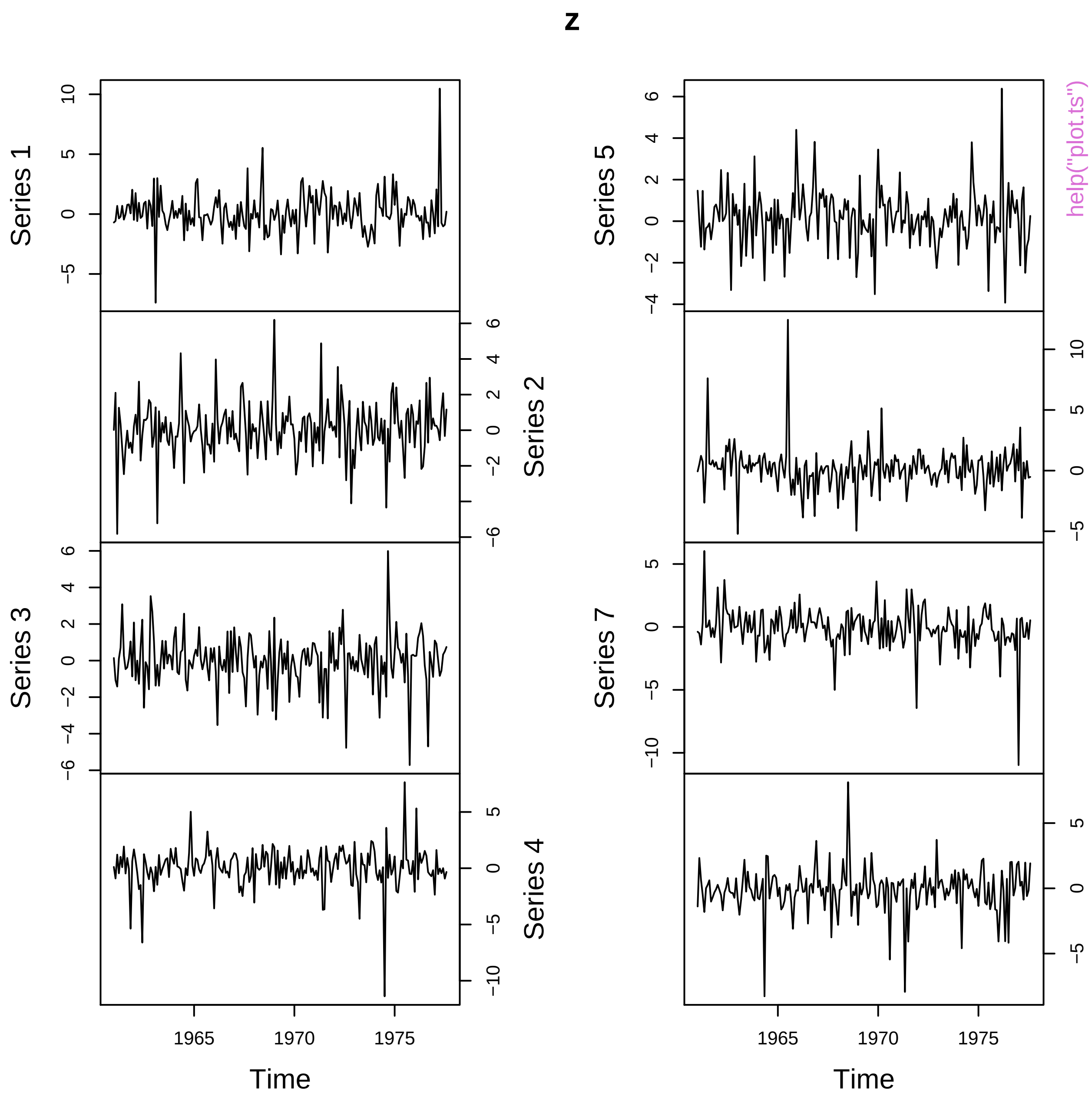
Confidence intervals based on the profile sum of squares
help("plot.profile.nls")
|τ|
τ
A
lrc
0.0
0.5
1.0
1.5
2.0
2.5
3.0
15
20
25
30
35
40
−2.0
−1.5
−1.0
−0.5
0.0
0.5
−3
−2
−1
0
1
2
3
BOD data − confidence levels of 50%, 80%, 90% and 95%


stepfun(1:3, y0, f = 0)
stepfun(1:3, y0, f = 0.2)
stepfun(1:3, y0, right = TRUE)
stepfun(x, y0, f=f) for f = 0, .2, 1
f(x)
x
1.0
2.0
3.0
4.0
0
1
2
3
4
f = 0
f = 0.2
f = 1
help("plot.stepfun")

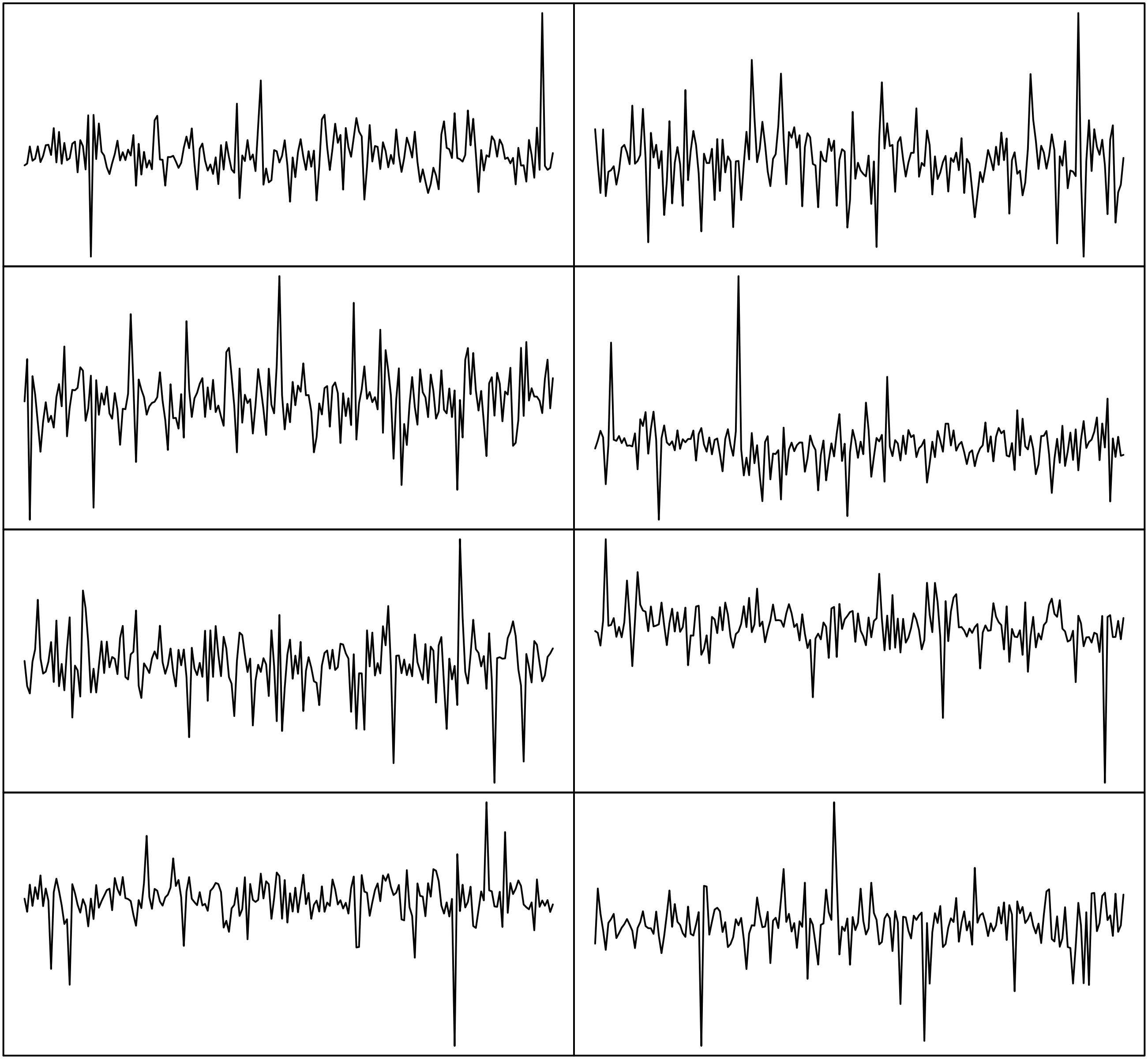


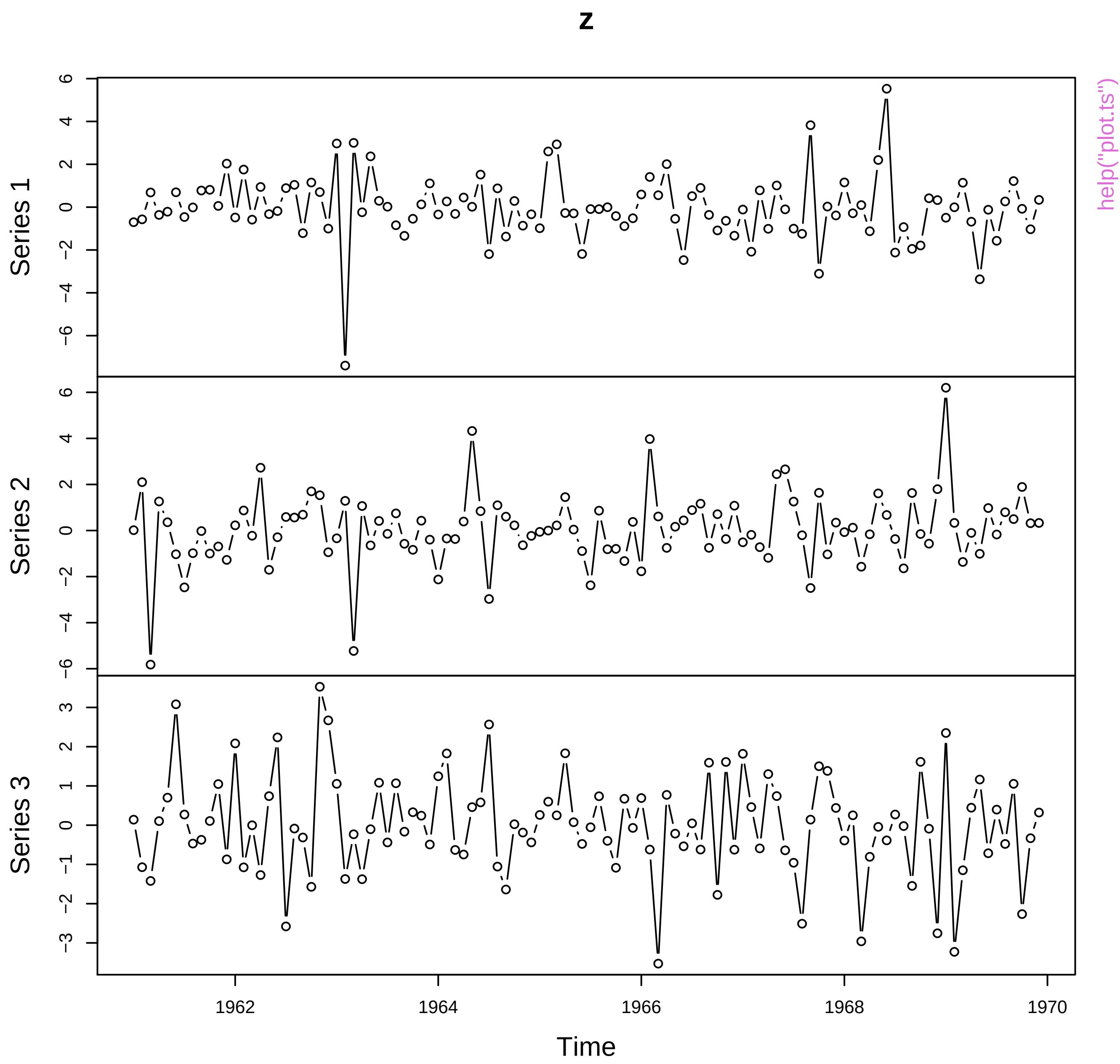
plot(stepfun(*), xlim= . , ylim = .)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
f(x)
0
1
2
3
4
5
x
help("plot.stepfun")

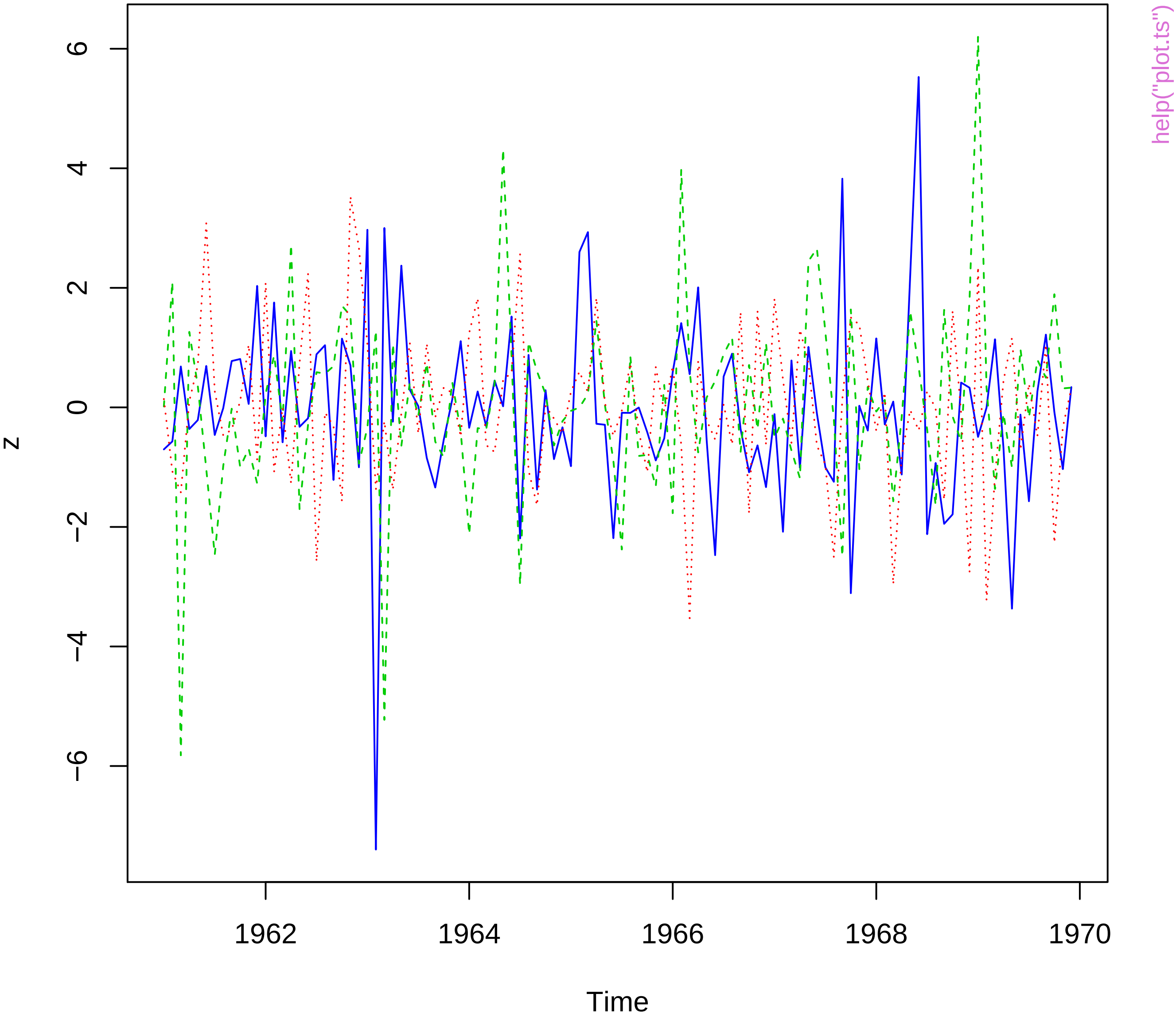

ecdf(rt(50, df = 3))
f(x)
x
0.0
0.2
0.4
0.6
0.8
1.0
−8
−6
−4
−2
0
2
4
help("plot.stepfun")


z
Series 1
Series 2
Series 3
Series 4
Series 5
Series 6
Series 7
Series 8
Time
Time
1965
1970
1975
help("plot.ts")

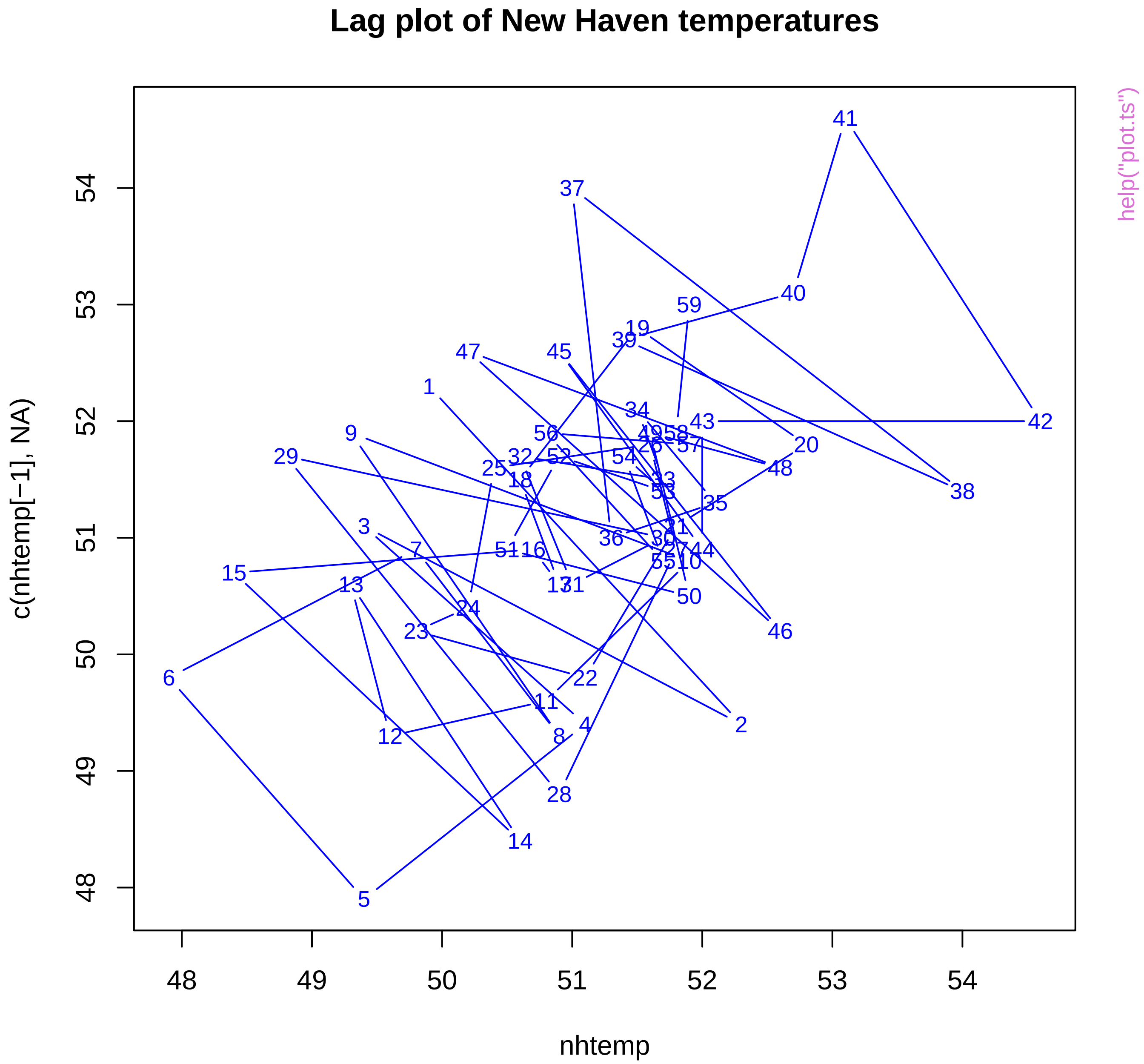
plot(ts(..), axes=FALSE, ann=FALSE, frame.plot=TRUE, mar..., oma...)

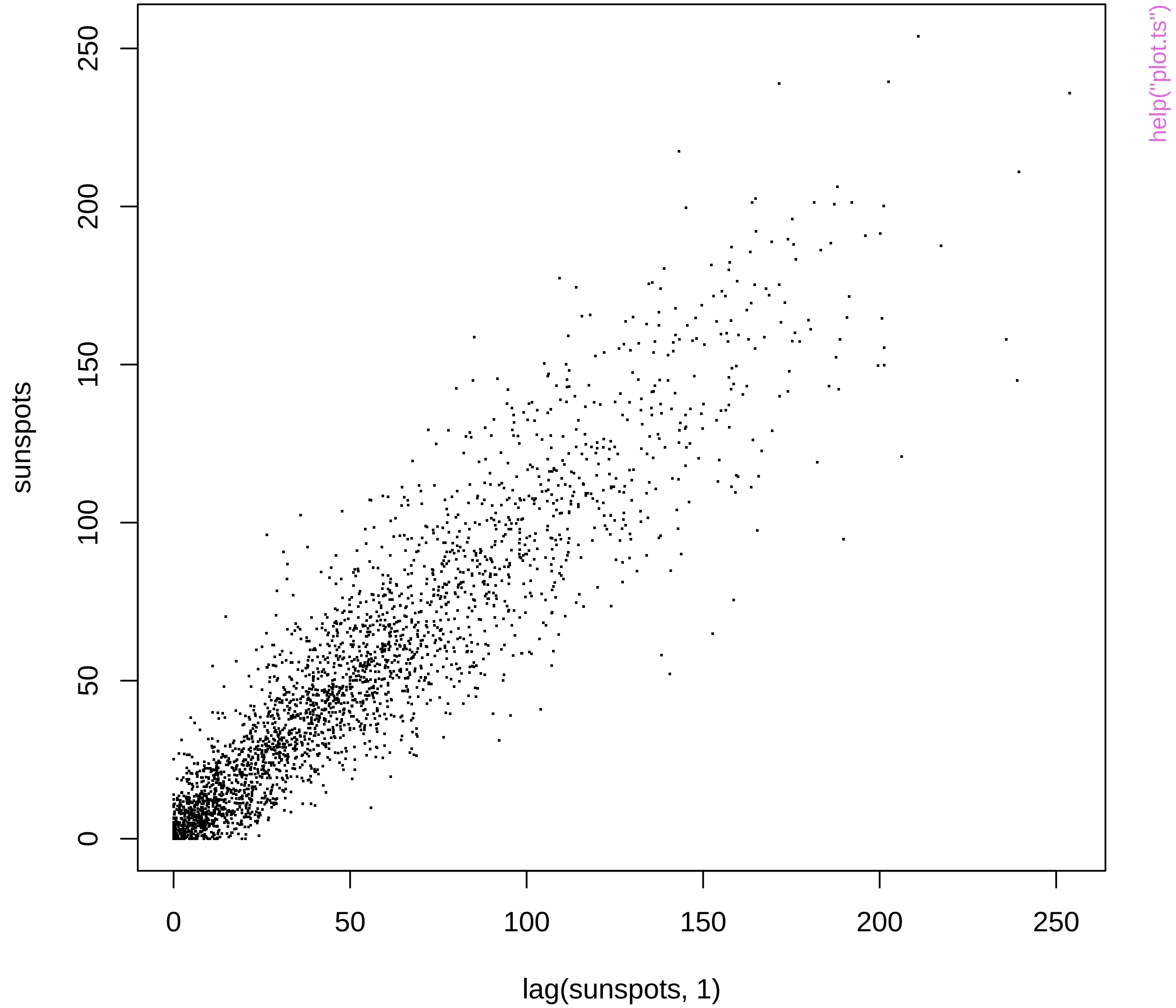



z
Series 1
Series 2
Series 3
Time
1962
1964
1966
1968
1970
help("plot.ts")

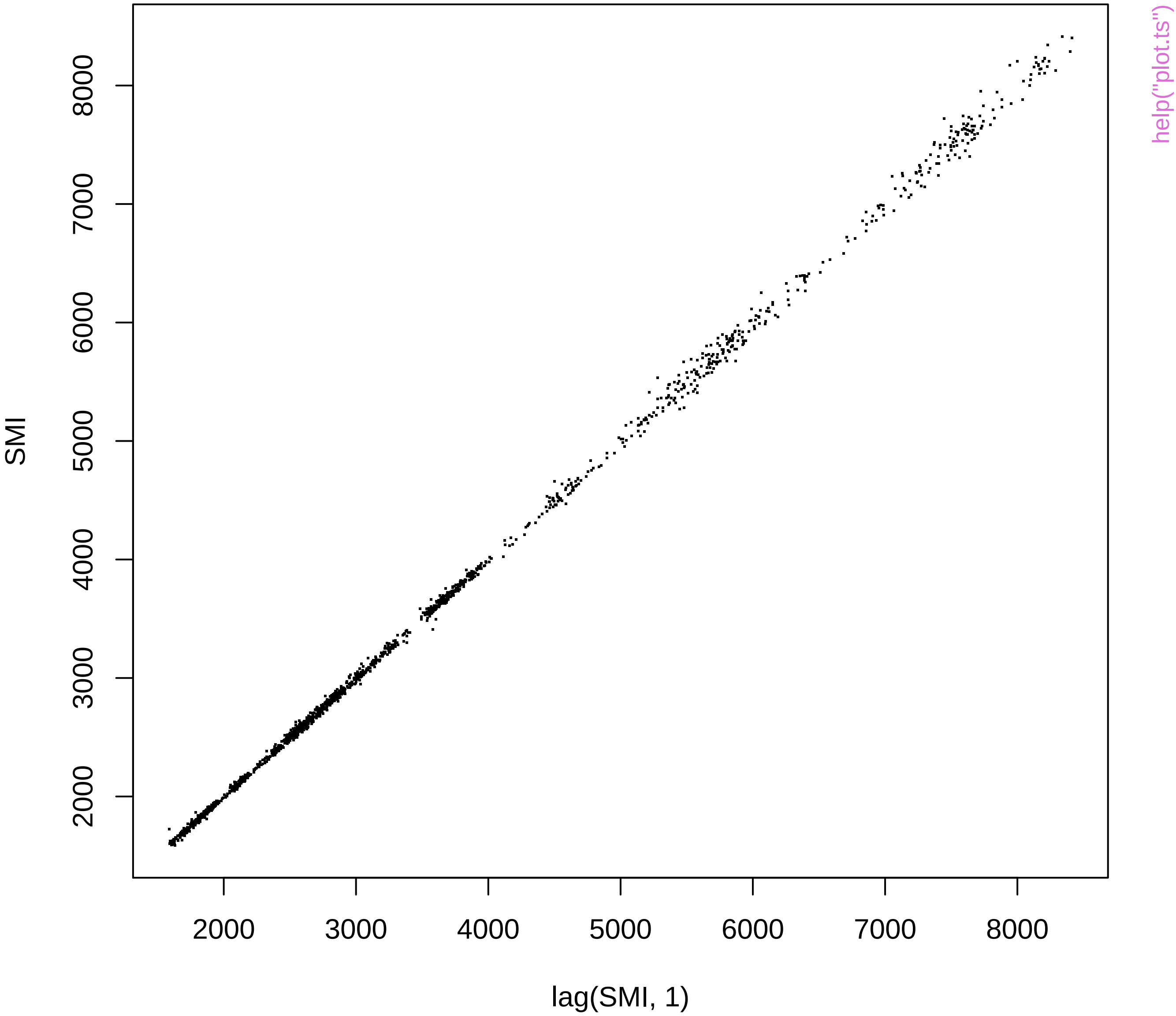


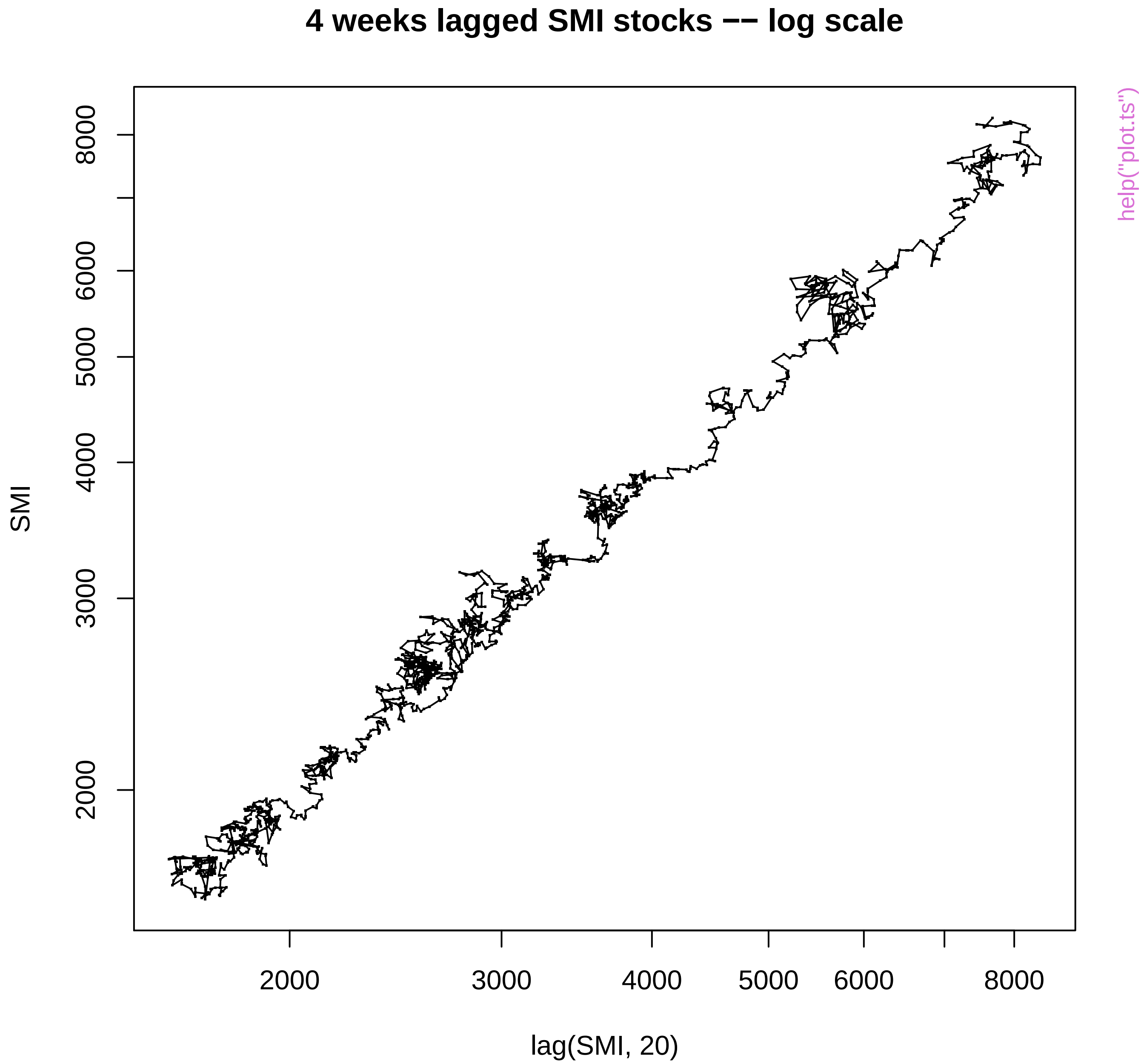
6
4
2
0
−2
−4
−6
z
1962
1964
1966
1968
1970
Time
help("plot.ts")

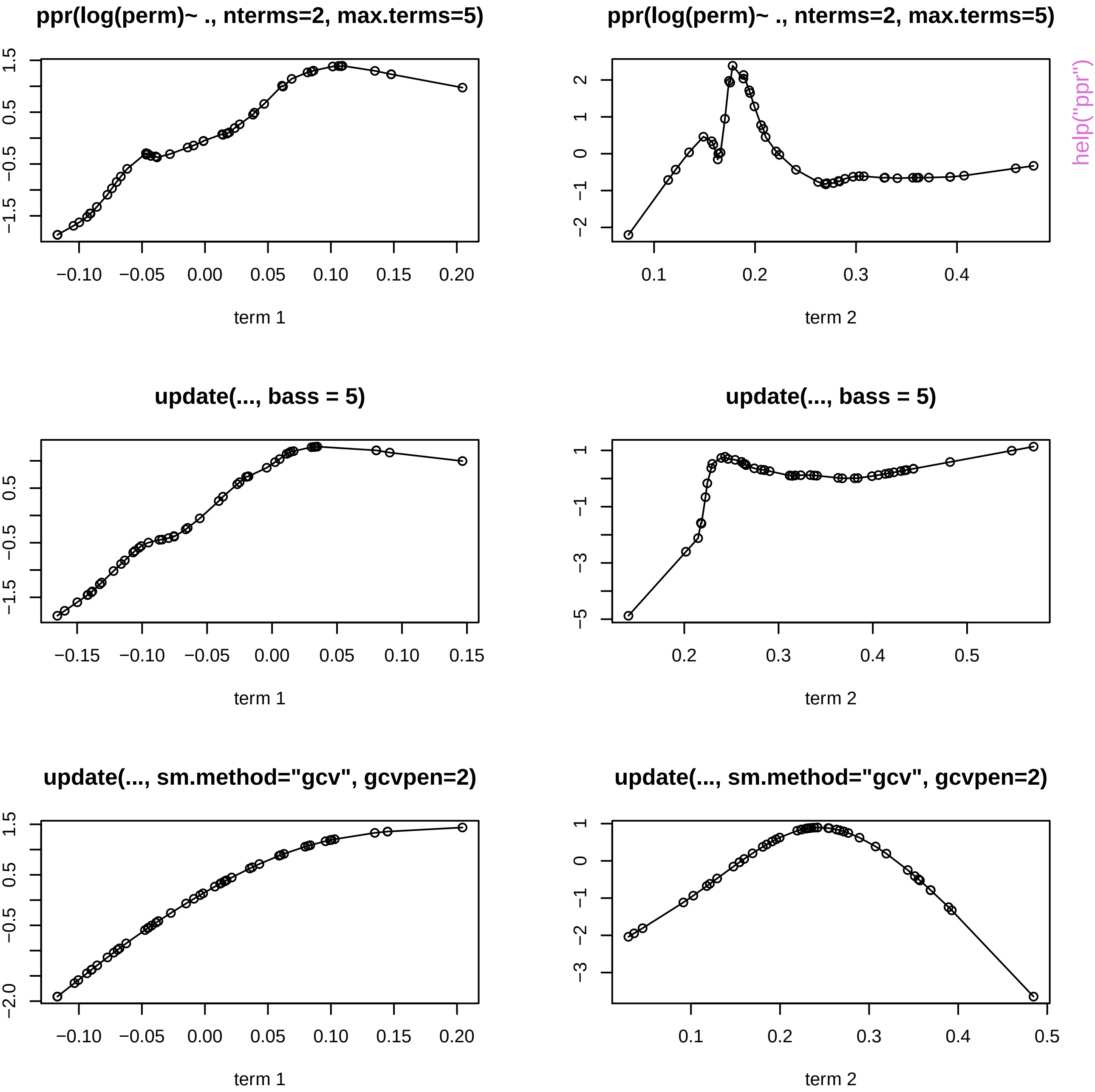

Lag plot of New Haven temperatures
c(nhtemp[−1], NA)
nhtemp
help("plot.ts")

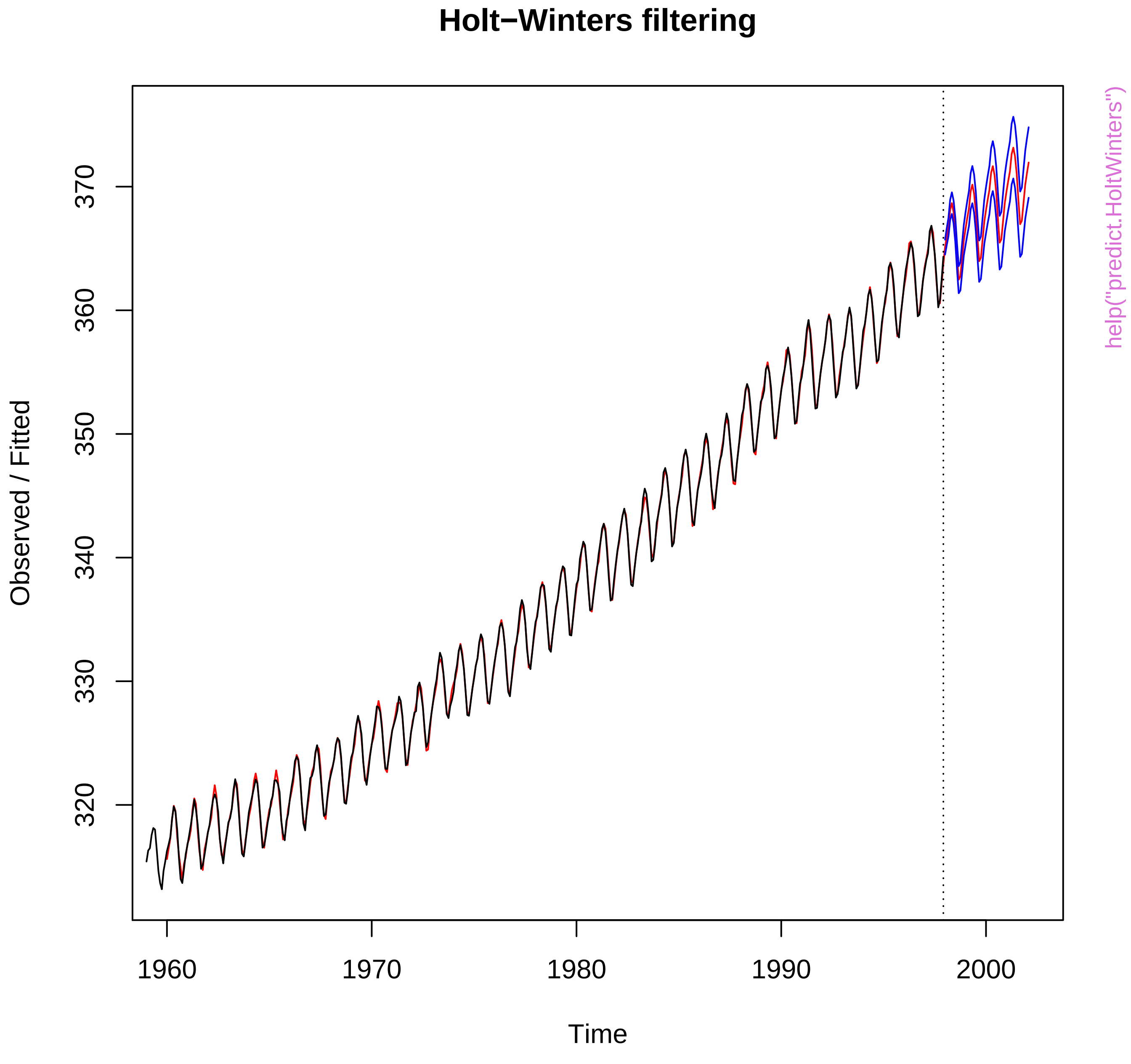


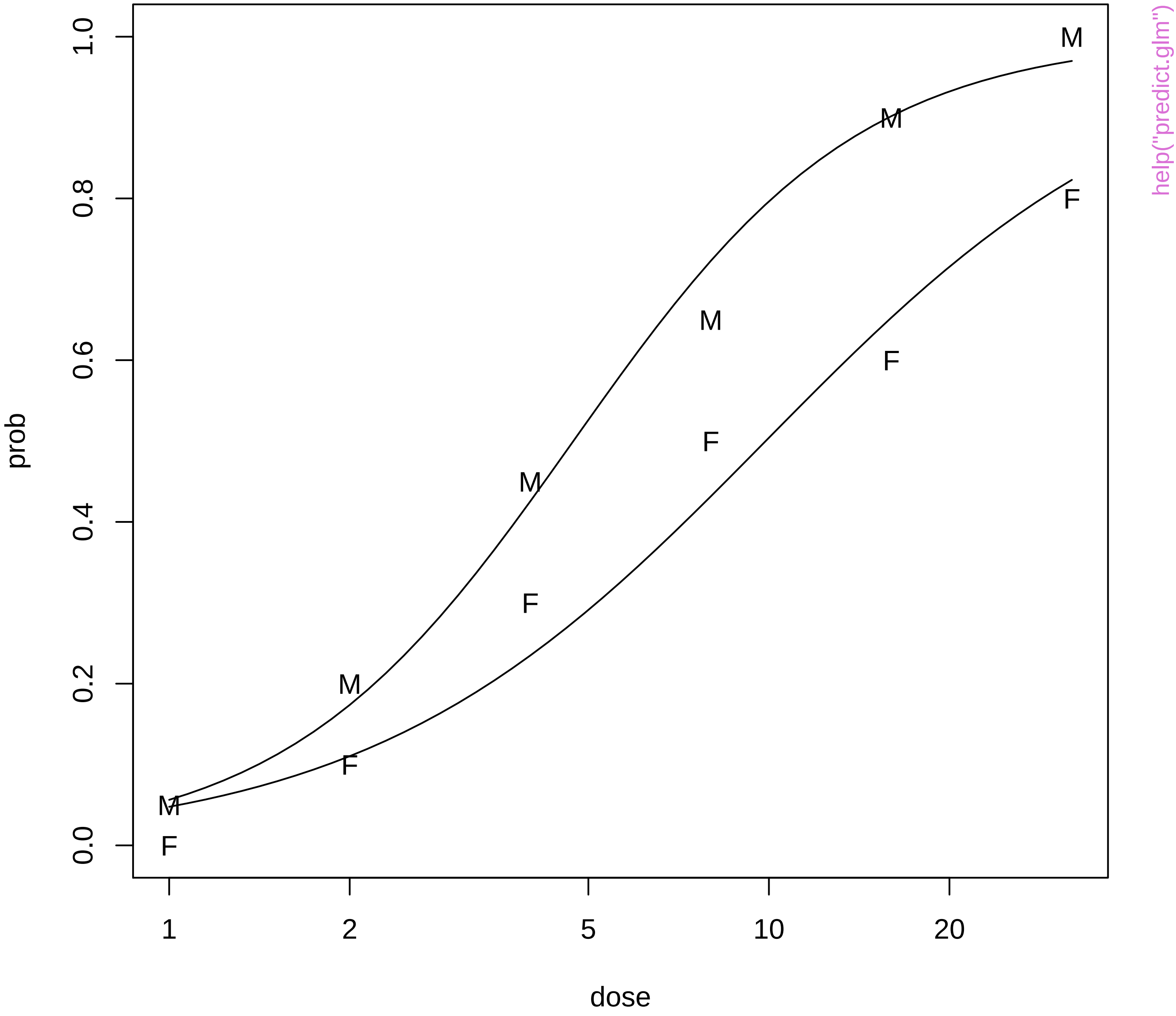
sunspots
0
50
100
150
200
250
lag(sunspots, 1)
help("plot.ts")


SMI
8000
7000
6000
5000
4000
3000
2000
2000
3000
4000
5000
6000
7000
8000
lag(SMI, 1)
help("plot.ts")

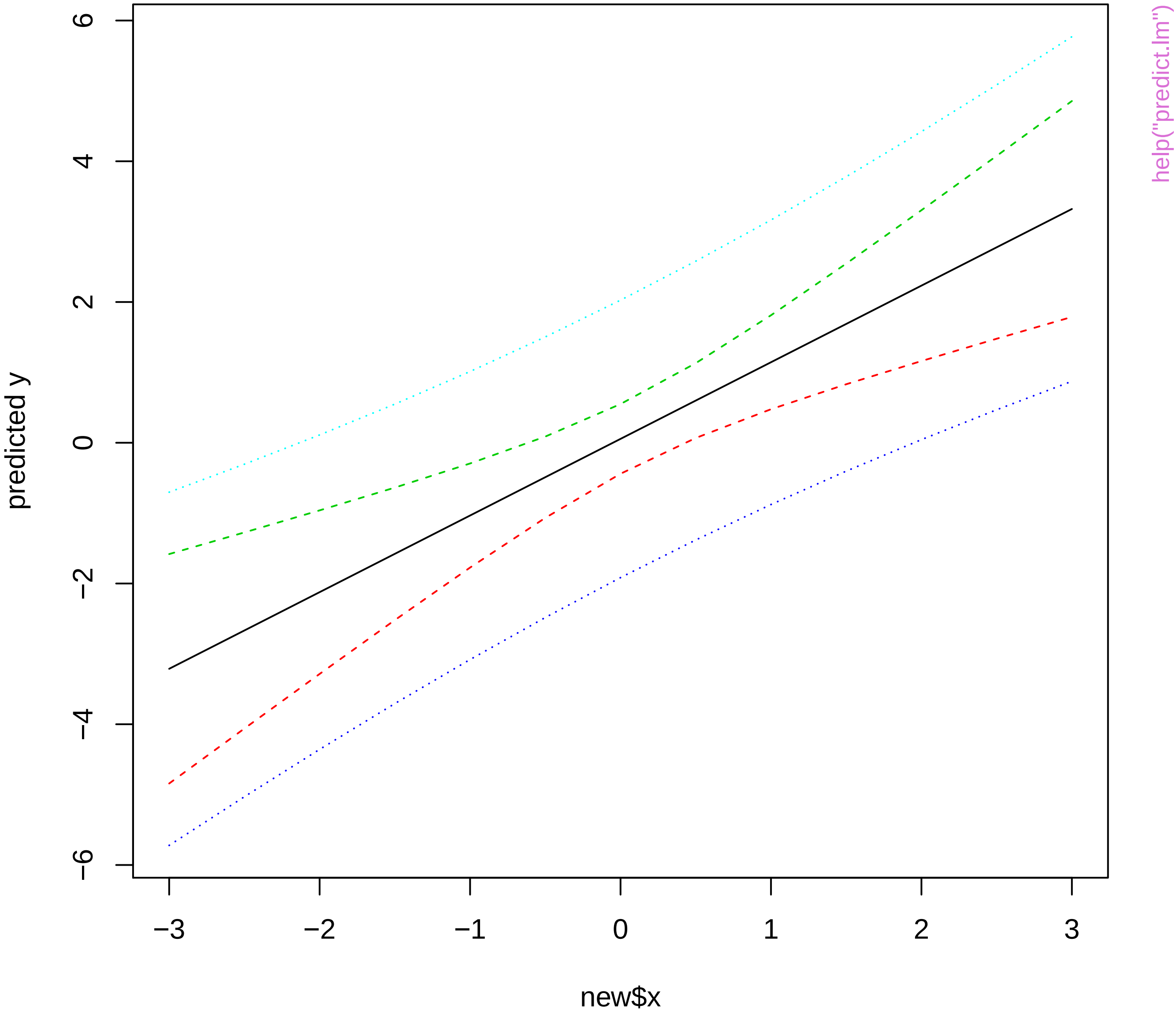

4 weeks lagged SMI stocks -- log scale
SMI
lag(SMI, 20)
2000
3000
4000
5000
6000
8000
2000
3000
4000
5000
6000
8000
help("plot.ts")


ppr(log(perm)~ ., nterms=2, max.terms=5)
update(..., bass = 5)
update(..., sm.method="gcv", gcvpen=2)
term 1
term 2
help("ppr")

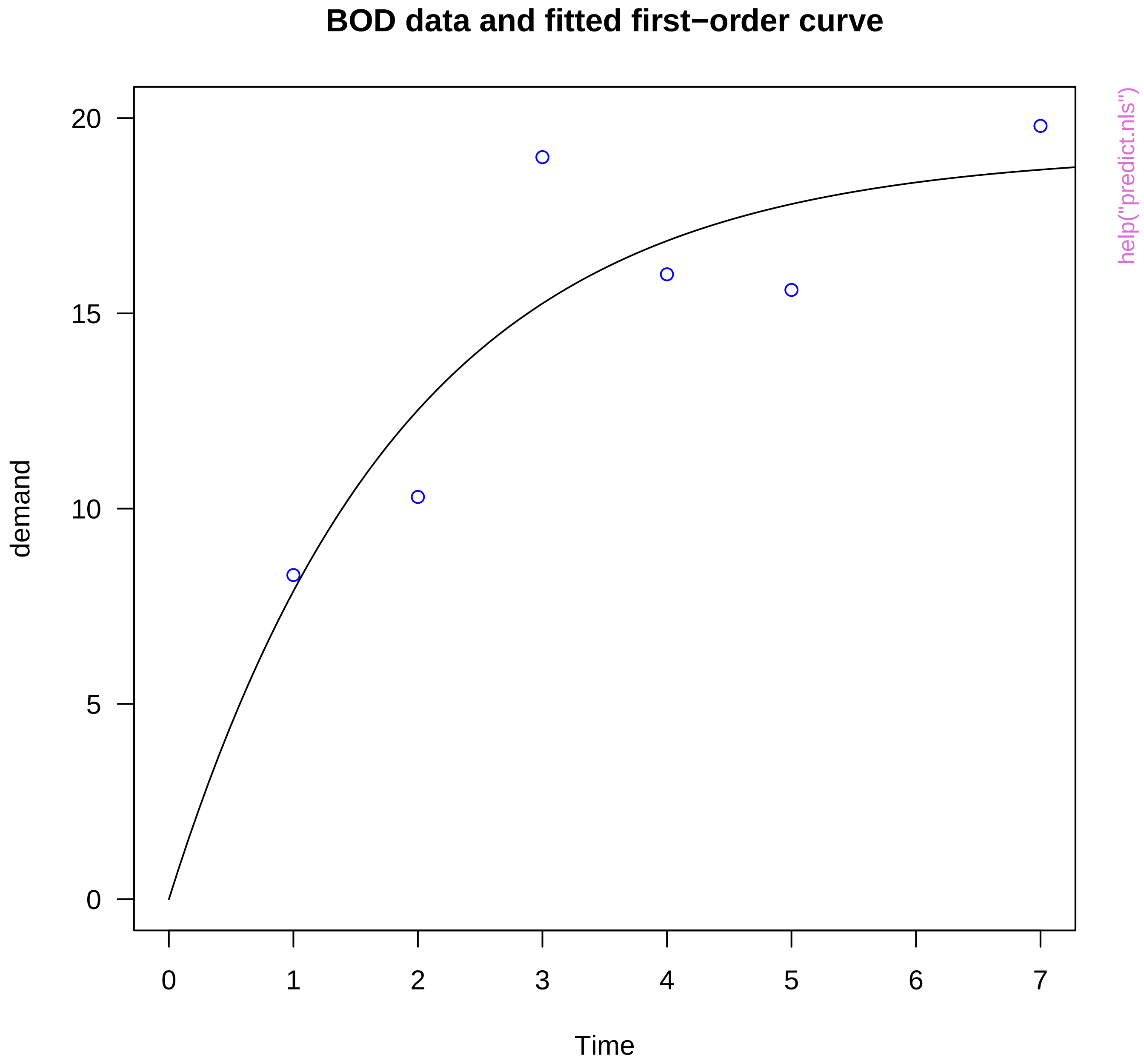

Holt−Winters filtering
Observed / Fitted
320
330
340
350
360
370
1960
1970
1980
1990
2000
Time
help("predict.HoltWinters")



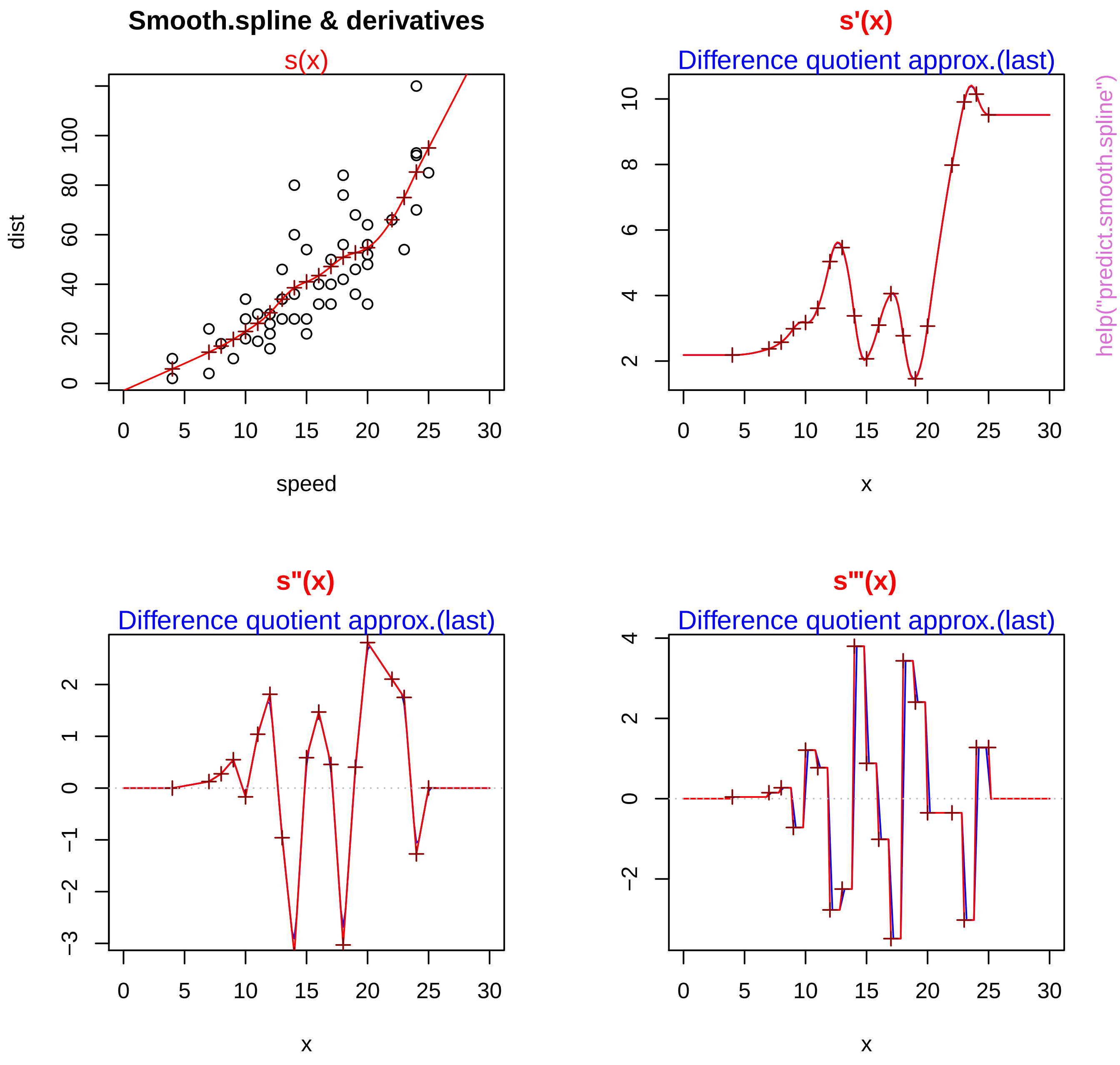
prob
dose
1.0
0.8
0.6
0.4
0.2
0.0
1
2
5
10
20
M
F
help("predict.glm")



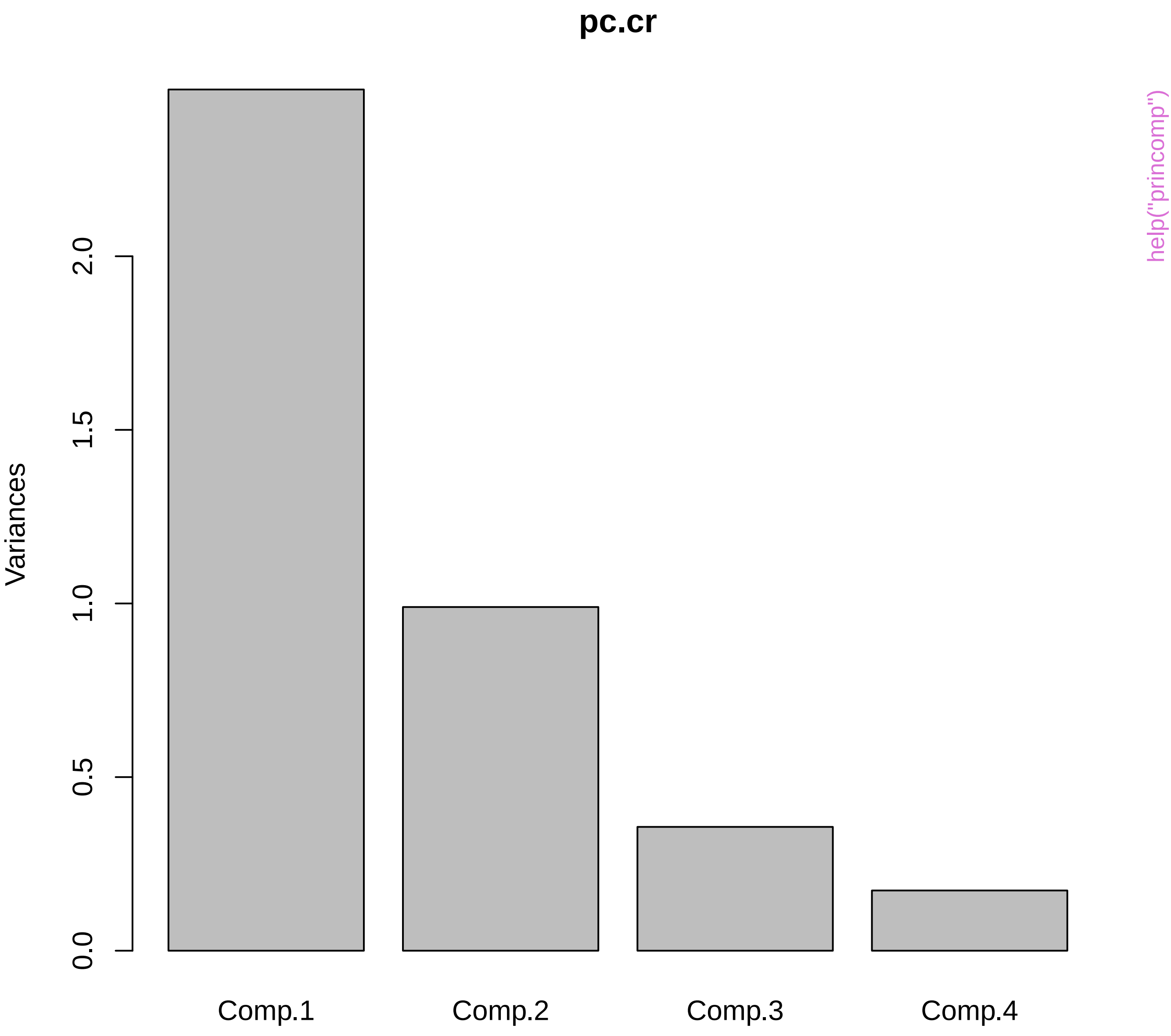
predicted y
new$x
−6
−4
−2
0
2
4
6
−3
−2
−1
0
1
2
3
help("predict.lm")

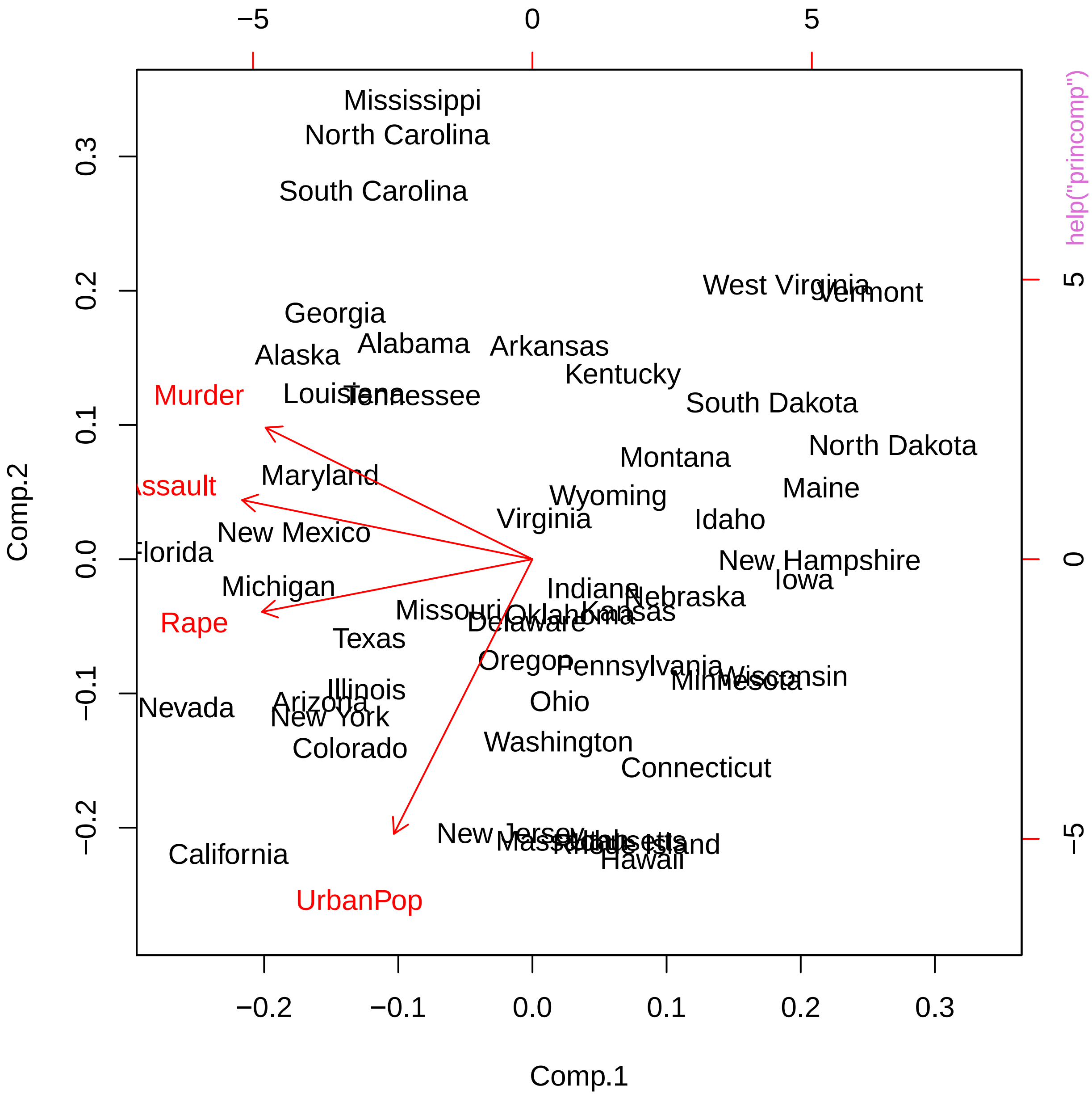


BOD data and fitted first−order curve
demand
Time
0
5
10
15
20
0
1
2
3
4
5
6
7
help("predict.nls")

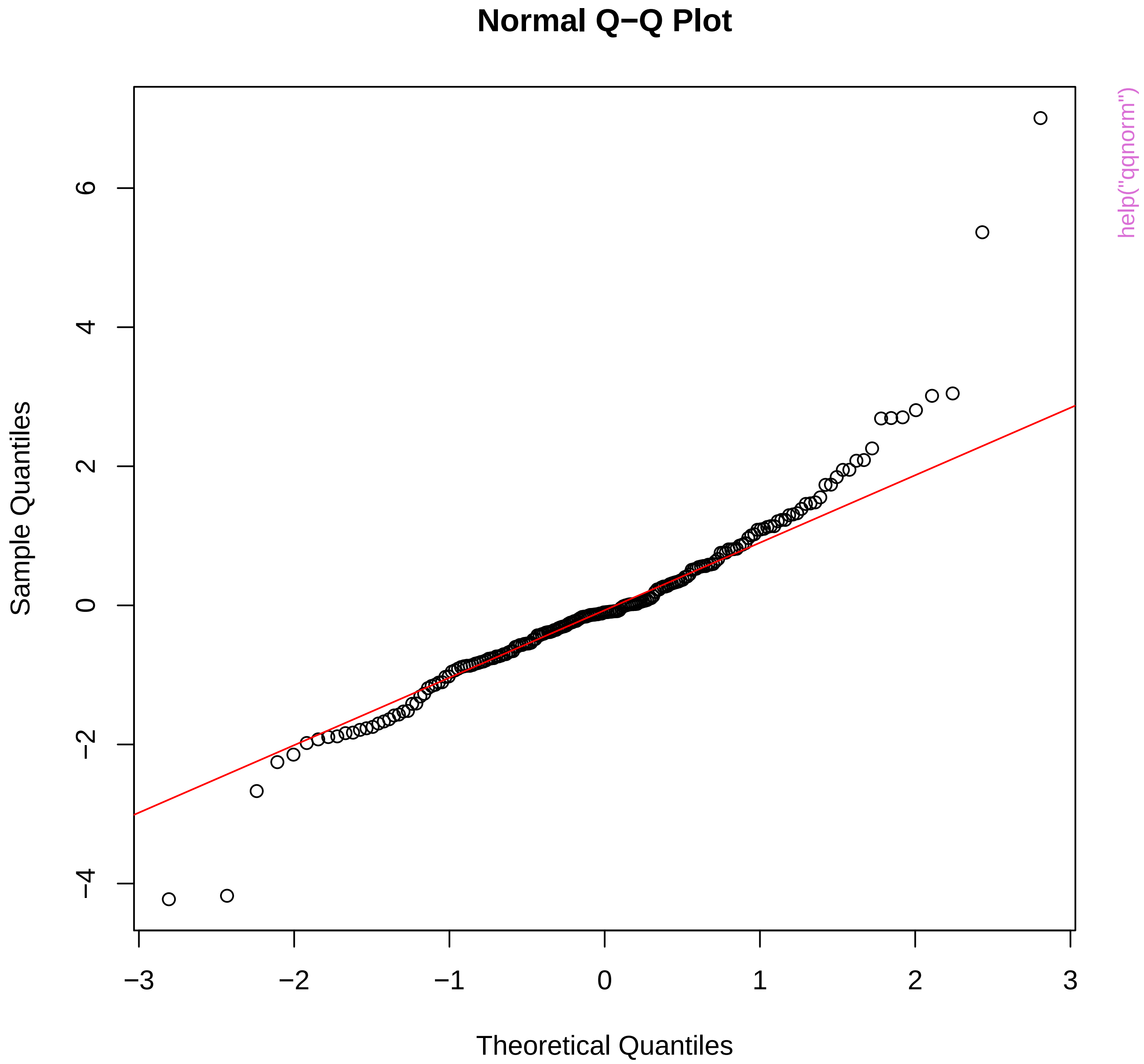


Smooth.spline & derivatives
s(x)
dist
speed
s'(x)
Difference quotient approx.(last)
help("predict.smooth.spline")
s"(x)
Difference quotient approx.(last)
s'''(x)
Difference quotient approx.(last)
x

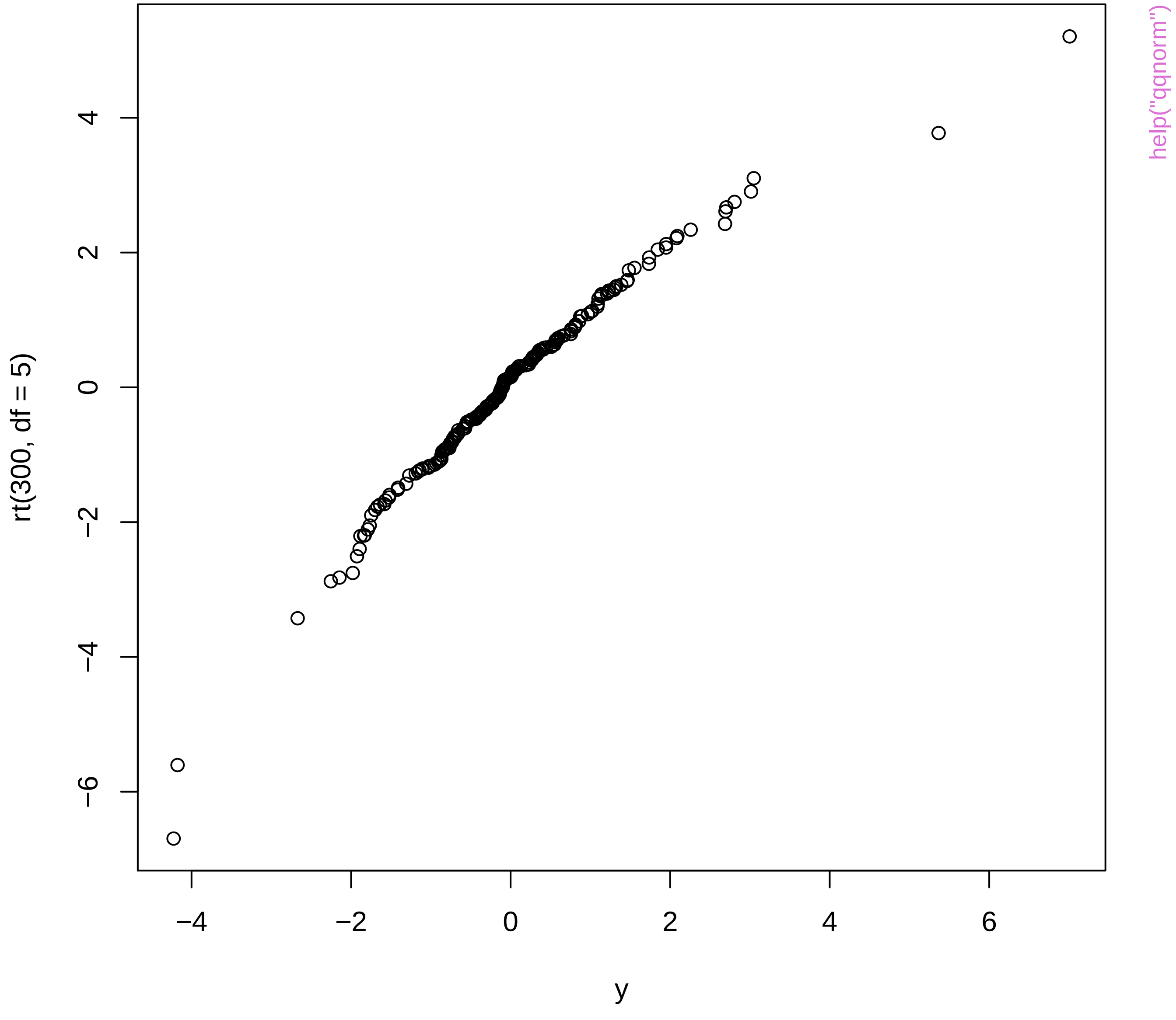

pc.cr
Variances
0.0
0.5
1.0
1.5
2.0
Comp.1
Comp.2
Comp.3
Comp.4
help("princomp")



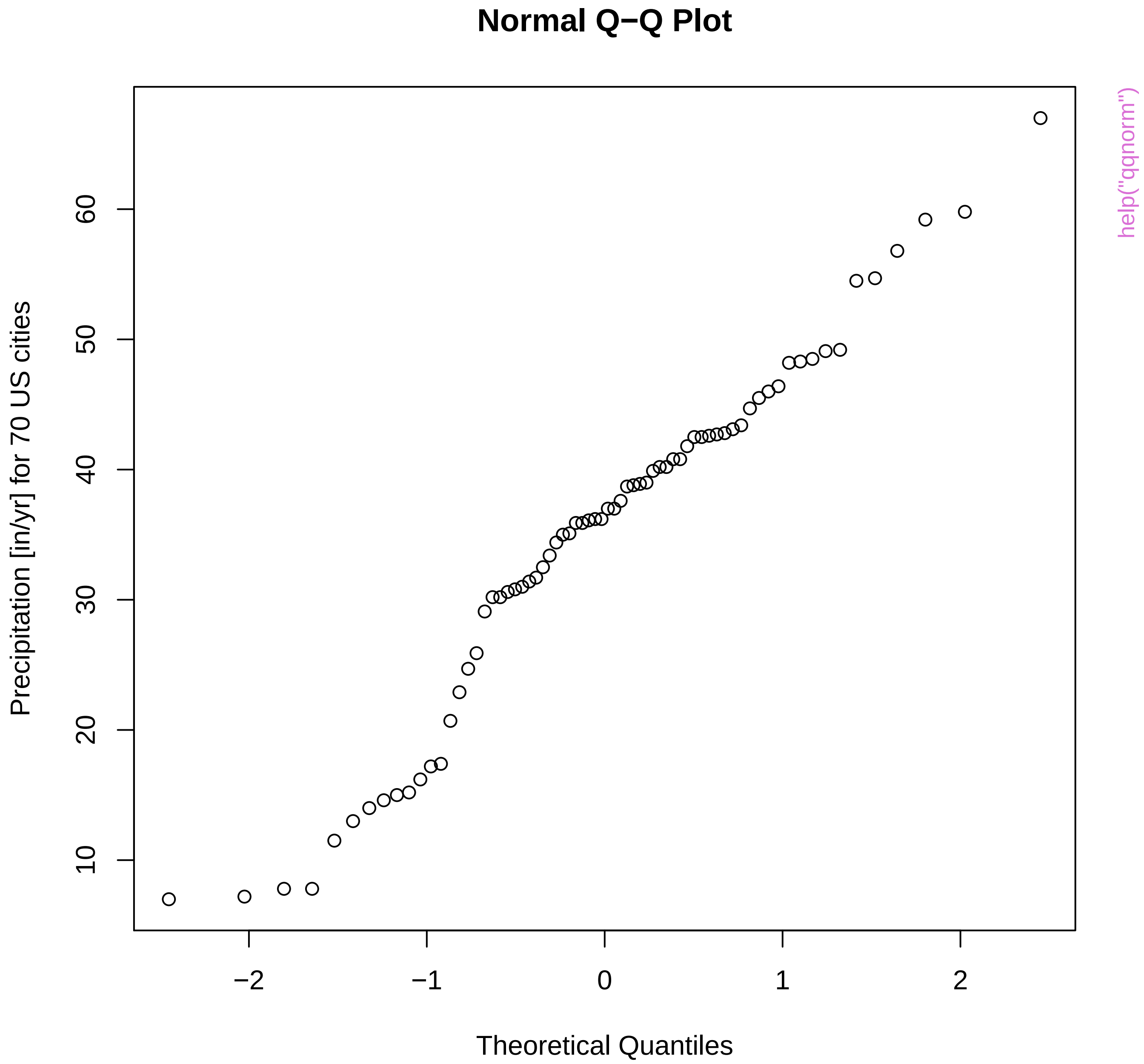
−5
0
5
Mississippi
North Carolina
South Carolina
West Virginia
Vermont
Georgia
Alabama
Arkansas
Alaska
Kentucky
Murder
Tennessee
South Dakota
North Dakota
Montana
Maryland
Maine
Assault
Wyoming
Virginia
Idaho
New Mexico
Florida
New Hampshire
Iowa
Michigan
Indiana
Nebraska
Missouri
Kansas
Delaware
Rape
Texas
Oregon
Pennsylvania
Wisconsin
Minnesota
Illinois
Nevada
Arizona
New York
Ohio
Colorado
Washington
Connecticut
New Jersey
Rhode Island
Hawaii
California
UrbanPop
0.3
0.2
0.1
0.0
−0.1
−0.2
Comp.2
−0.2
−0.1
0.0
0.1
0.2
0.3
Comp.1
help("princomp")
5
0
−5

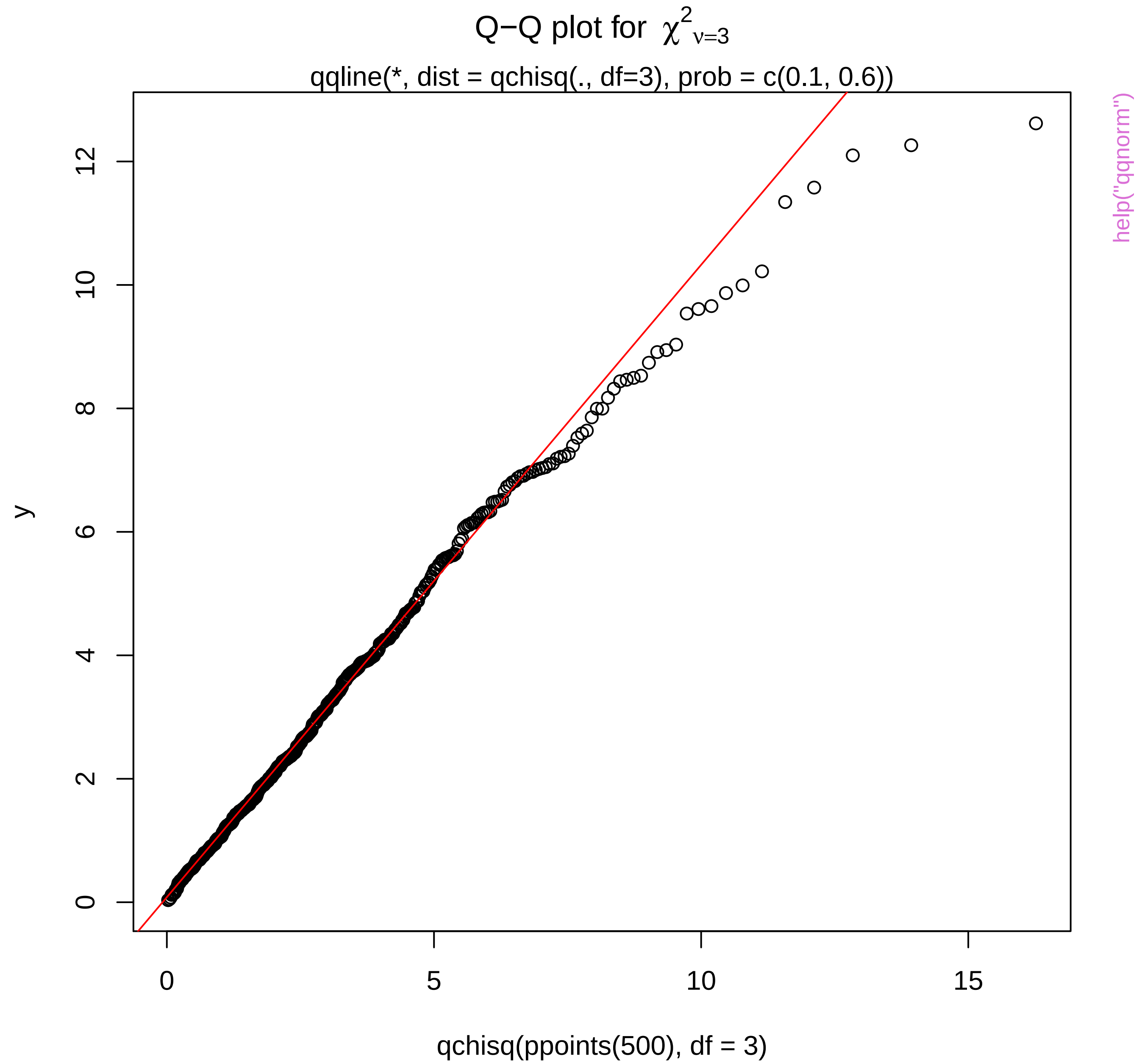


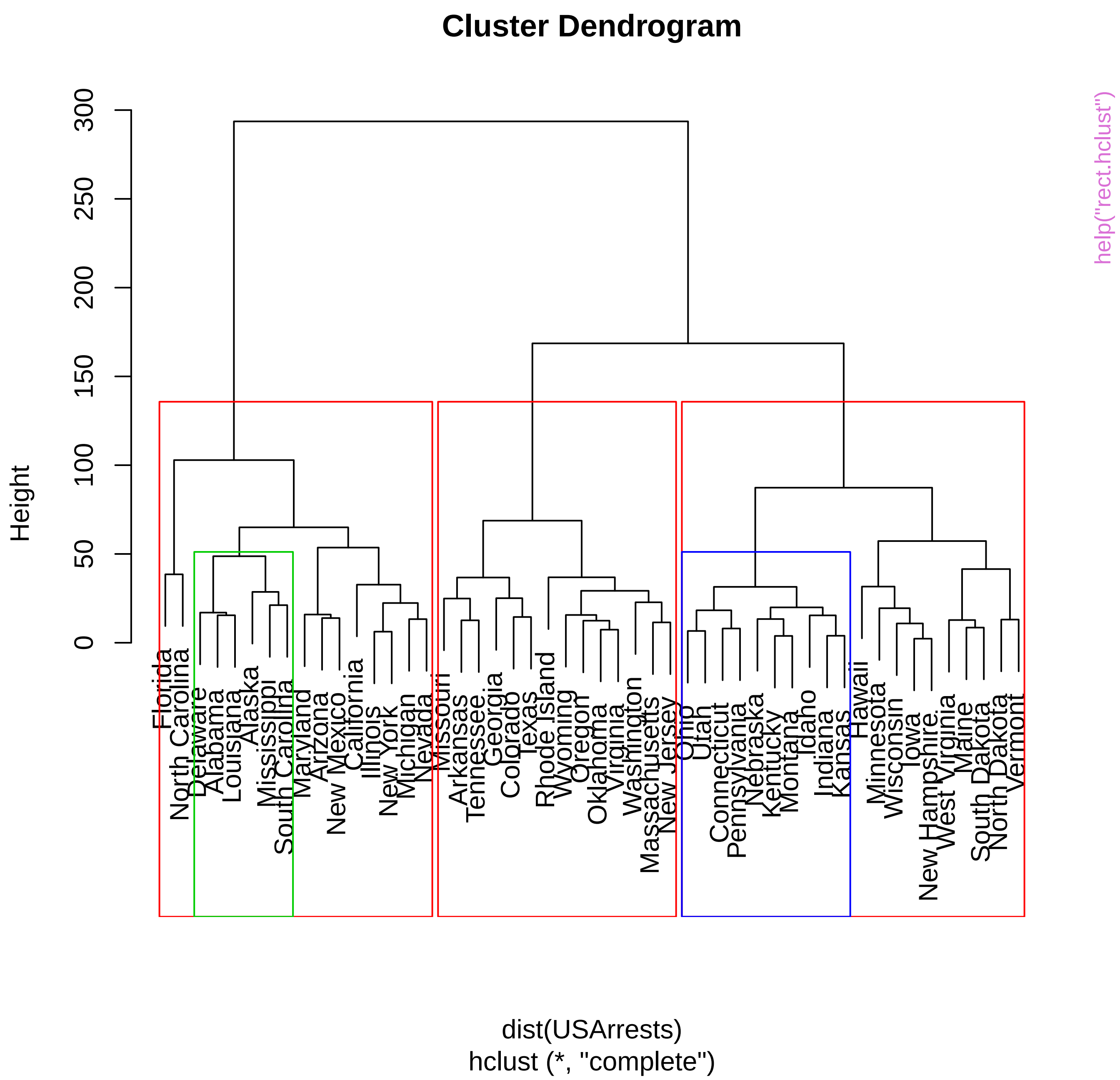
Normal Q−Q Plot
Sample Quantiles
Theoretical Quantiles
−4
−2
0
2
4
6
−3
−2
−1
0
1
2
3
help("qqnorm")

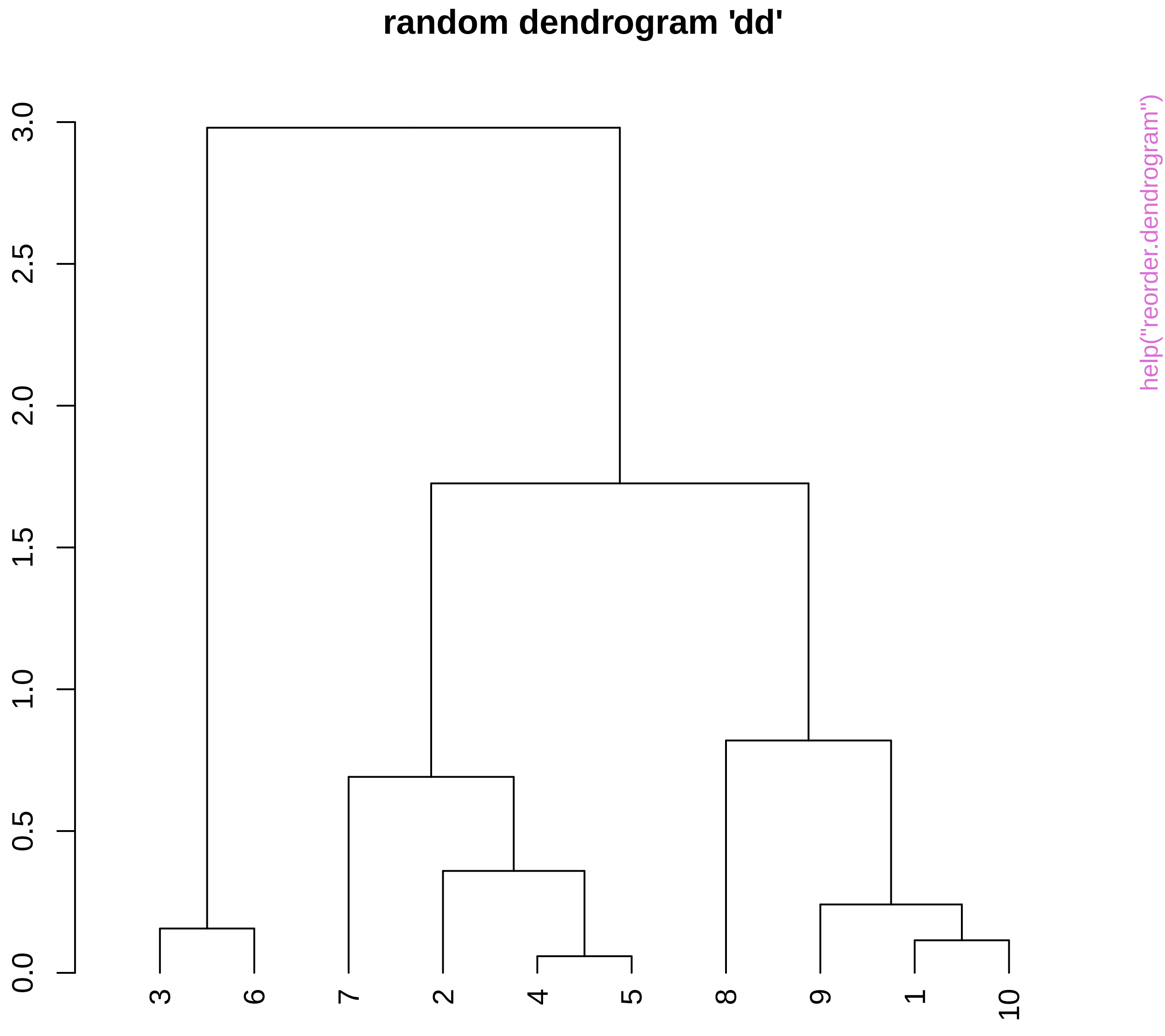


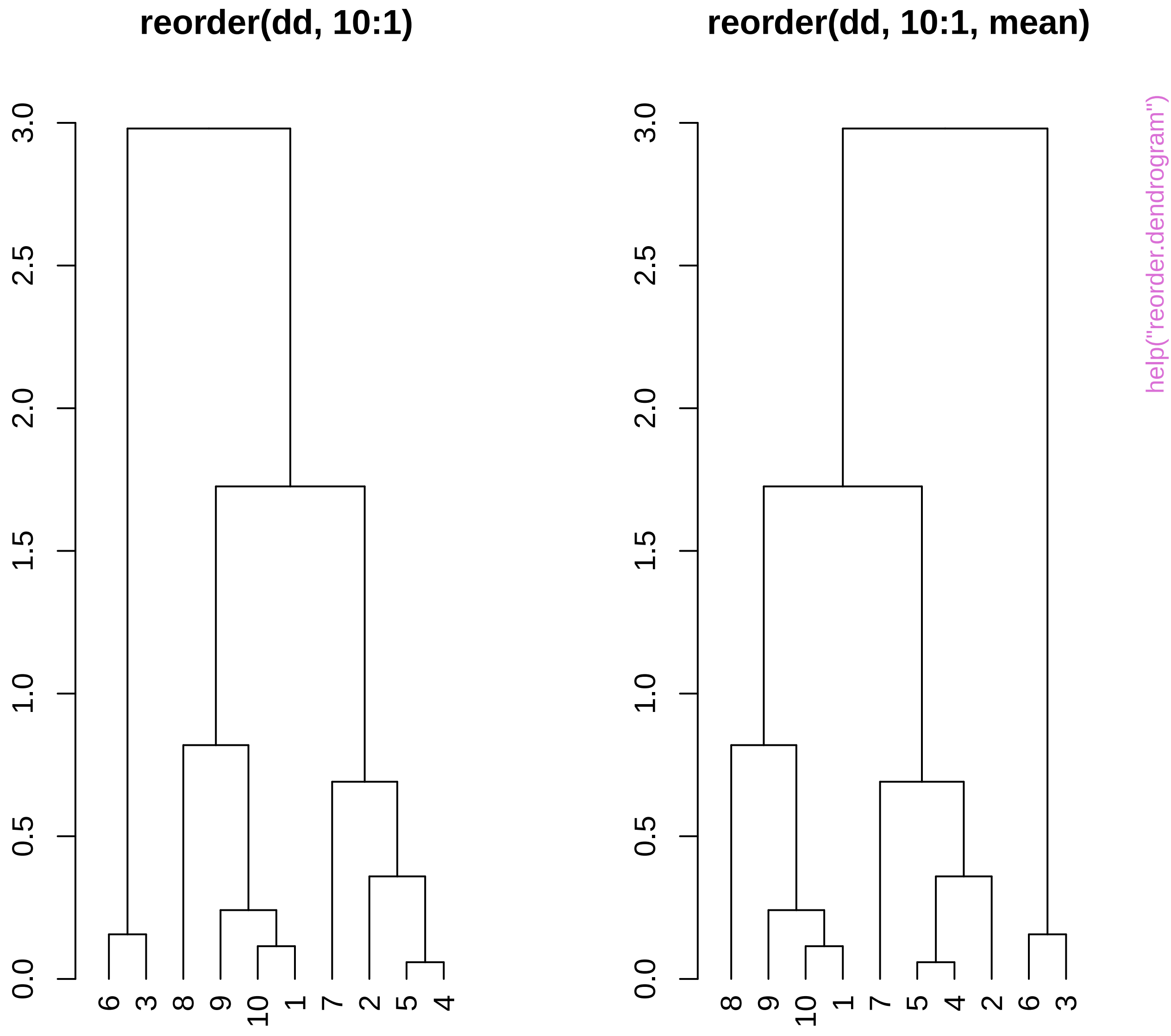
rt(300, df = 5)
y
−4
−2
0
2
4
6
−6
help("qqnorm")

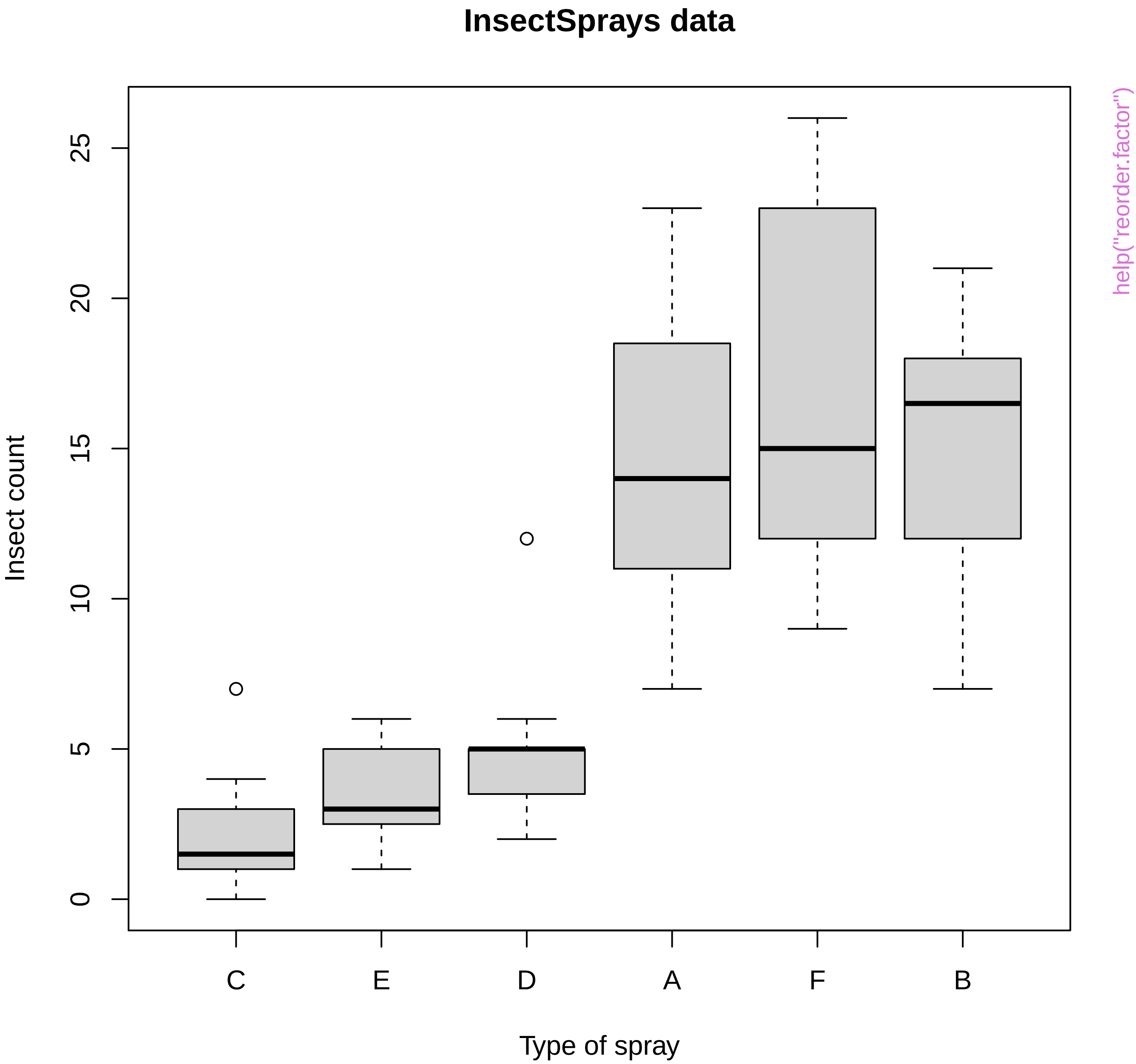

Normal Q−Q Plot
Precipitation [in/yr] for 70 US cities
Theoretical Quantiles
help("qqnorm")
10
20
30
40
50
60
−2
−1
0
1
2

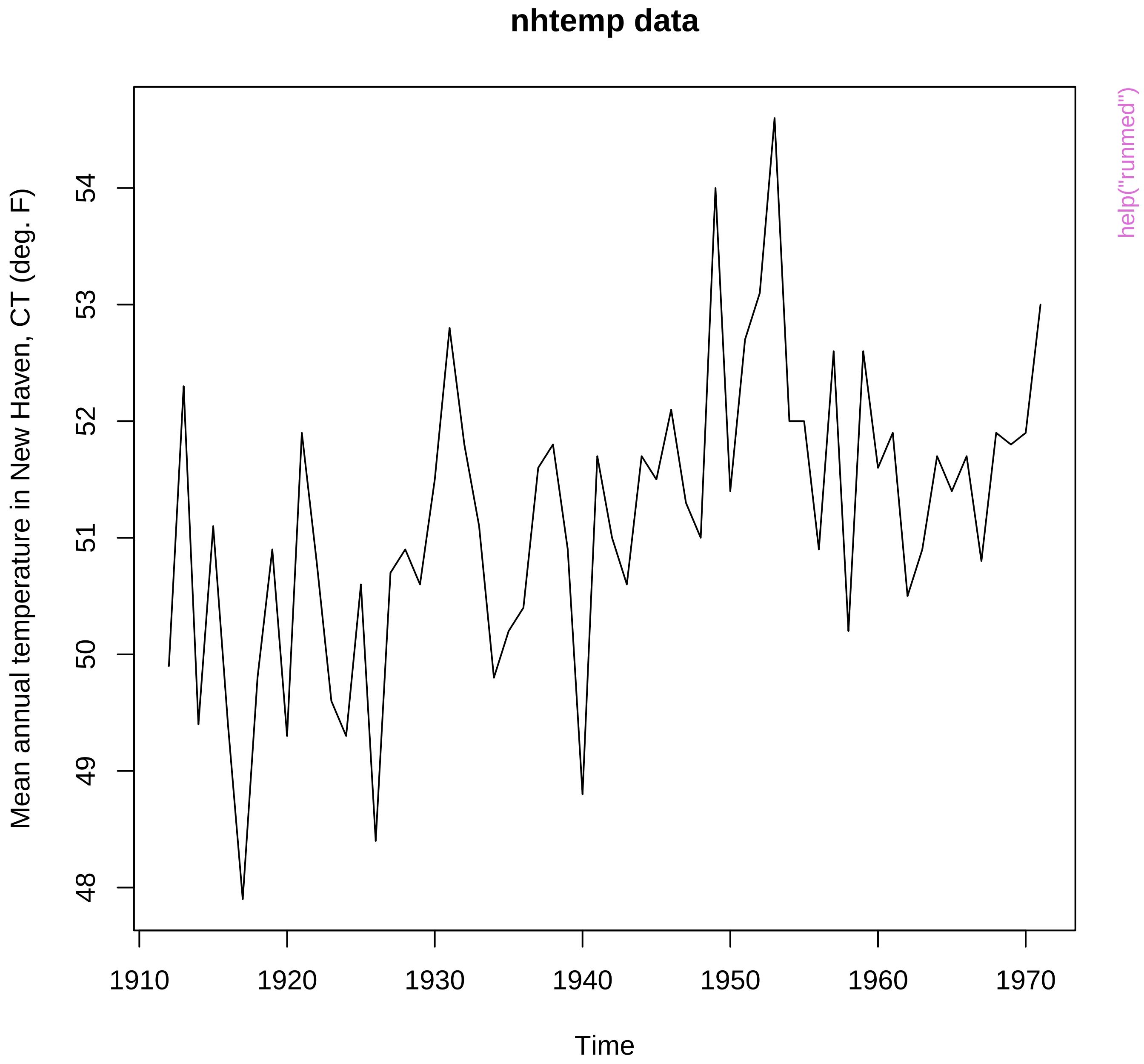

Q−Q plot for $\chi^2_{\nu=3}$
qqline(*, dist = qchisq(., df=3), prob = c(0.1, 0.6))
y
0
2
4
6
8
10
12
0
5
10
15
qchisq(ppoints(500), df = 3)
help("qqnorm")


Cluster Dendrogram
Height
0
50
100
150
200
250
300
Florida
North Carolina
Delaware
Alabama
Louisiana
Alaska
Mississippi
South Carolina
Maryland
Arizona
New Mexico
California
Illinois
New York
Michigan
Nevada
Missouri
Arkansas
Tennessee
Georgia
Colorado
Texas
Rhode Island
Wyoming
Oregon
Oklahoma
Virginia
Washington
Massachusetts
New Jersey
Ohio
Utah
Connecticut
Pennsylvania
Nebraska
Kentucky
Montana
Idaho
Indiana
Kansas
Hawaii
Minnesota
Wisconsin
Iowa
New Hampshire
West Virginia
Maine
South Dakota
North Dakota
Vermont
help("rect.hclust")
dist(USArrests)
hclust (*, "complete")

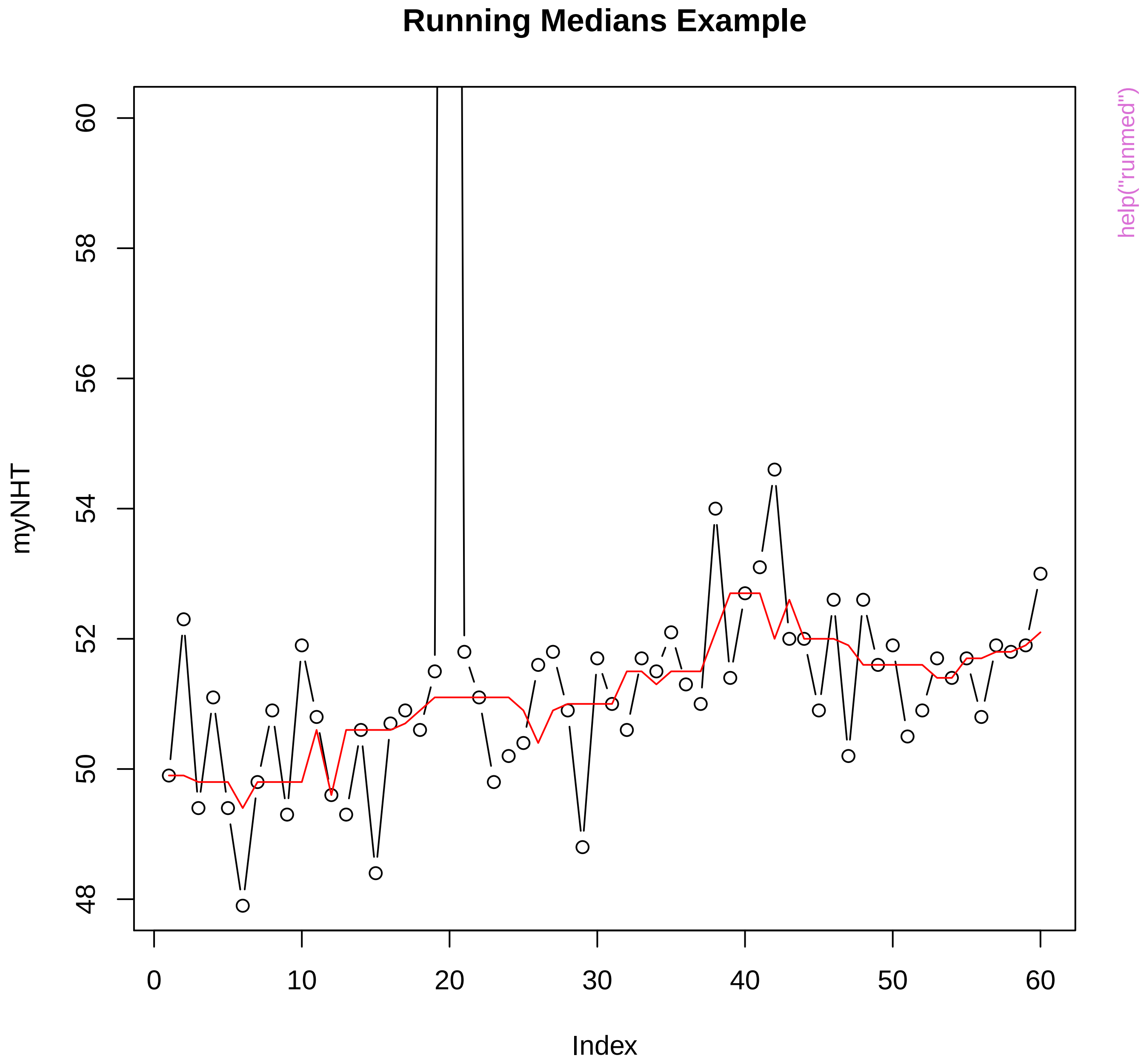

random dendrogram 'dd'
3.0
2.5
2.0
1.5
1.0
0.5
0.0
3
6
7
2
4
5
8
9
1
10
help("reorder.dendrogram")

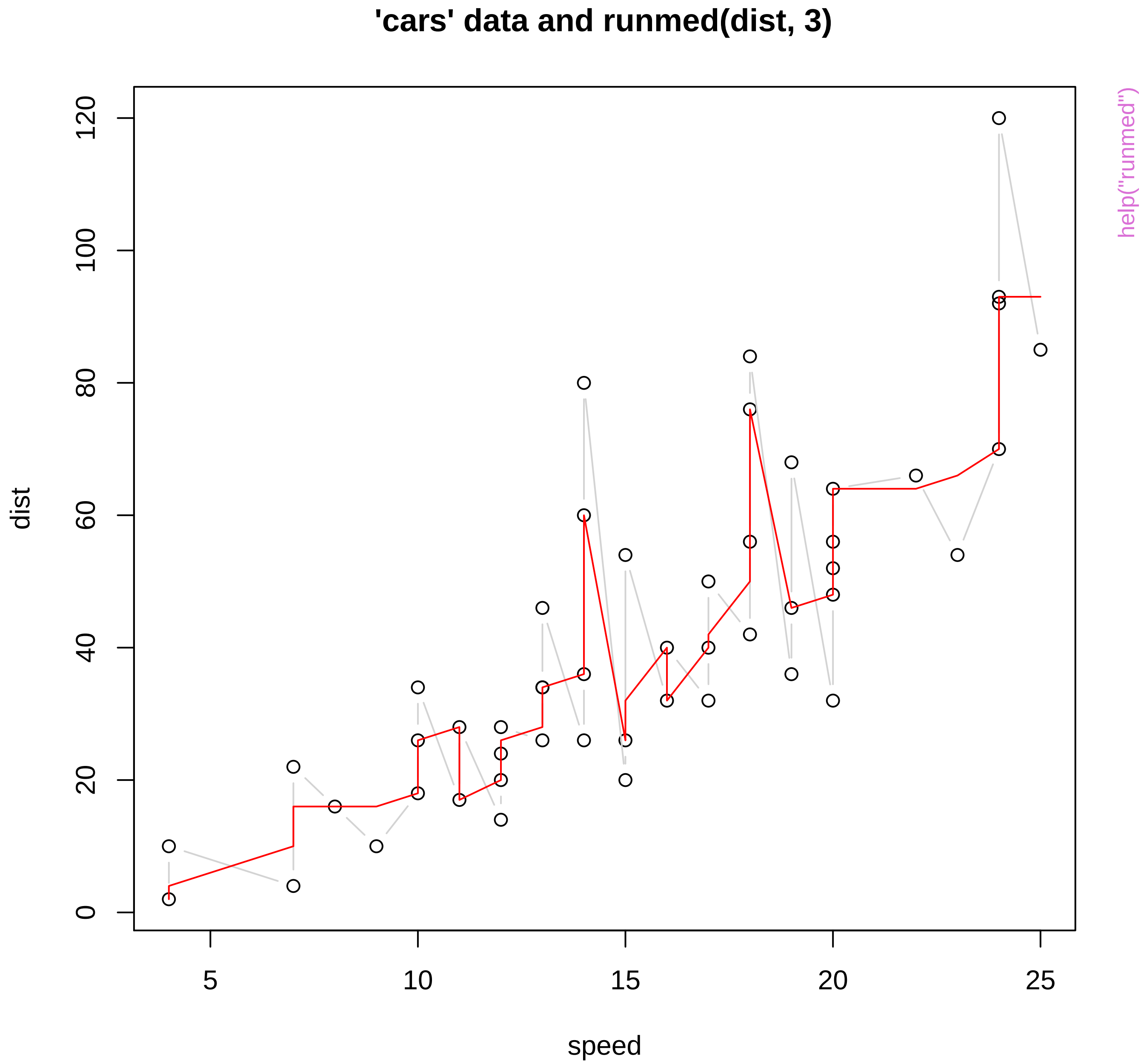

reorder(dd, 10:1)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
6 3 8 9 10 1 7 2 5 4
reorder(dd, 10:1, mean)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
8 9 10 1 7 5 4 2 6 3
help("reorder.dendrogram")

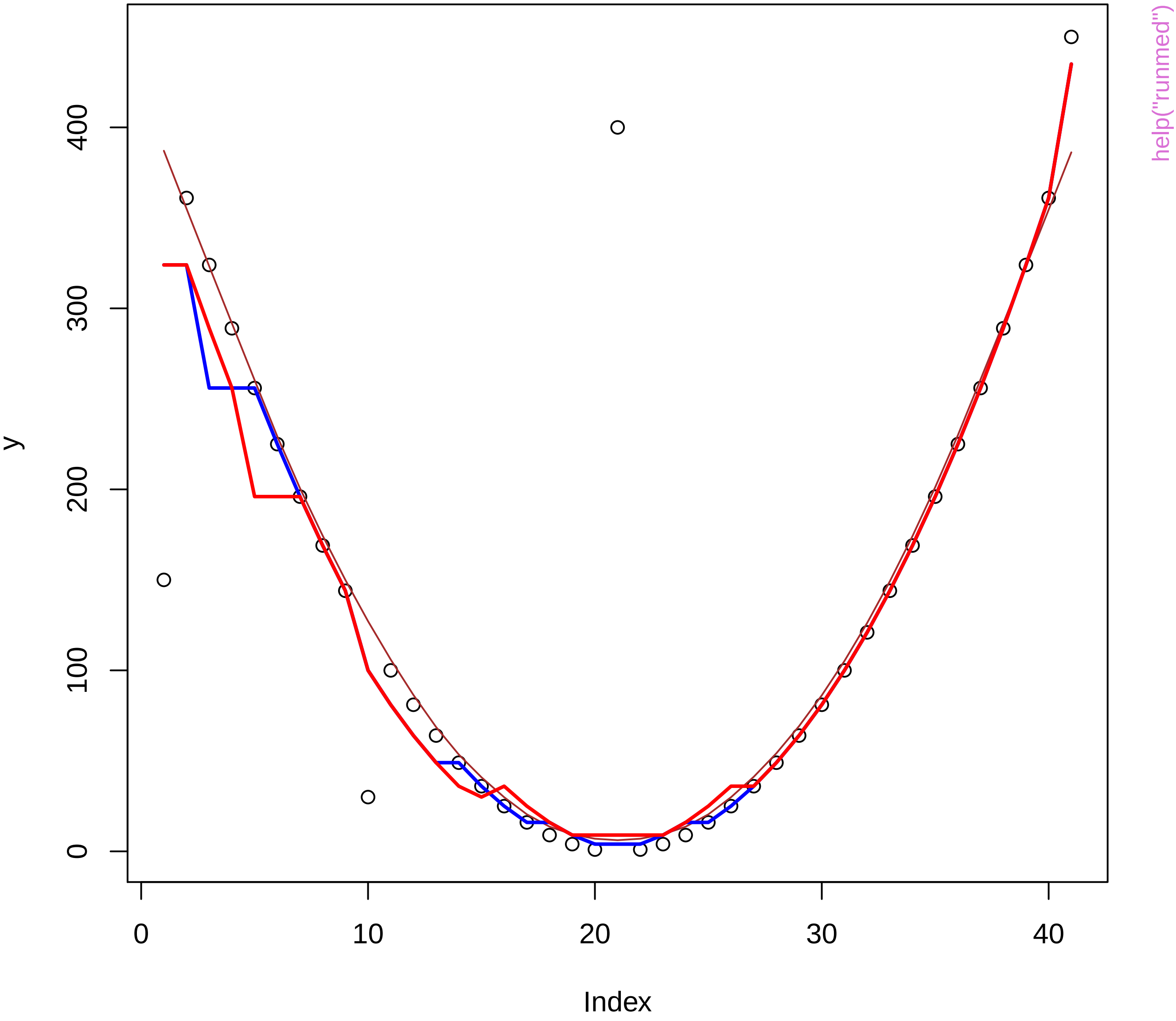

InsectSprays data
Insect count
0
5
10
15
20
25
C
E
D
A
F
B
Type of spray
help("reorder.factor")



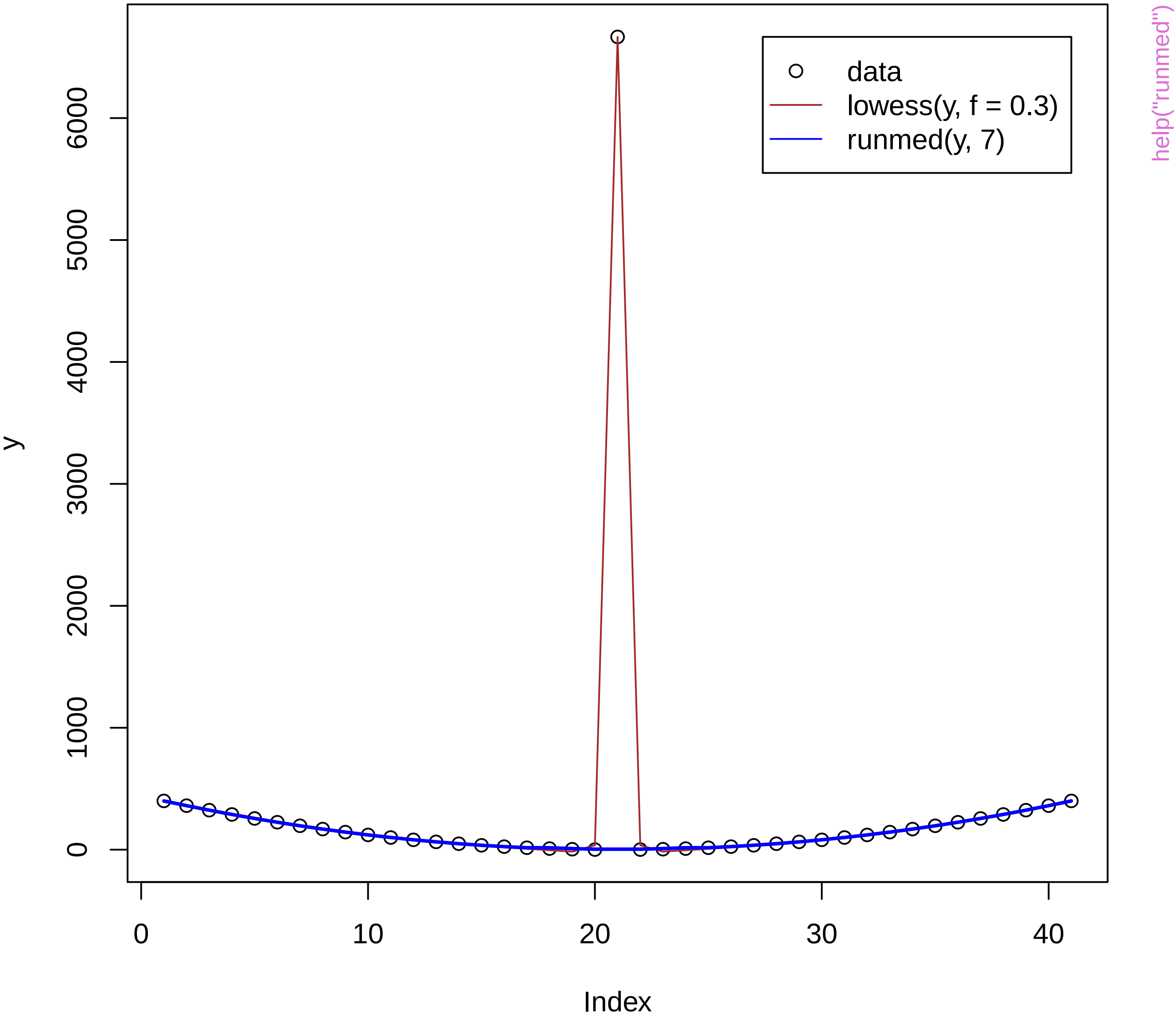
nhtemp data
Mean annual temperature in New Haven, CT (deg. F)
48
49
50
51
52
53
54
1910
1920
1930
1940
1950
1960
1970
Time
help("runmed")


Running Medians Example
myNHT
Index
48
50
52
54
56
58
60
0
10
20
30
40
50
60
help("runmed")

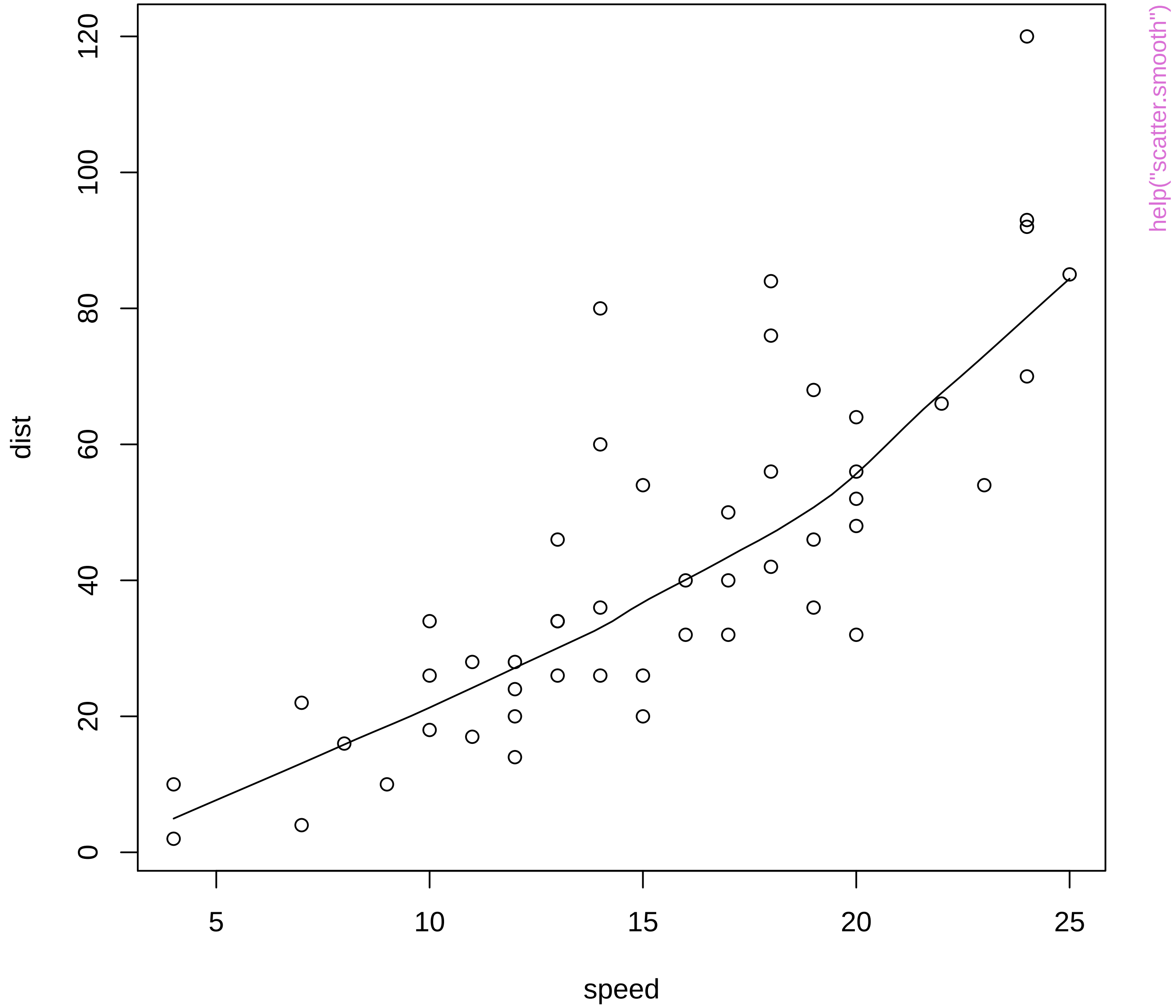

'cars' data and runmed(dist, 3)
dist
0
20
40
60
80
100
120
5
10
15
20
25
speed
help("runmed")



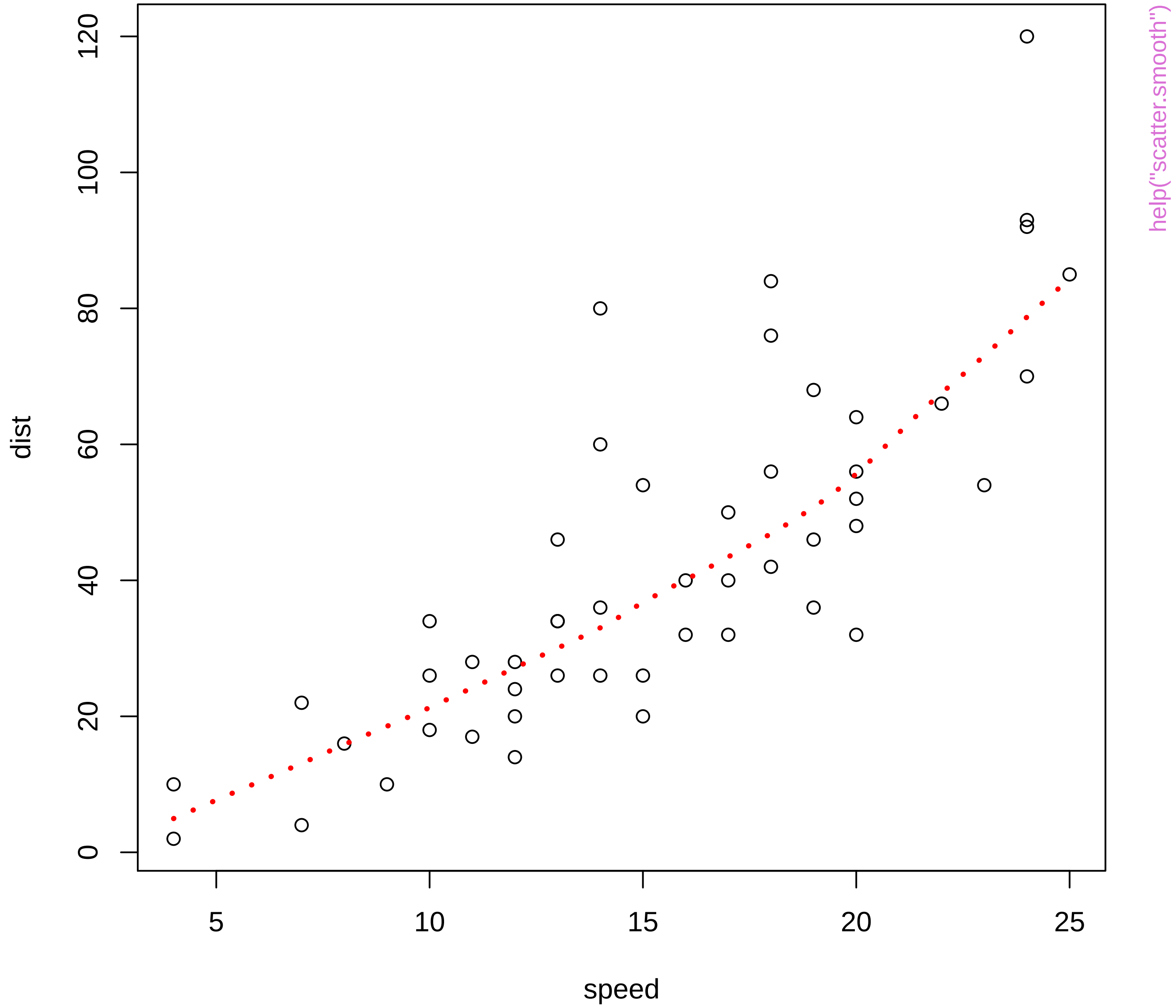
help("runmed")
y
0
100
200
300
400
0
10
20
30
40
Index



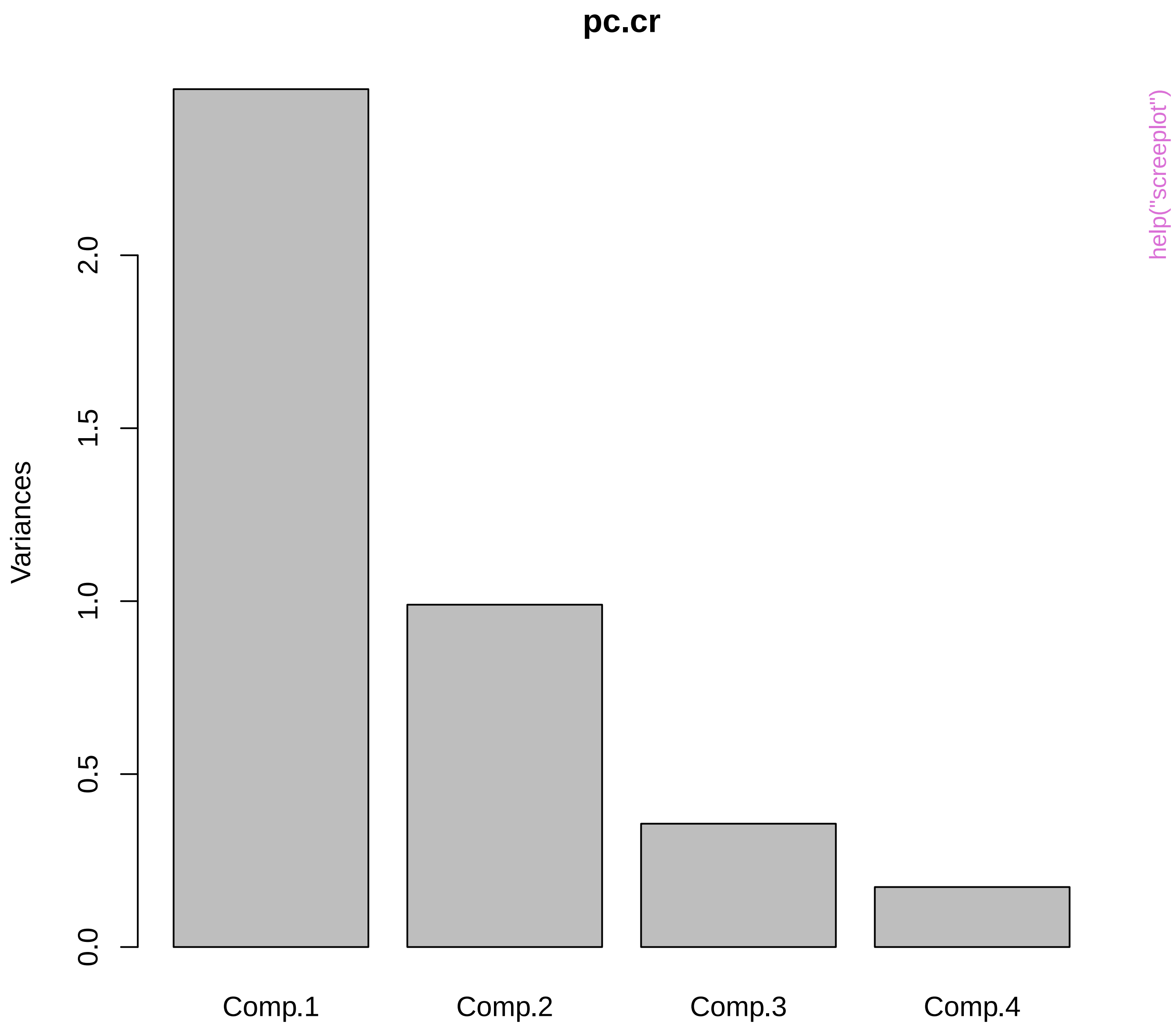
data
lowess(y, f = 0.3)
runmed(y, 7)
0
1000
2000
3000
4000
5000
6000
y
0
10
20
30
40
Index
help("runmed")



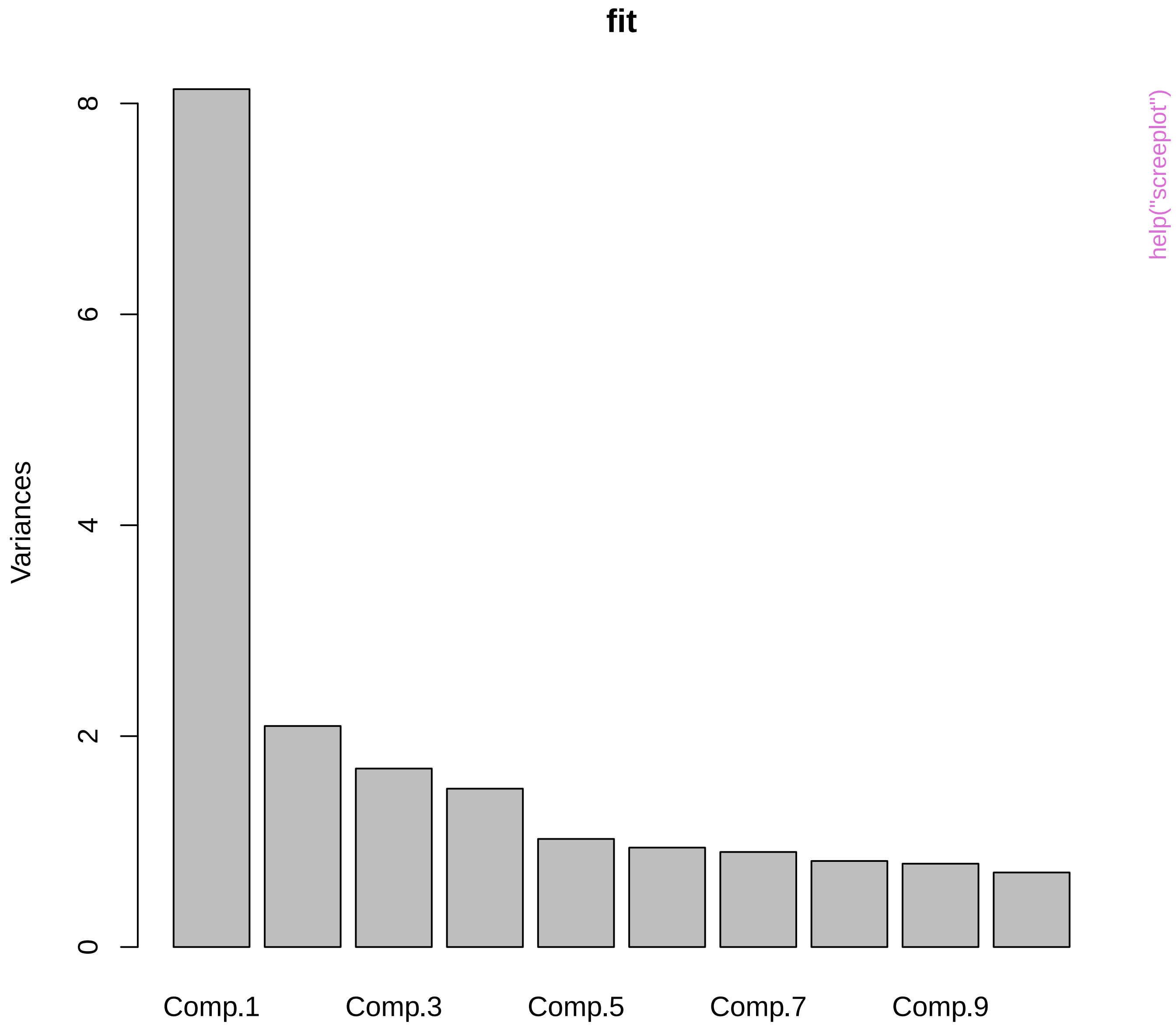
0
20
40
60
80
100
120
dist
5
10
15
20
25
speed
help("scatter.smooth")

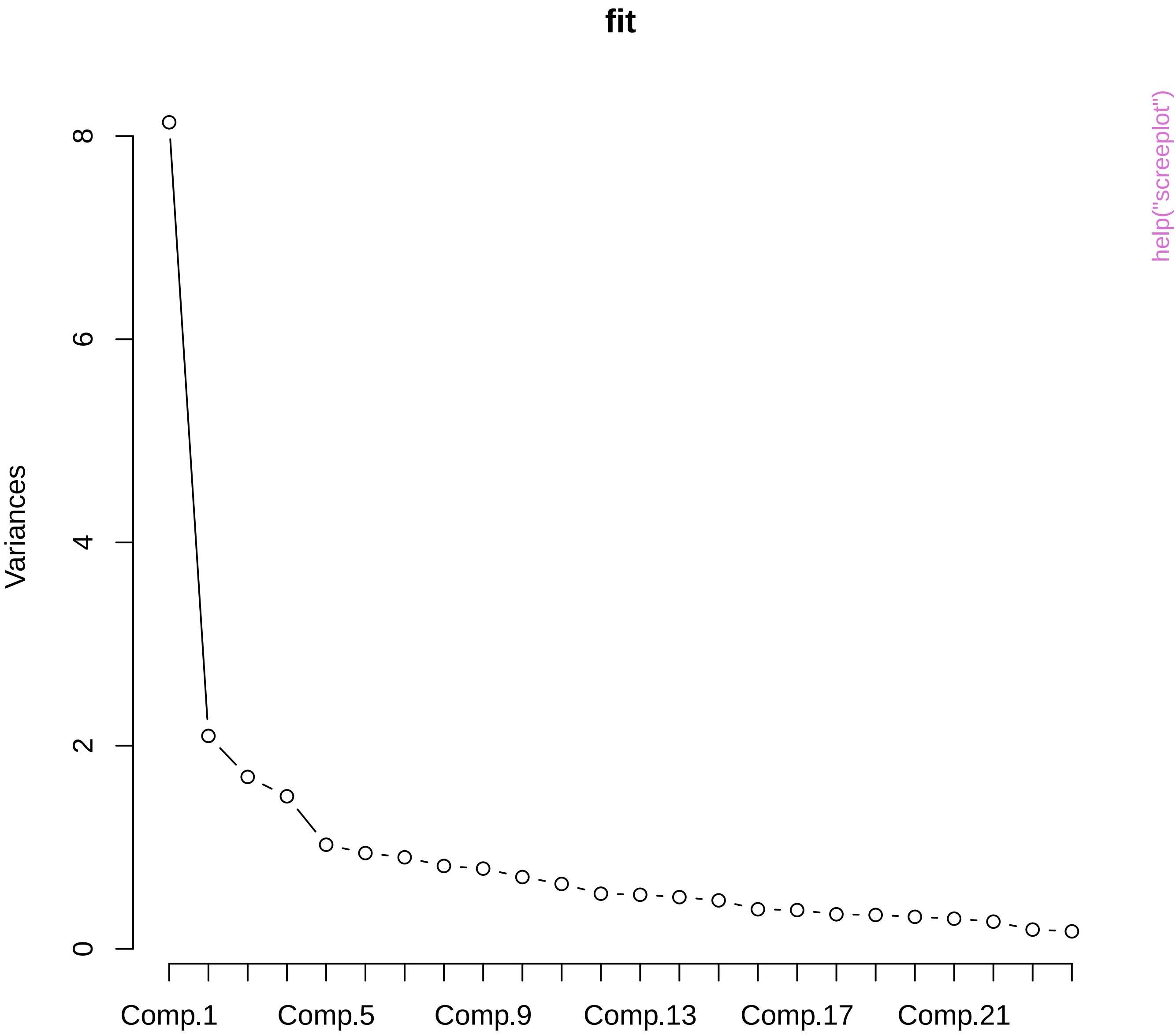


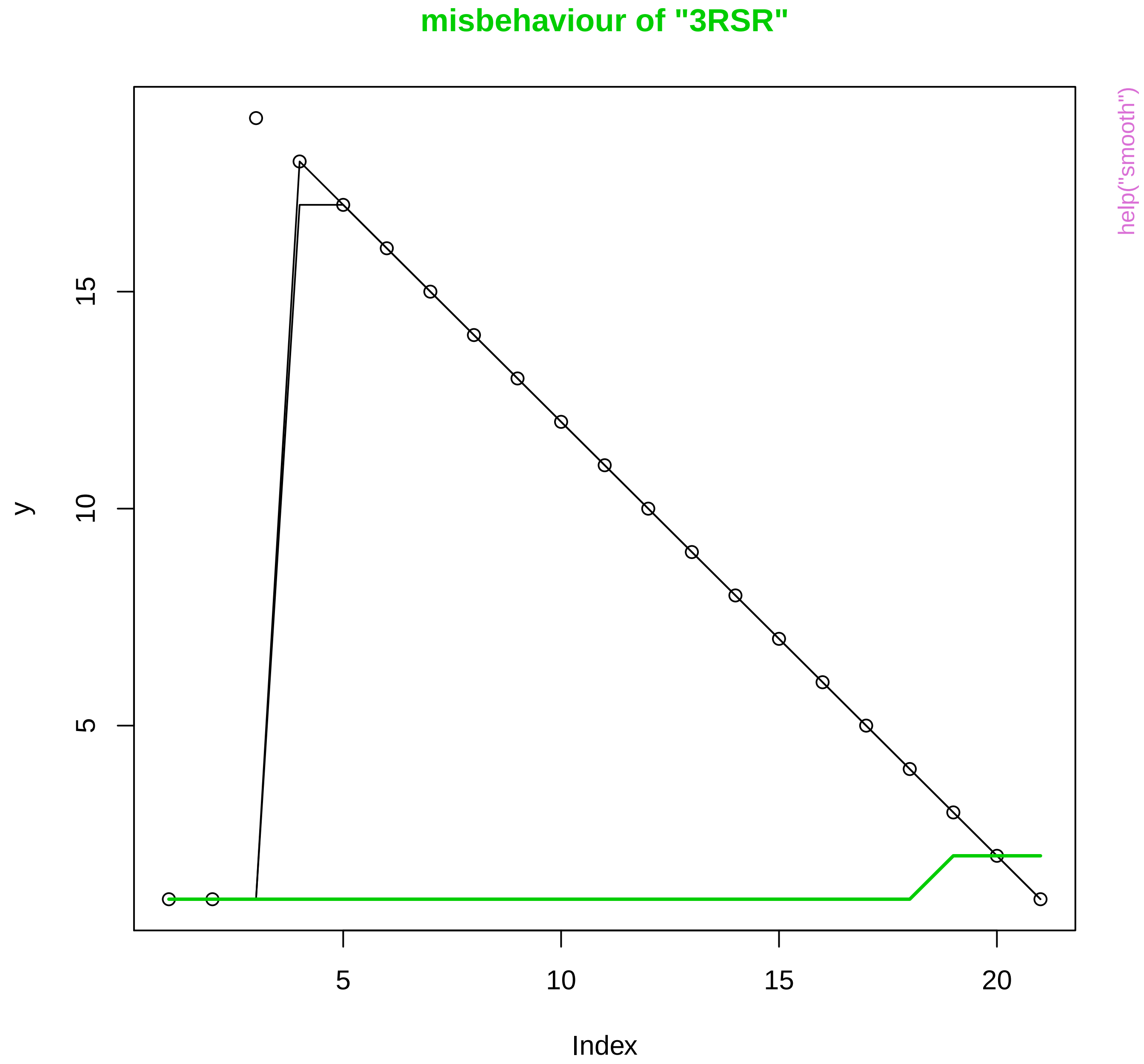
dist
0
20
40
60
80
100
120
speed
5
10
15
20
25
help("scatter.smooth")

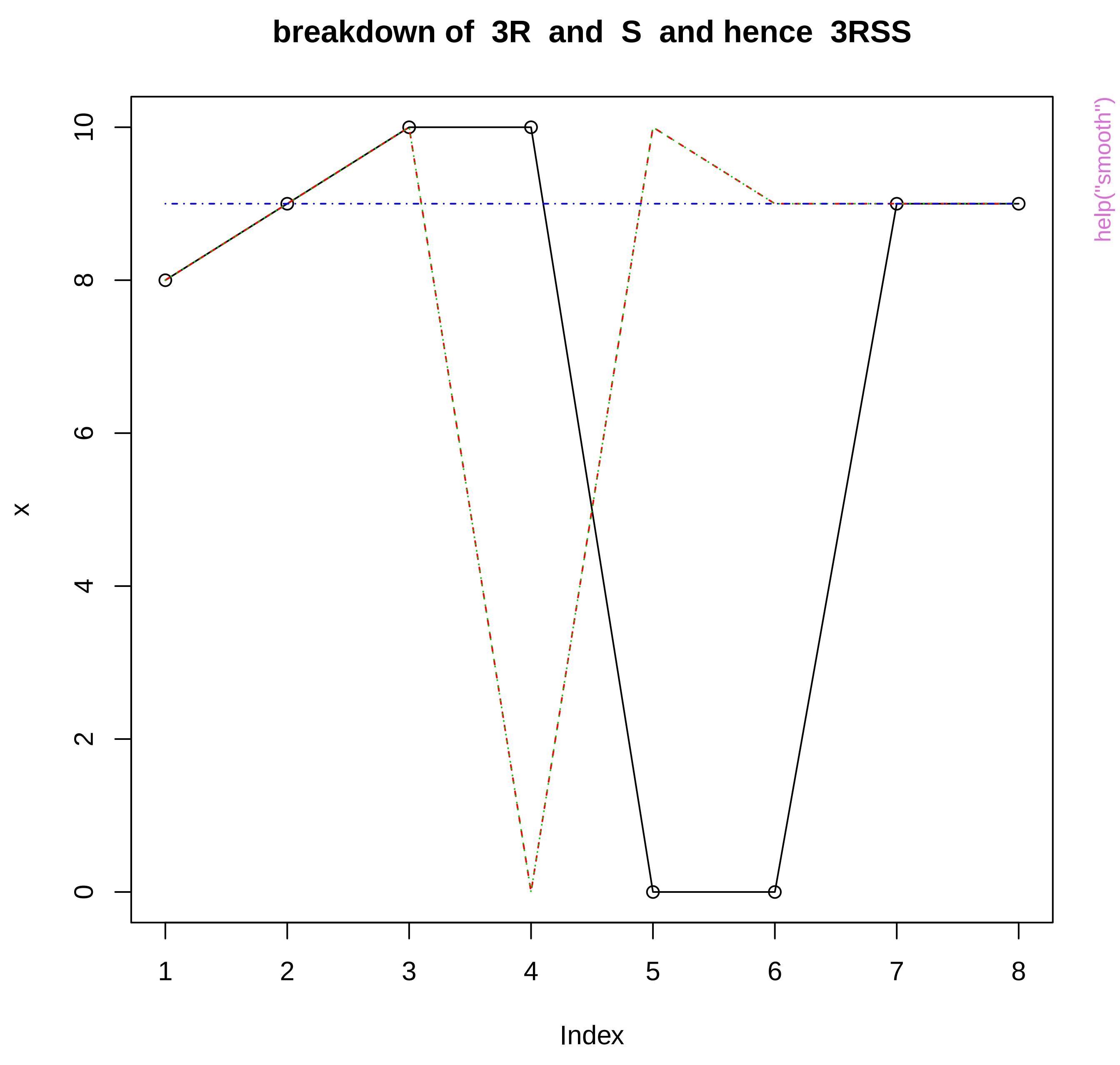


pc.cr
Variances
0.0
0.5
1.0
1.5
2.0
Comp.1
Comp.2
Comp.3
Comp.4
help("screeplot")

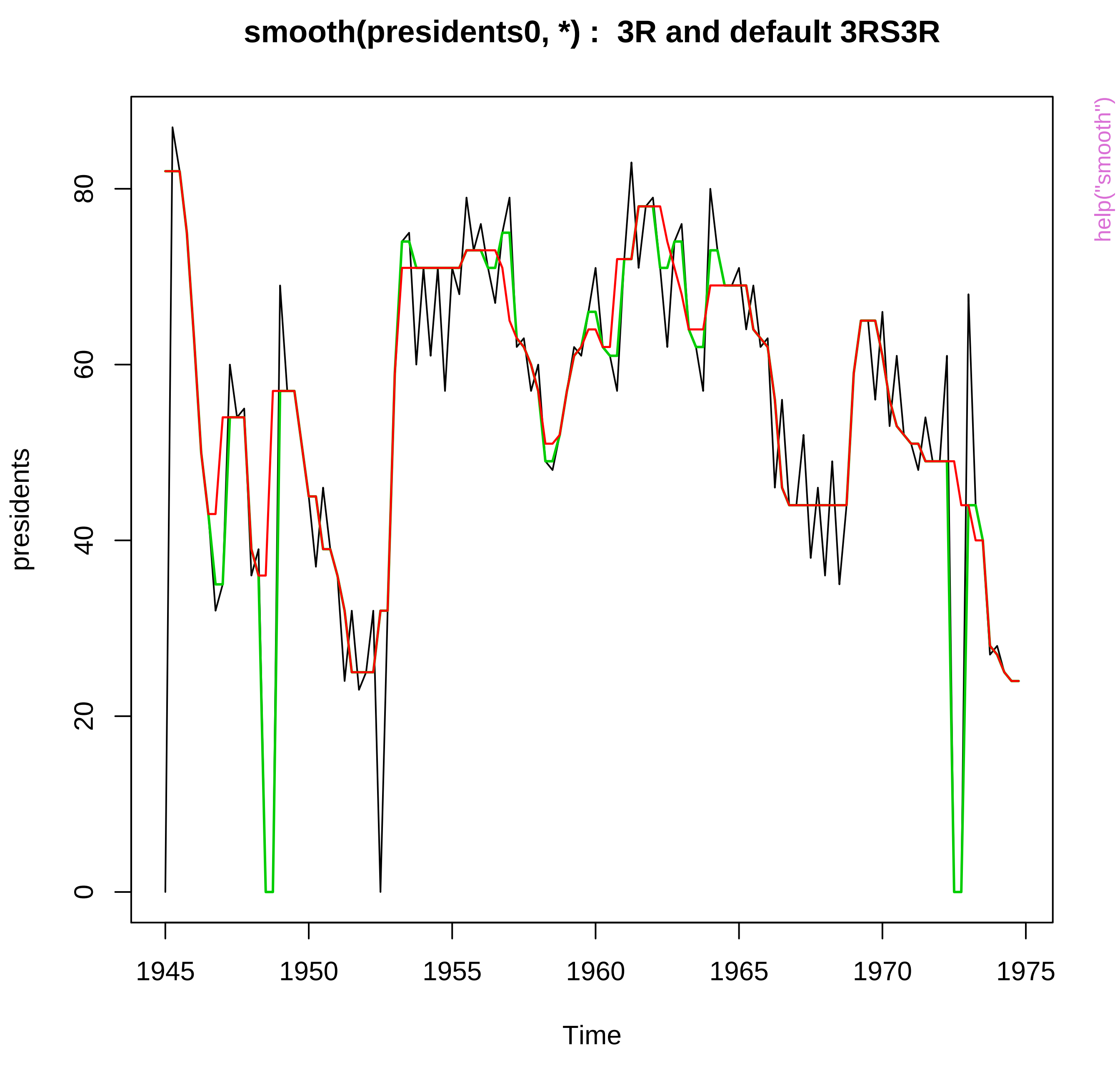

fit
Variances
0
2
4
6
8
Comp.1
Comp.3
Comp.5
Comp.7
Comp.9
help("screeplot")


fit
Variances
0
2
4
6
8
Comp.1
Comp.5
Comp.9
Comp.13
Comp.17
Comp.21
help("screeplot")

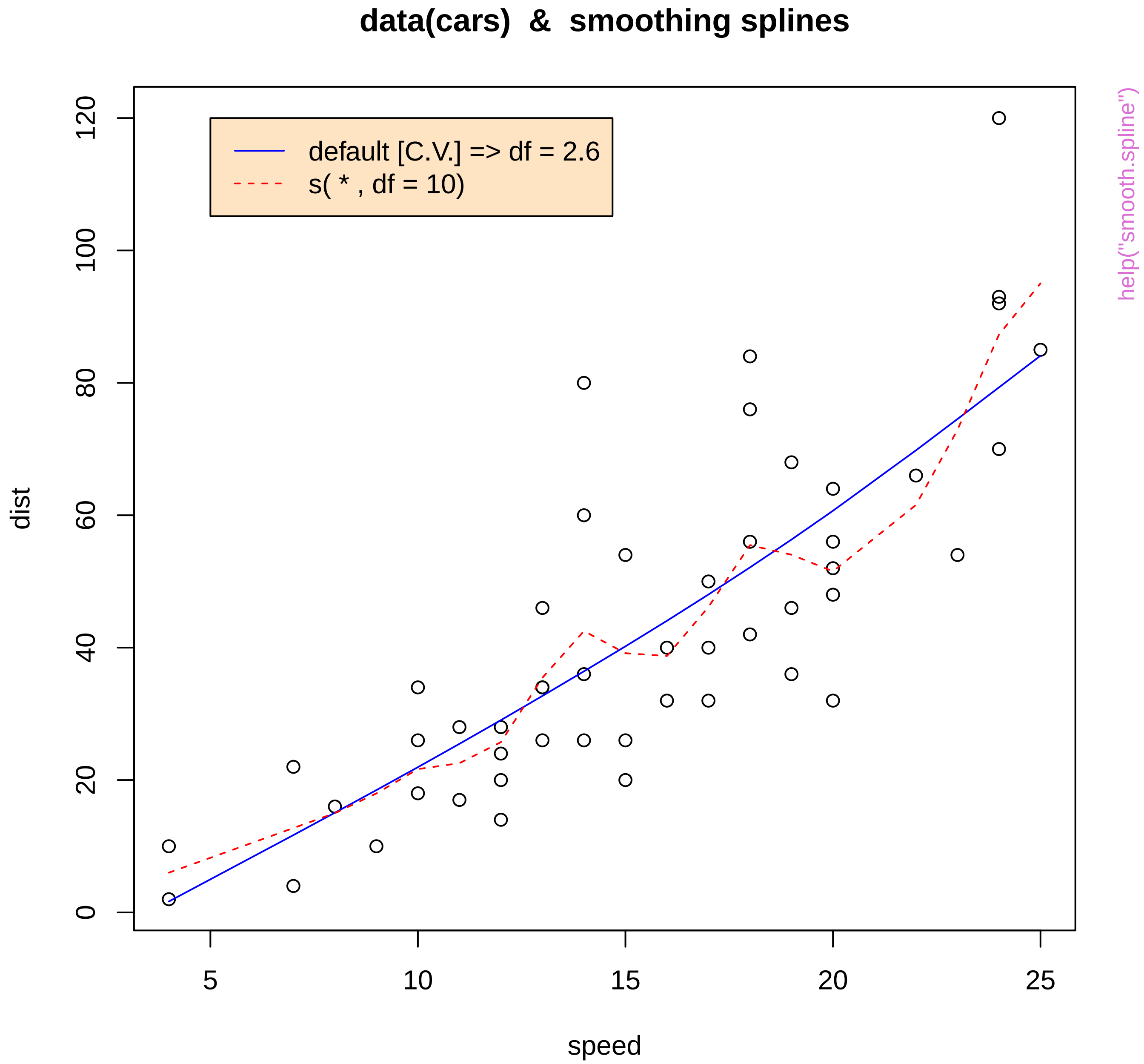

misbehaviour of "3RSR"
help("smooth")
y
15
10
5
5
10
15
20
Index

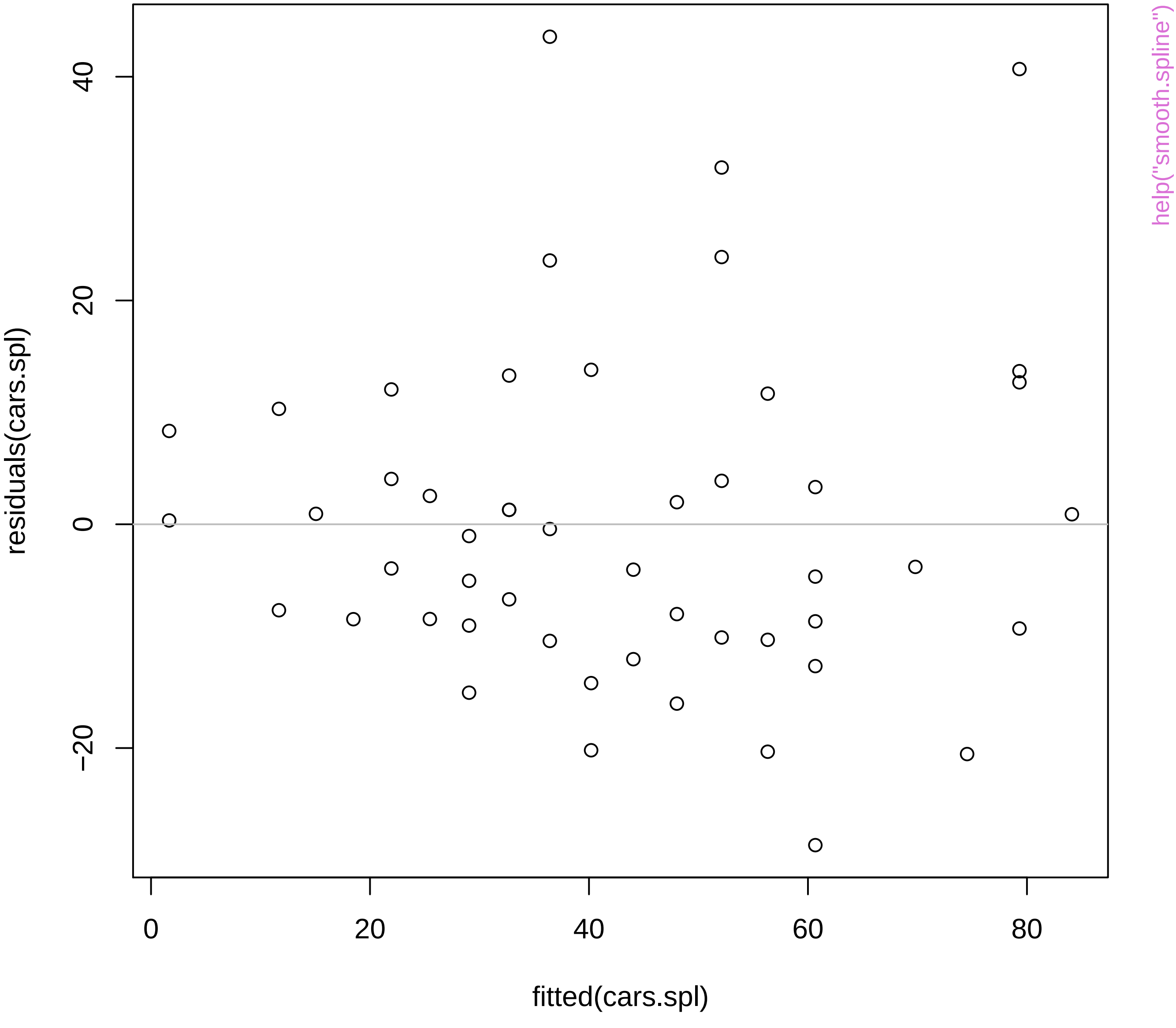


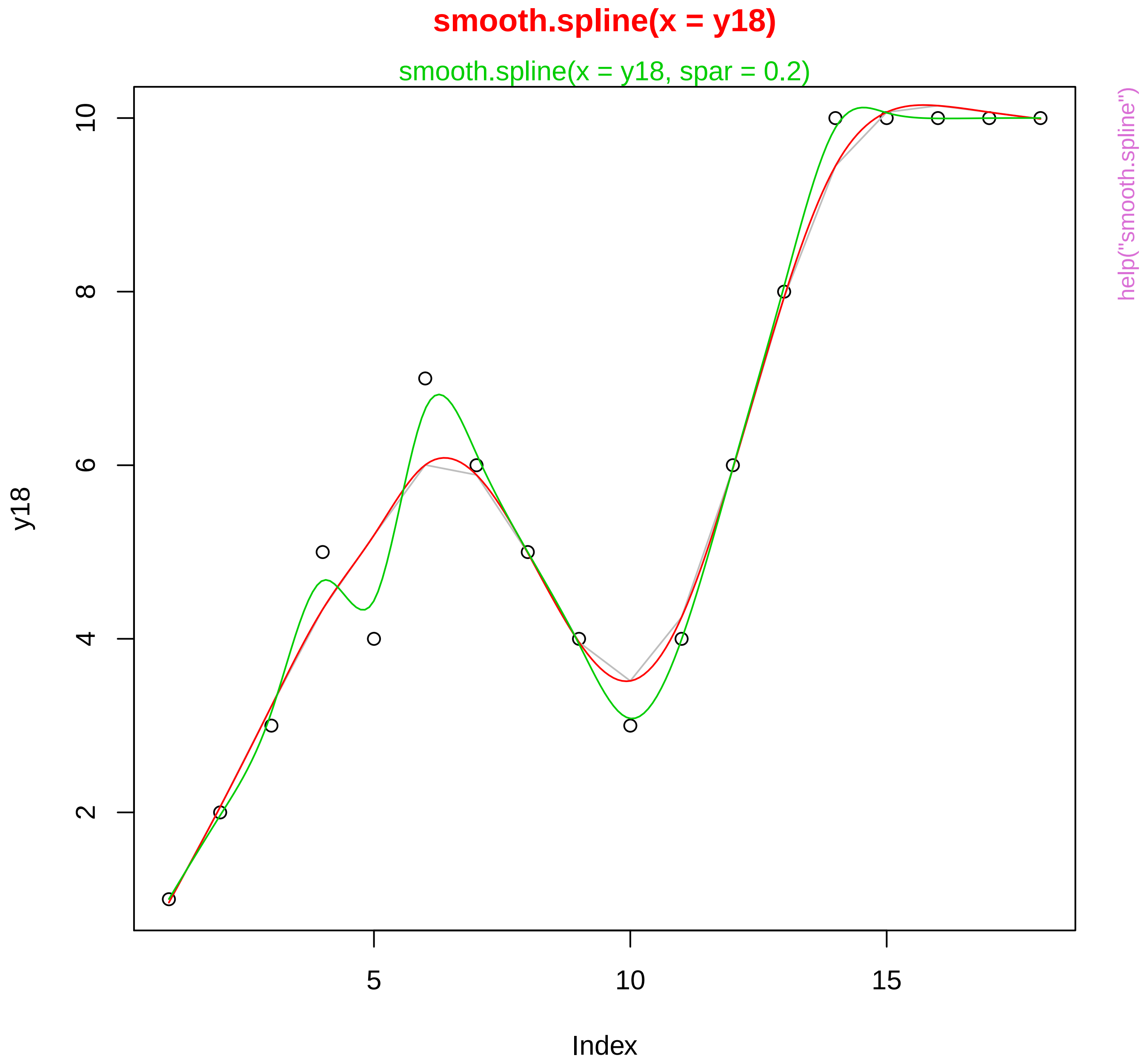
breakdown of 3R and S and hence 3RSS
x
Index
0
2
4
6
8
10
1
2
3
4
5
6
7
8
help("smooth")

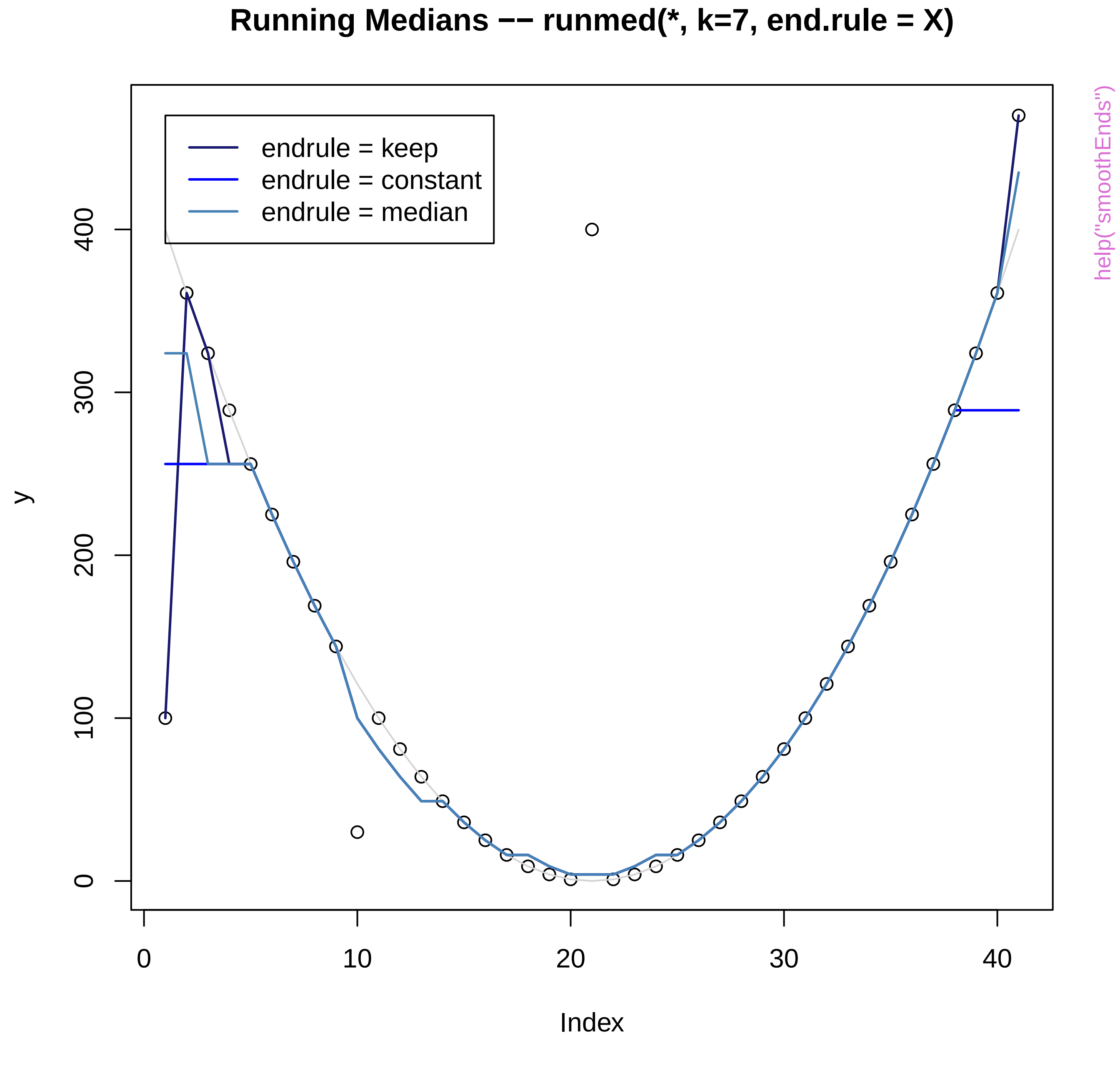


smooth(presidents0, *) : 3R and default 3RS3R
presidents
Time
0
20
40
60
80
1945
1950
1955
1960
1965
1970
1975
help("smooth")

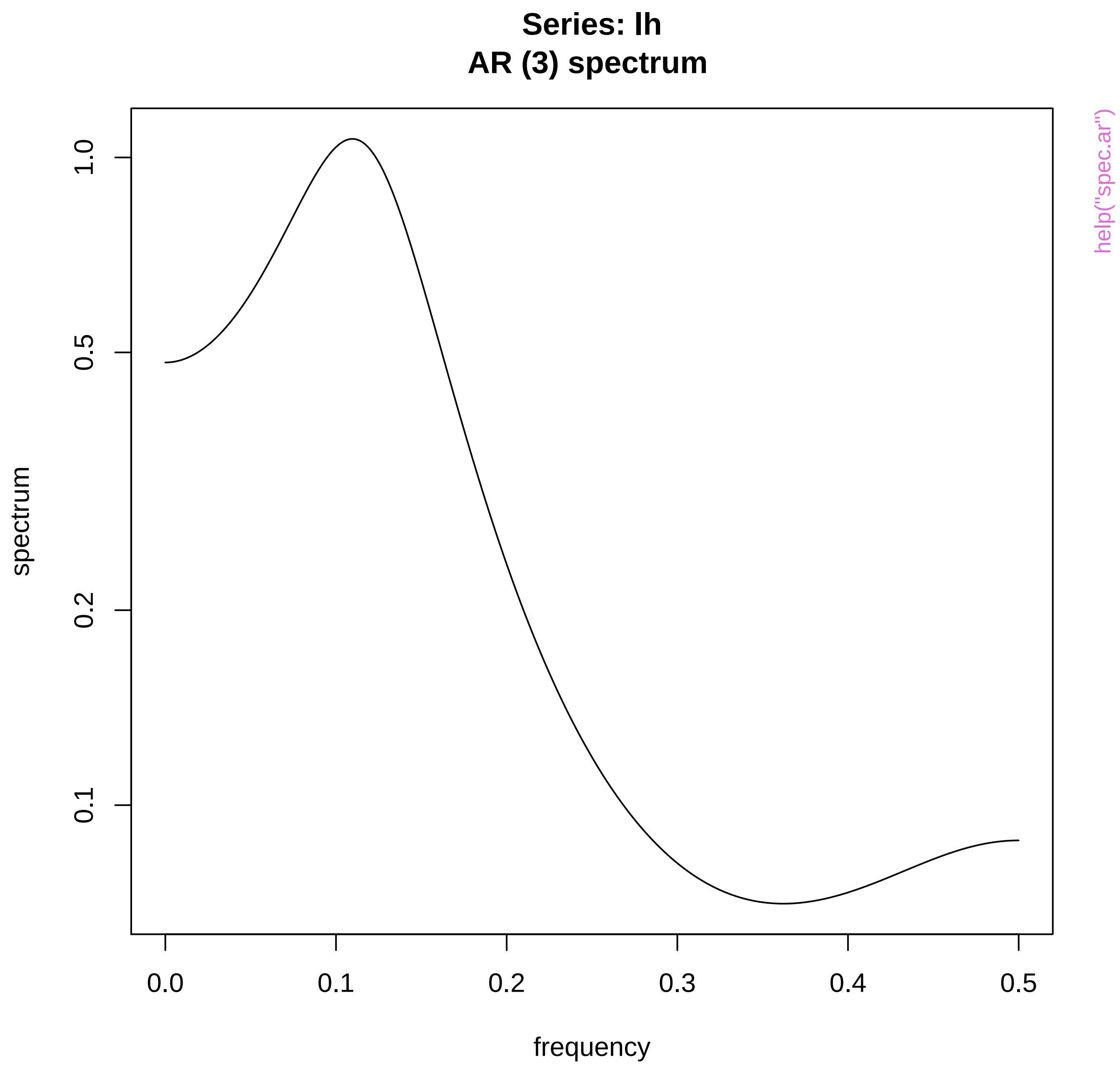

data(cars) & smoothing splines
default [C.V.] => df = 2.6
s(* , df = 10)
help("smooth.spline")
dist
speed
0
20
40
60
80
100
120
5
10
15
20
25


residuals(cars.spl)
fitted(cars.spl)
-20
0
20
40
0
20
40
60
80
help("smooth.spline")

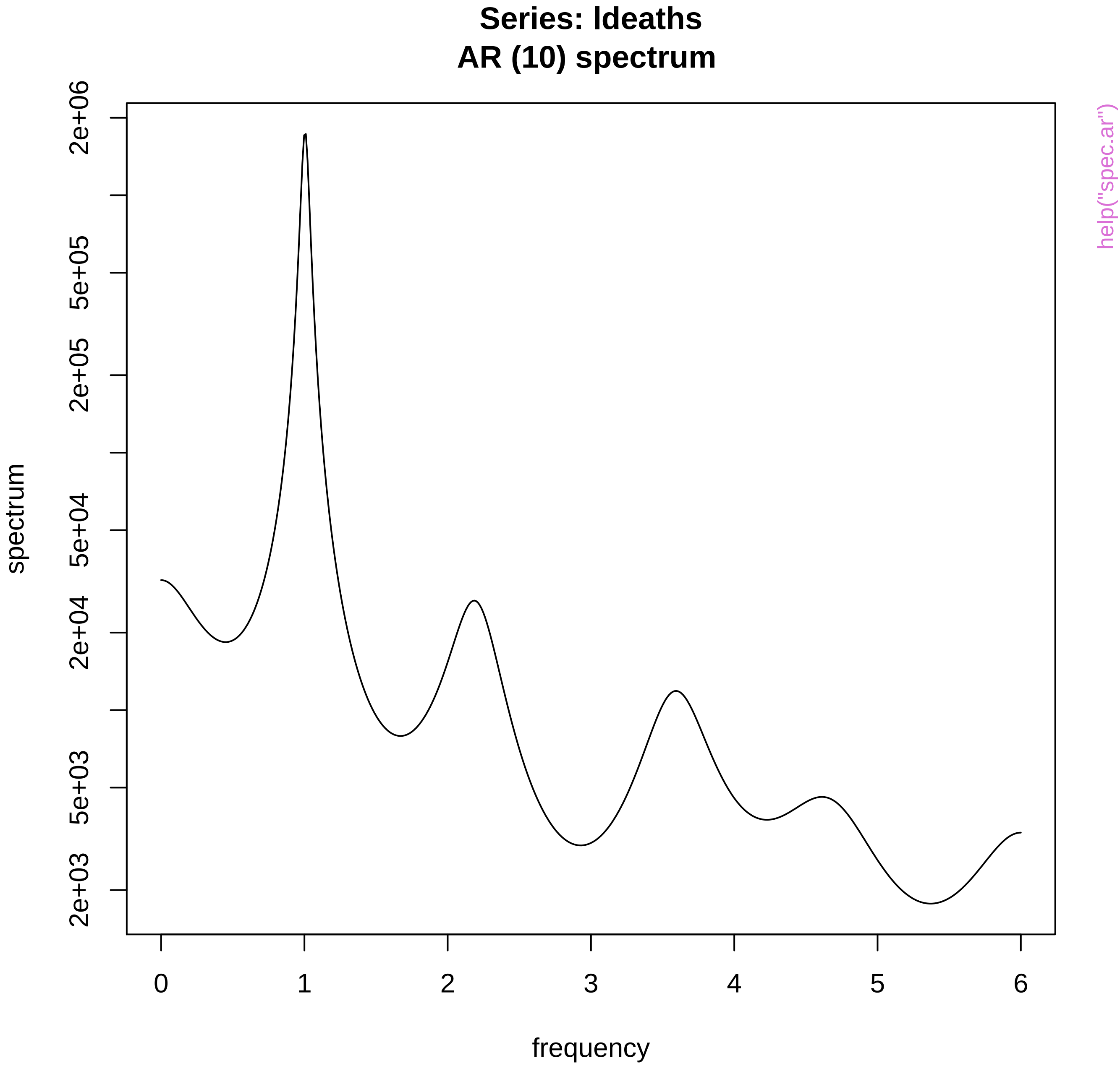

smooth.spline(x = y18)
smooth.spline(x = y18, spar = 0.2)
help("smooth.spline")
y18
10
8
6
4
2
5
10
15
Index

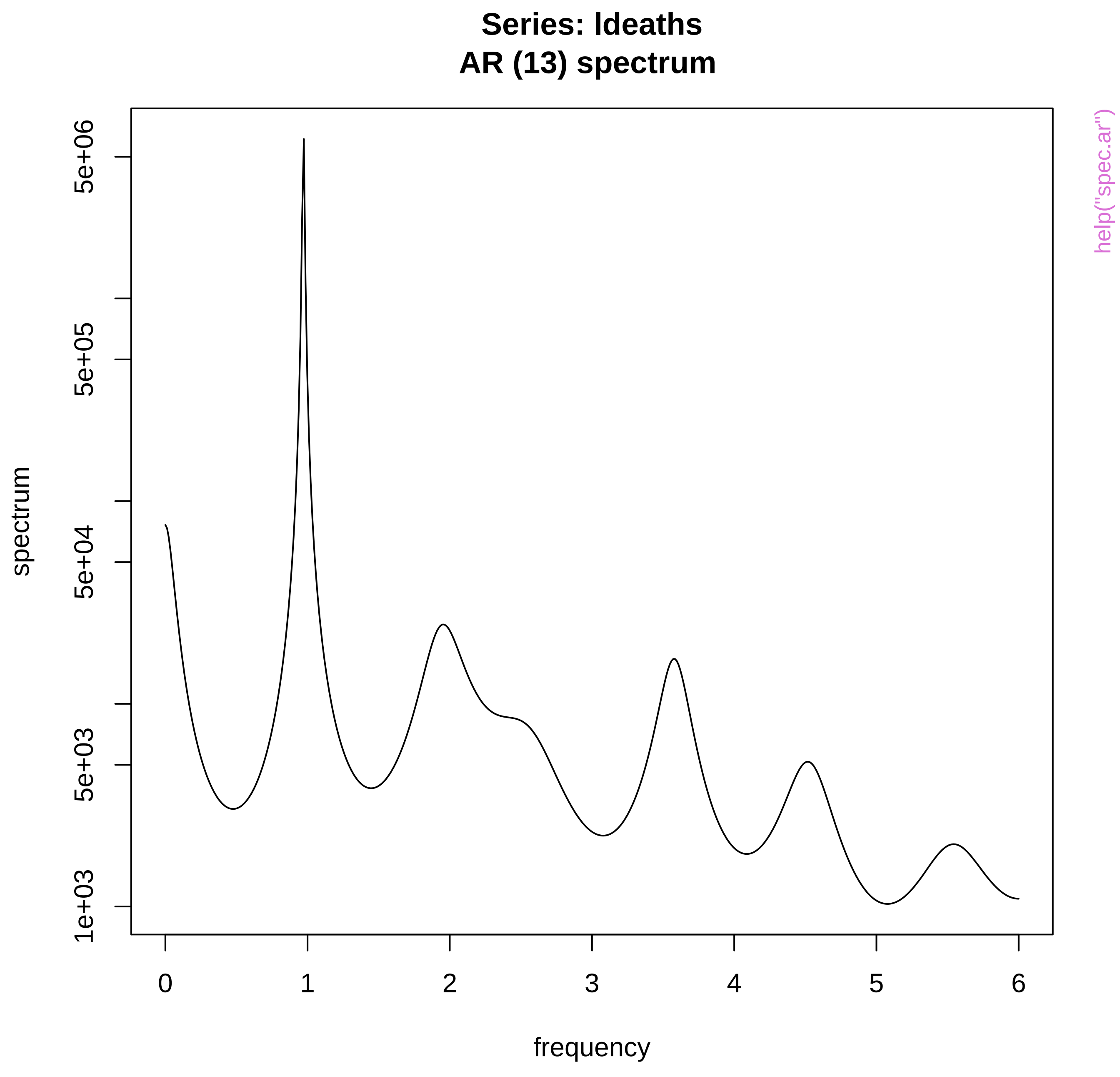


Running Medians −− runmed(*, k=7, end.rule = X)
endrule = keep
endrule = constant
endrule = median
y
0
100
200
300
400
Index
0
10
20
30
40
help("smoothEnds")

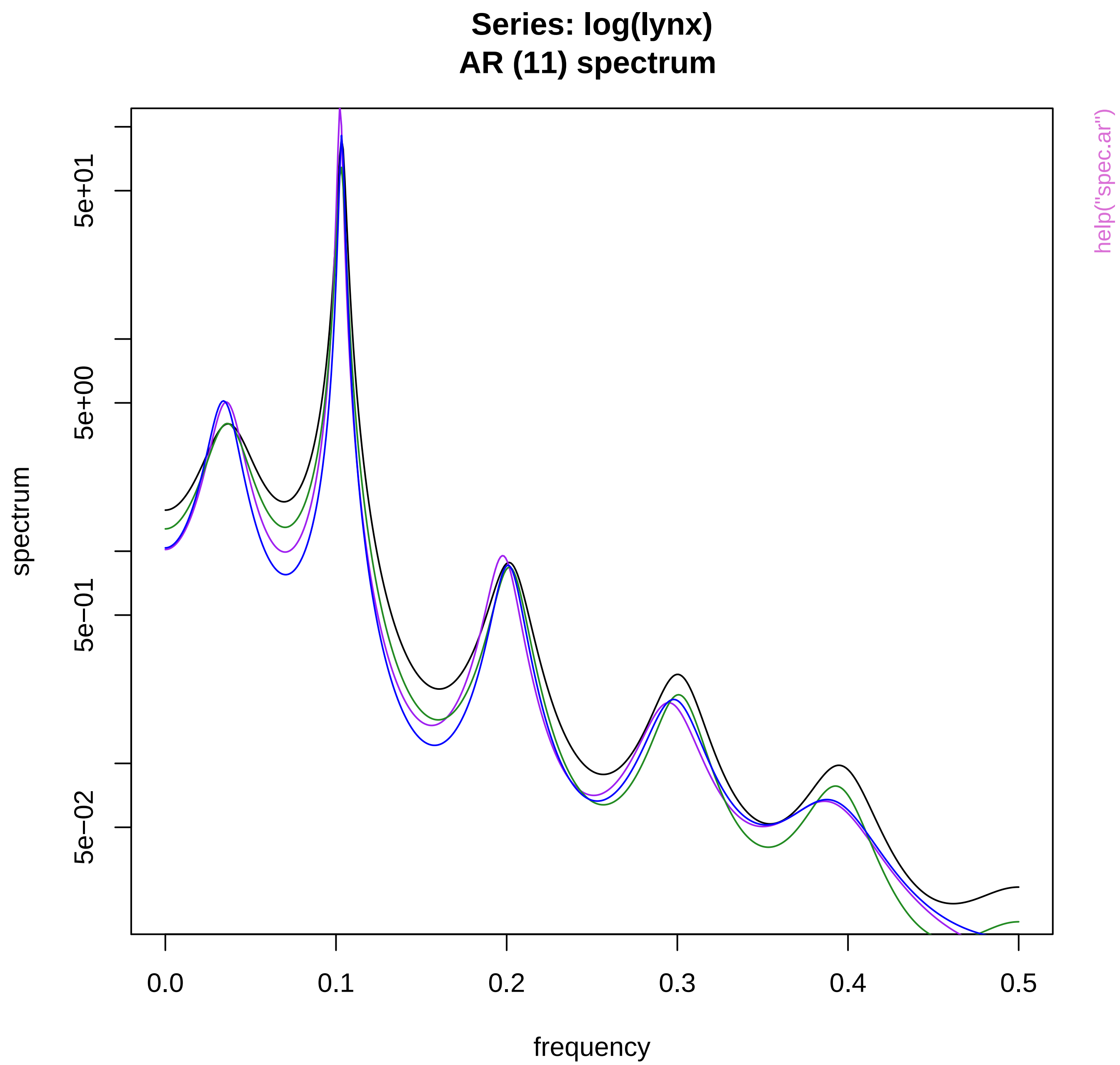


Series: lh
AR (3) spectrum
spectrum
frequency
1.0
0.5
0.2
0.1
0.0
0.1
0.2
0.3
0.4
0.5
help("spec.ar")

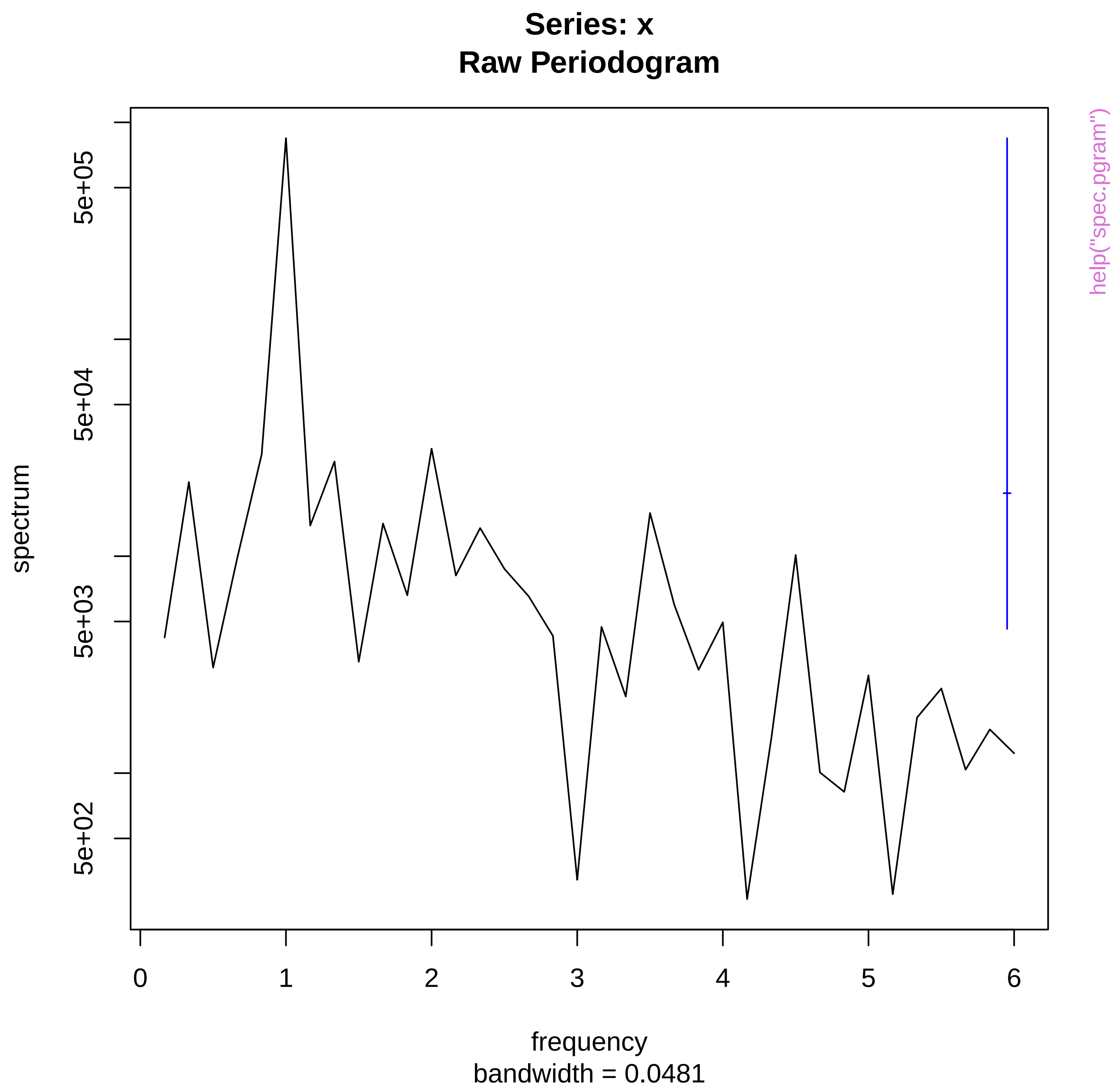

Series: ldeaths
AR (10) spectrum
spectrum
2e+06
5e+05
2e+05
5e+04
2e+04
5e+03
2e+03
0
1
2
3
4
5
6
frequency
help("spec.ar")

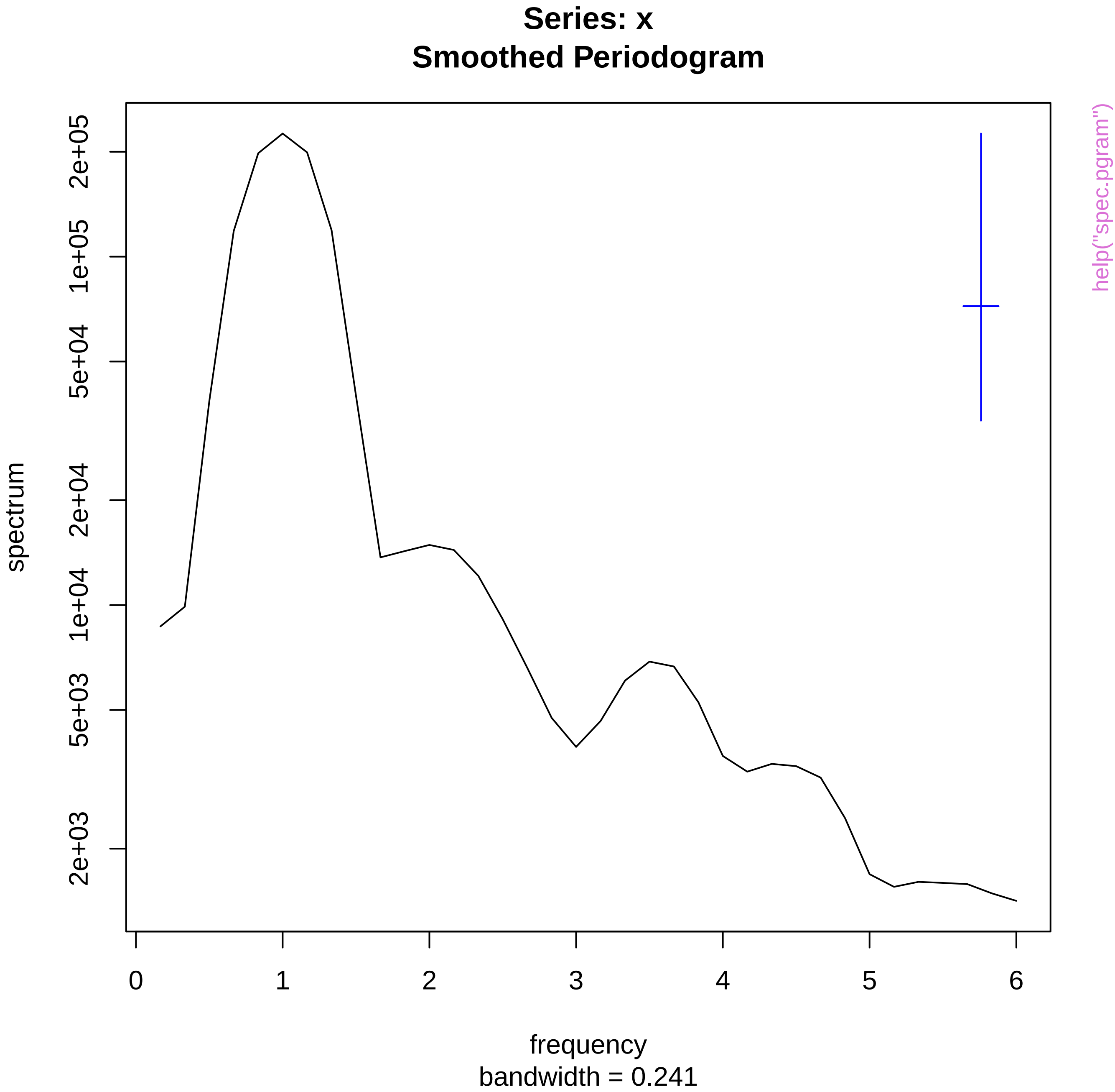


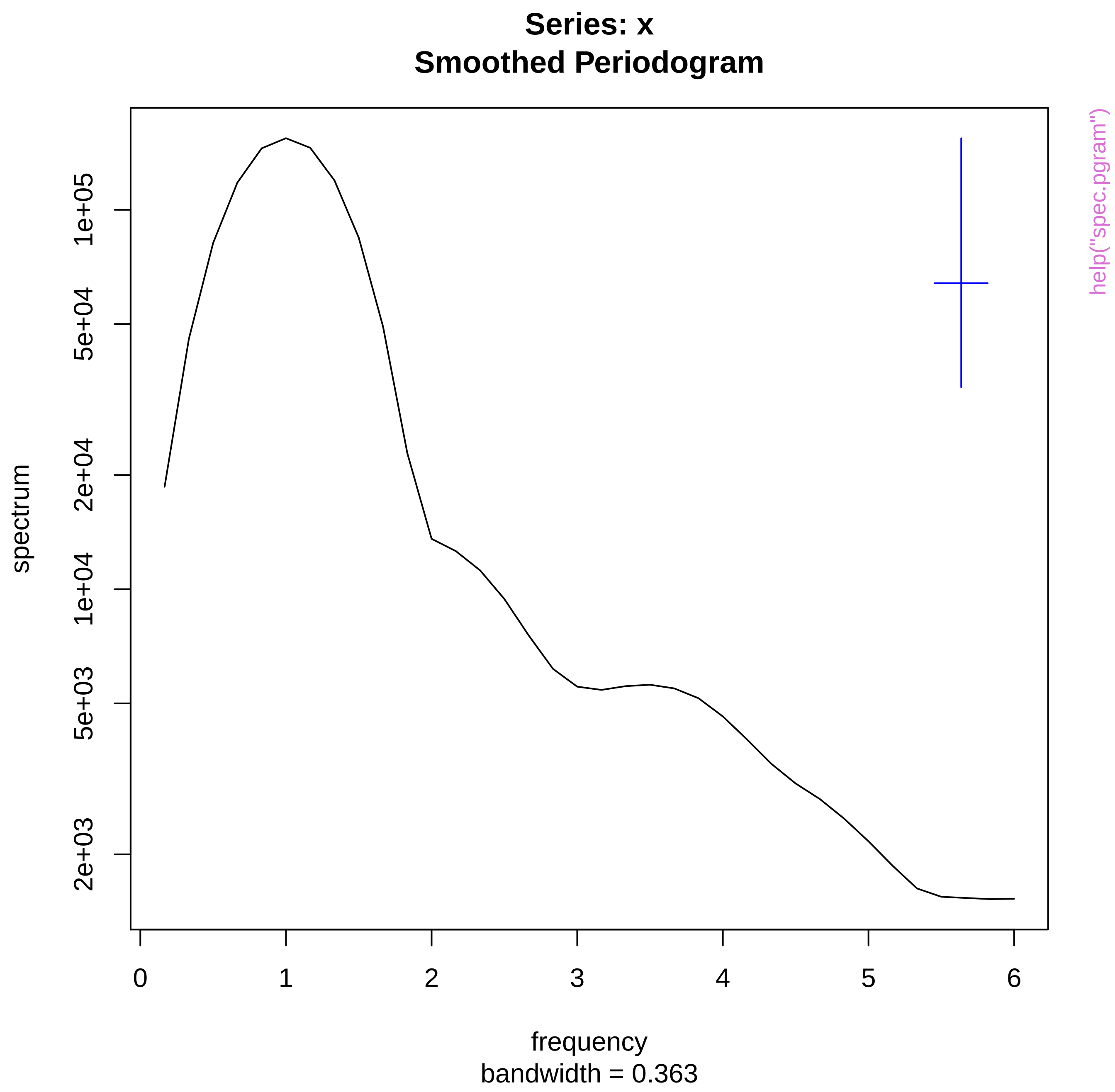
Series: ldeaths
AR (13) spectrum
spectrum
5e+06
5e+05
5e+04
5e+03
1e+03
0
1
2
3
4
5
6
frequency
help("spec.ar")



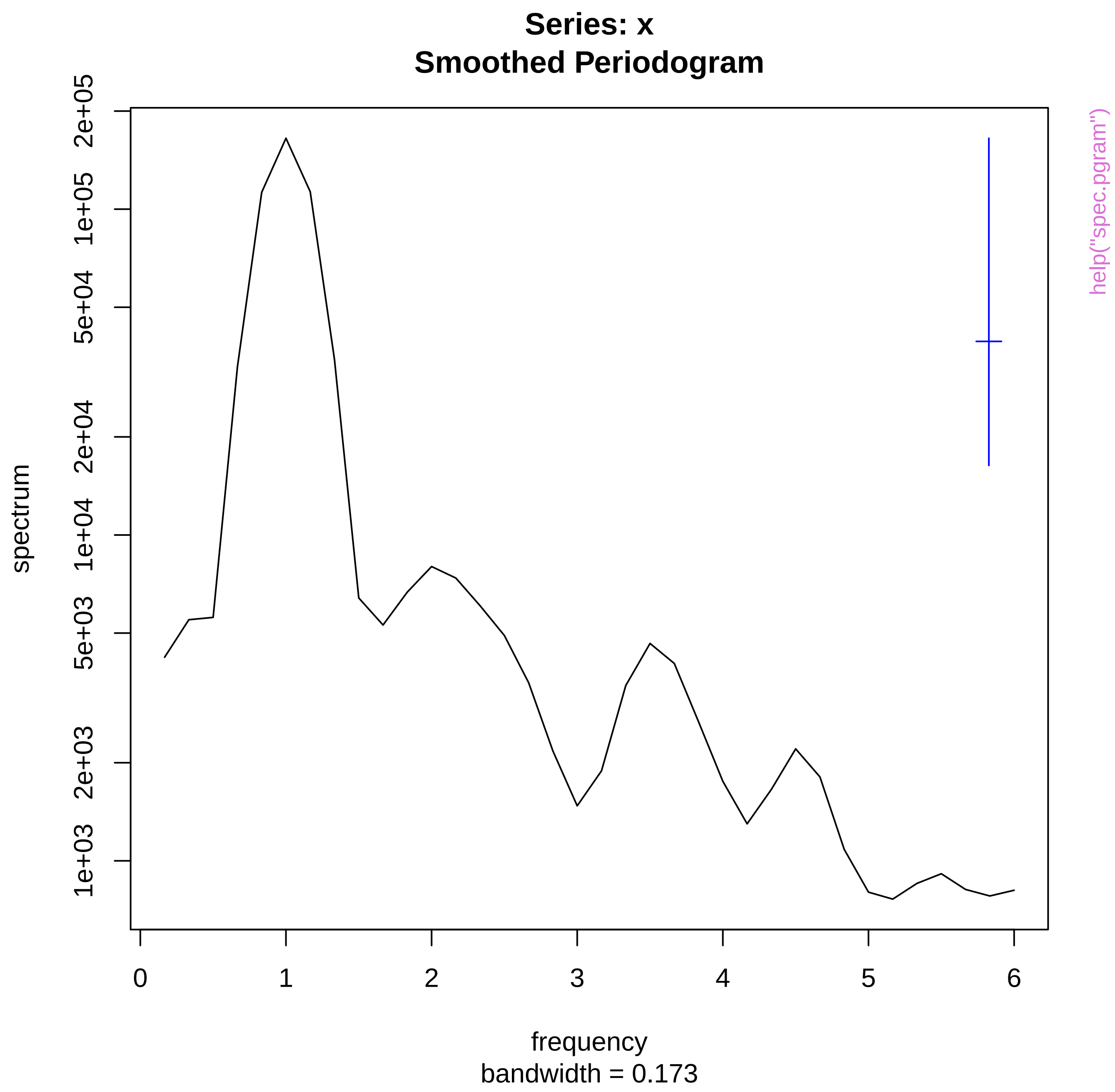
Series: log(lynx)
AR (11) spectrum
spectrum
5e+01
5e+00
5e−01
5e−02
0.0
0.1
0.2
0.3
0.4
0.5
frequency
help("spec.ar")


Series: x
Raw Periodogram
5e+05
5e+04
5e+03
5e+02
spectrum
0
1
2
3
4
5
6
frequency
bandwidth = 0.0481
help("spec.pgram")

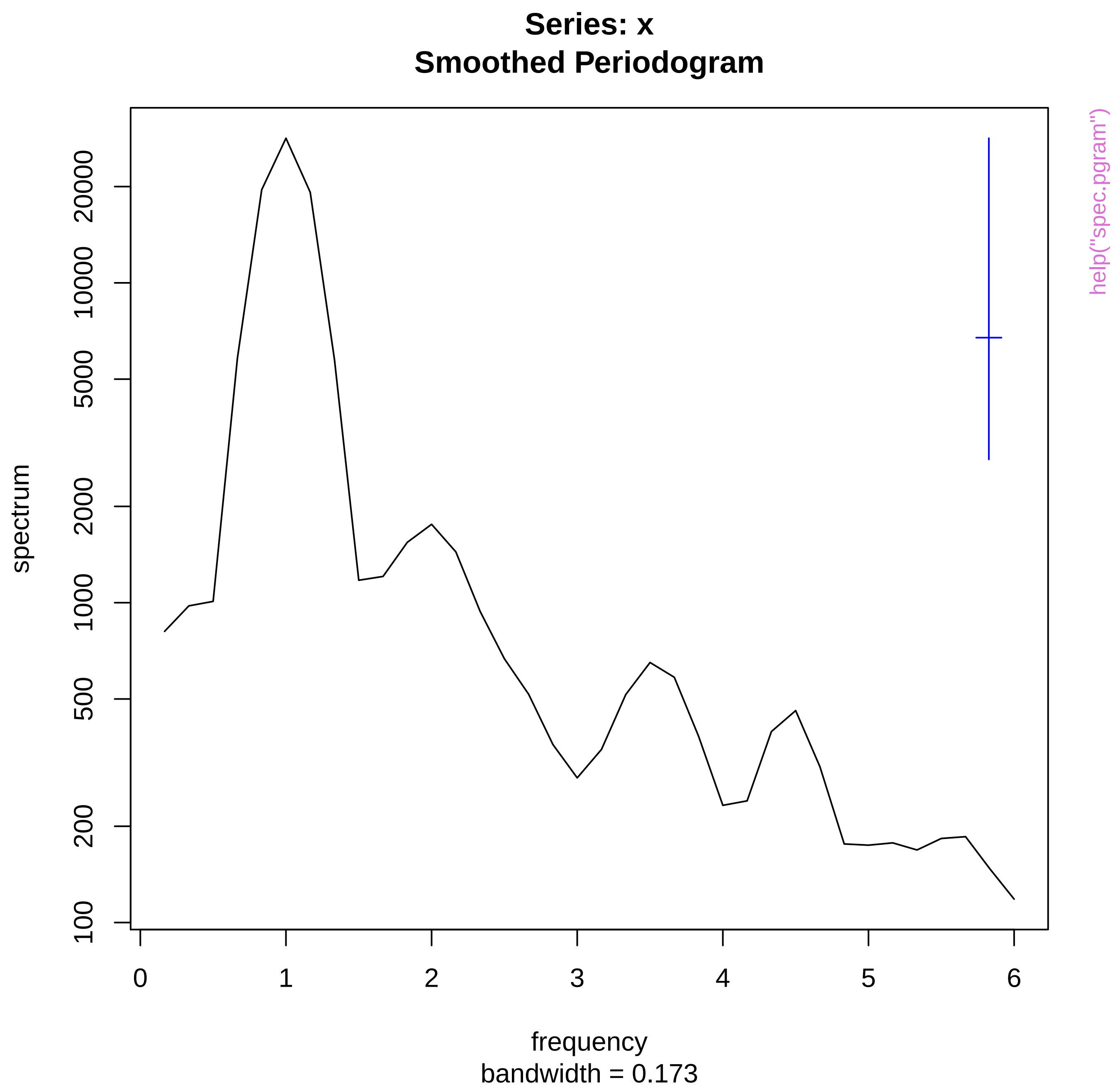

Series: x
Smoothed Periodogram
spectrum
2e+05
1e+05
5e+04
2e+04
1e+04
5e+03
2e+03
0
1
2
3
4
5
6
frequency
bandwidth = 0.241
help("spec.pgram")

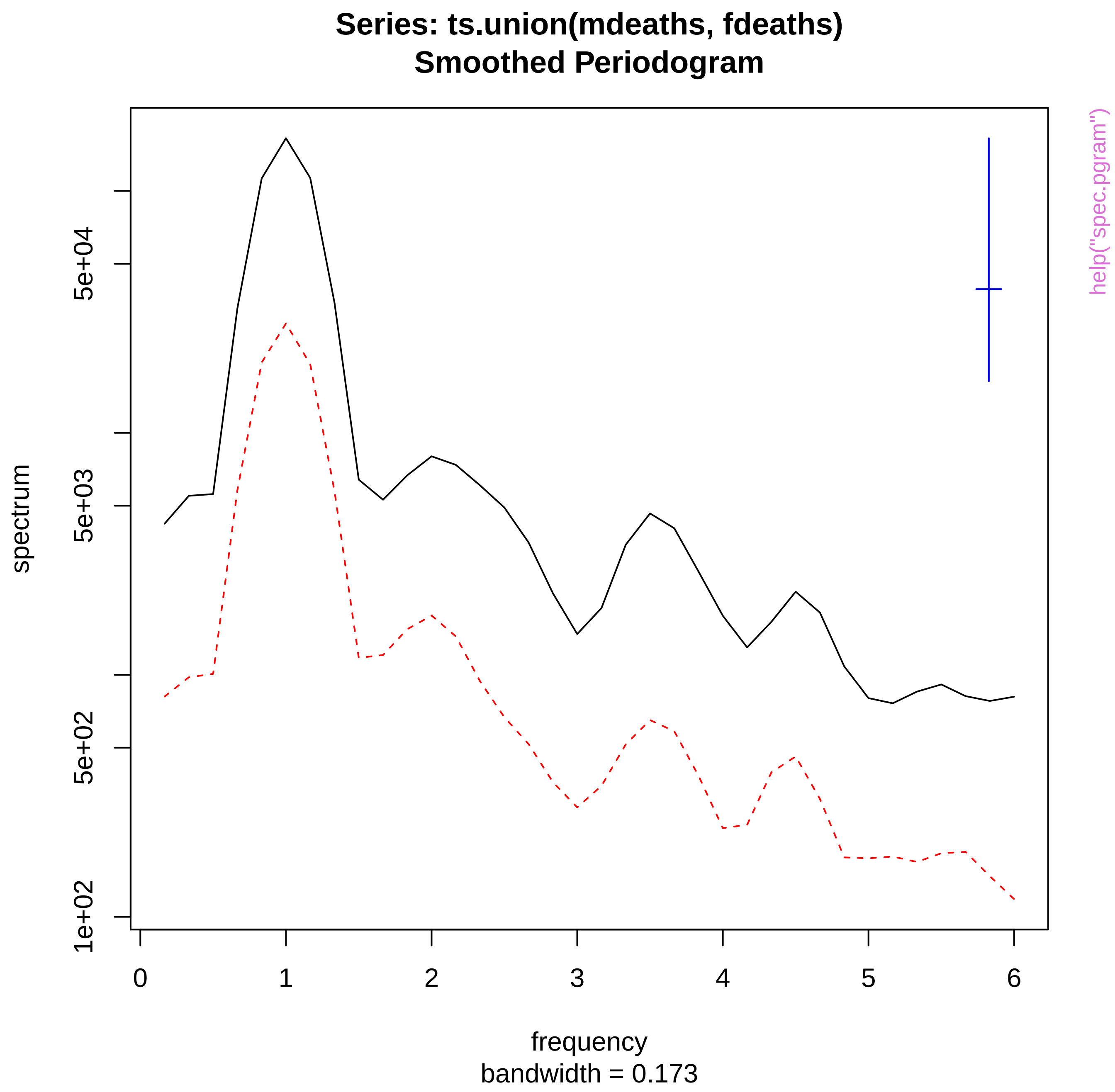


Series: x
Smoothed Periodogram
spectrum
2e+03
5e+03
1e+04
2e+04
5e+04
1e+05
0
1
2
3
4
5
6
frequency
bandwidth = 0.363
help("spec.pgram")

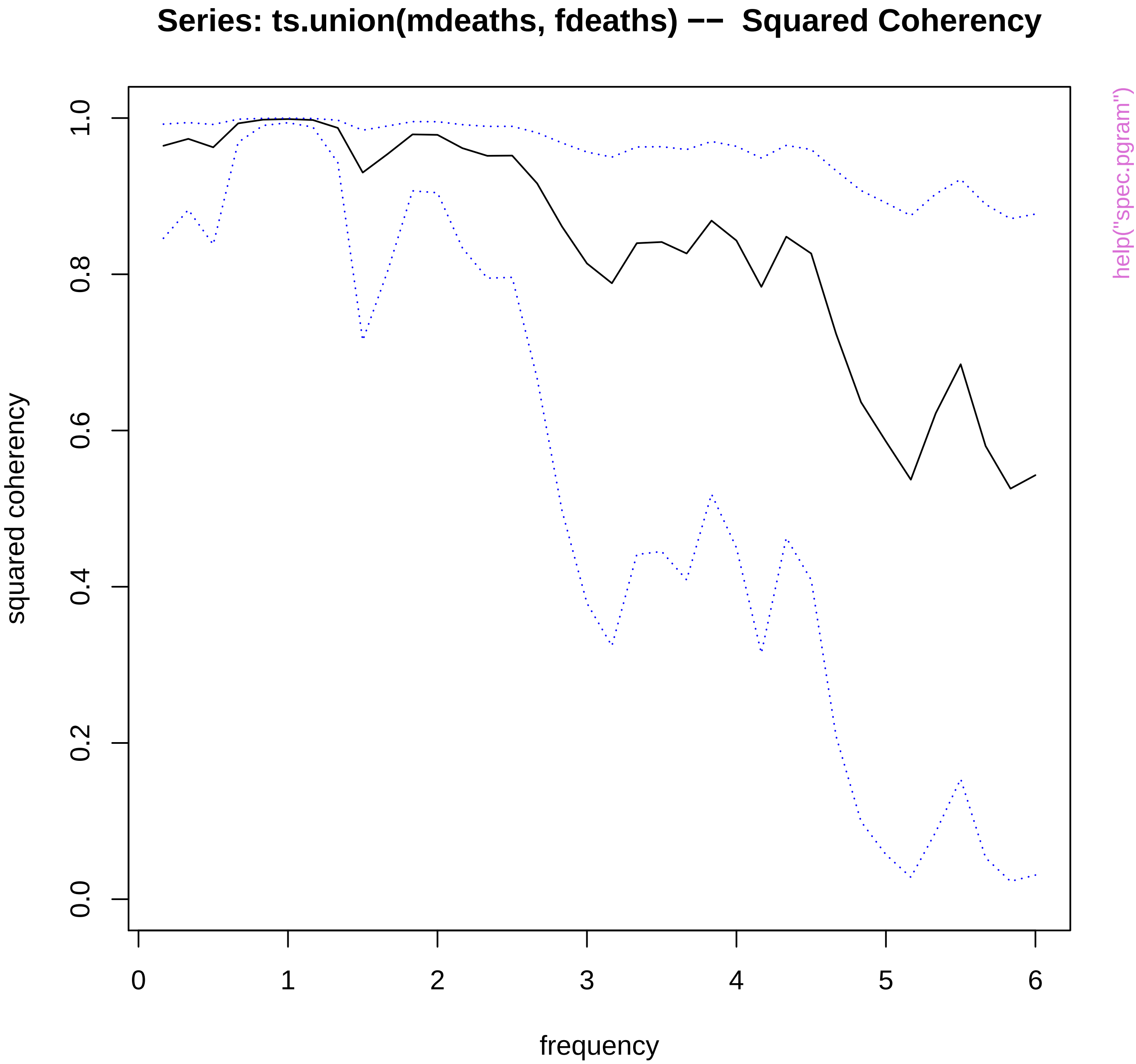


Series: x
Smoothed Periodogram
spectrum
2e+05
1e+05
5e+04
2e+04
1e+04
5e+03
2e+03
1e+03
0
1
2
3
4
5
6
frequency
bandwidth = 0.173
help("spec.pgram")

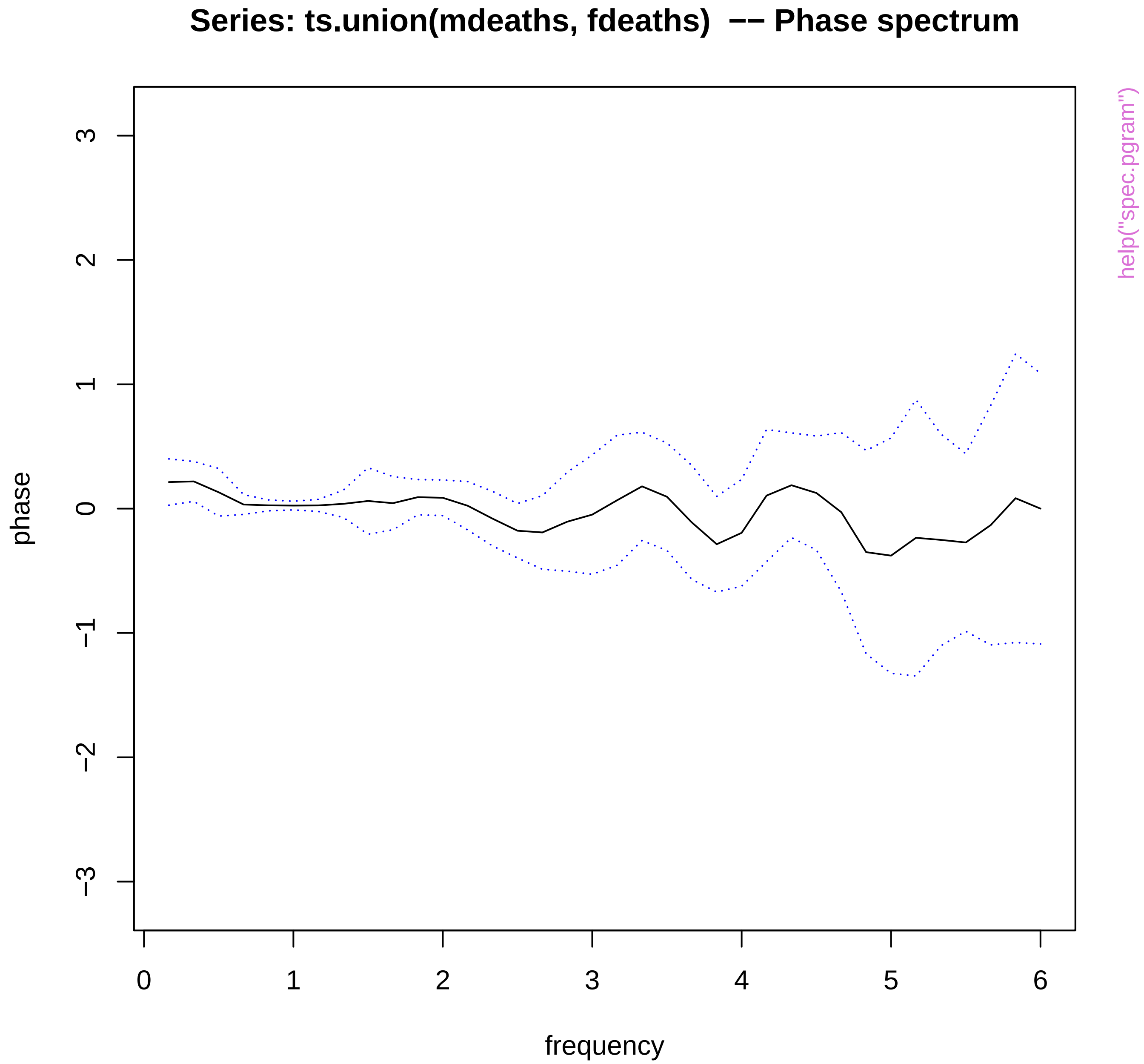

Series: x
Smoothed Periodogram
spectrum
100
200
500
1000
2000
5000
10000
20000
0
1
2
3
4
5
6
frequency
bandwidth = 0.173
help("spec.pgram")



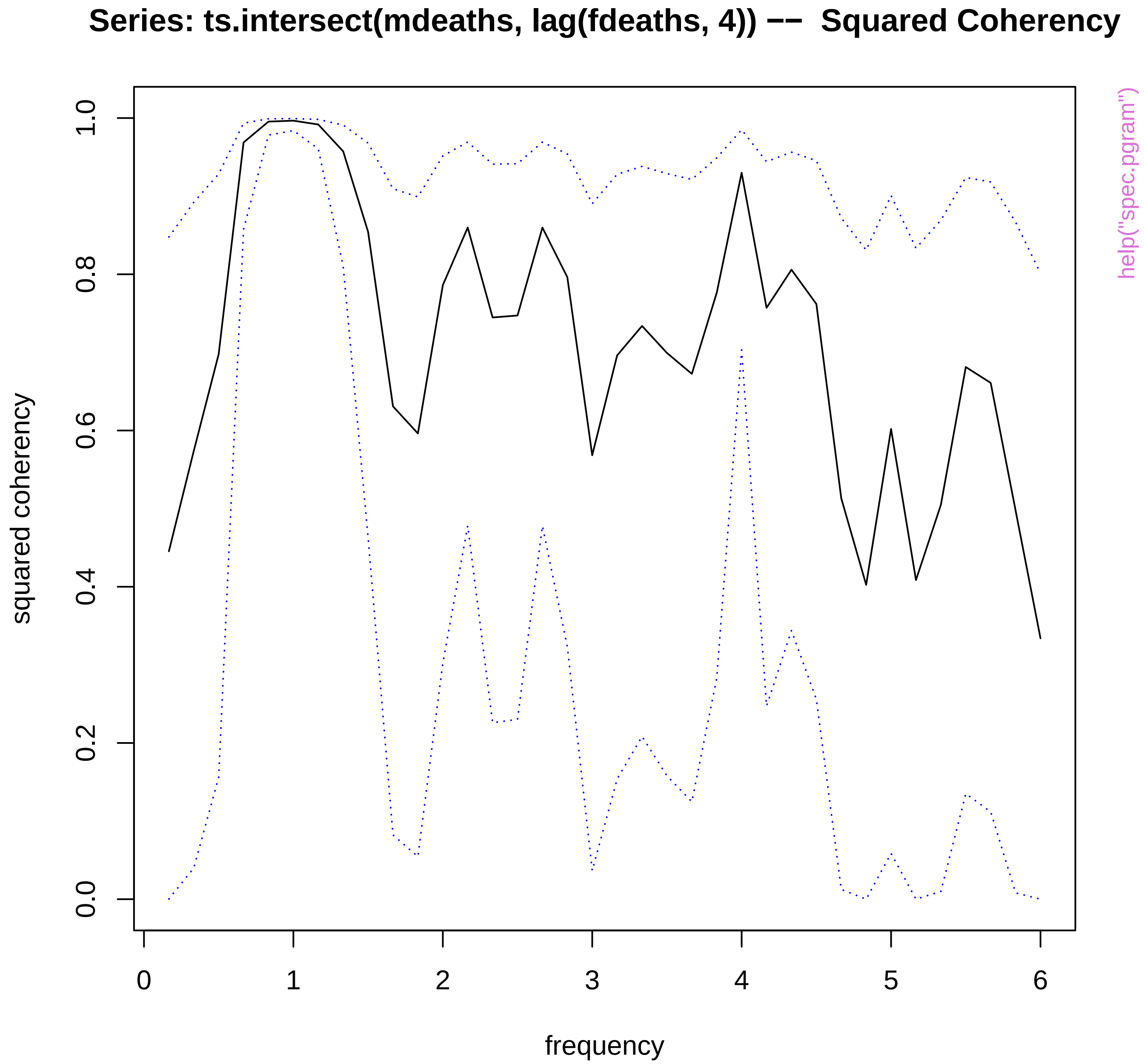
Series: ts.union(mdeaths, fdeaths)
Smoothed Periodogram
spectrum
1e+02
5e+02
5e+03
5e+04
0
1
2
3
4
5
6
frequency
bandwidth = 0.173
help("spec.pgram")



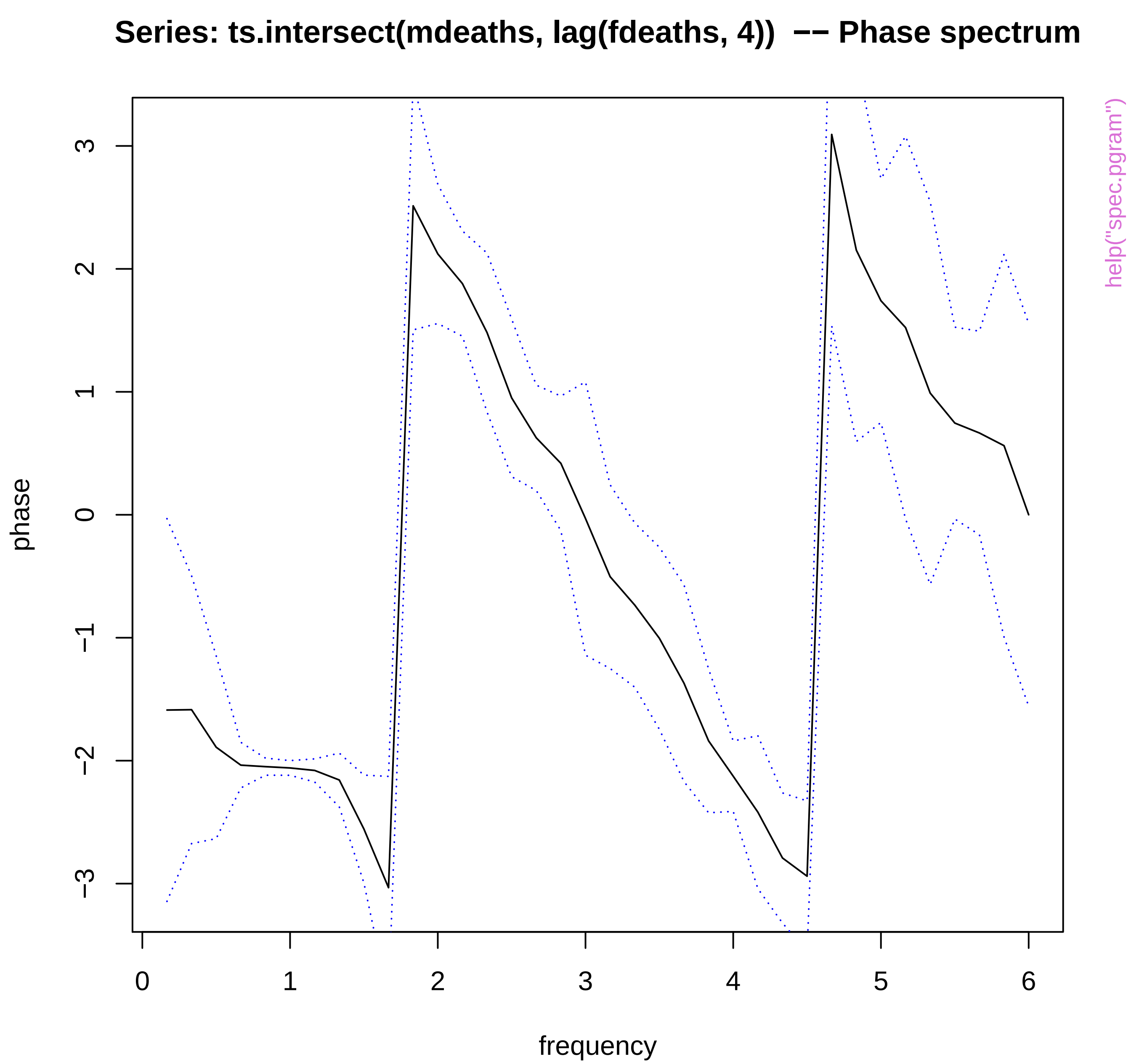
Series: ts.union(mdeaths, fdeaths) -- Squared Coherency
squared coherency
frequency
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4
5
6
help("spec.pgram")



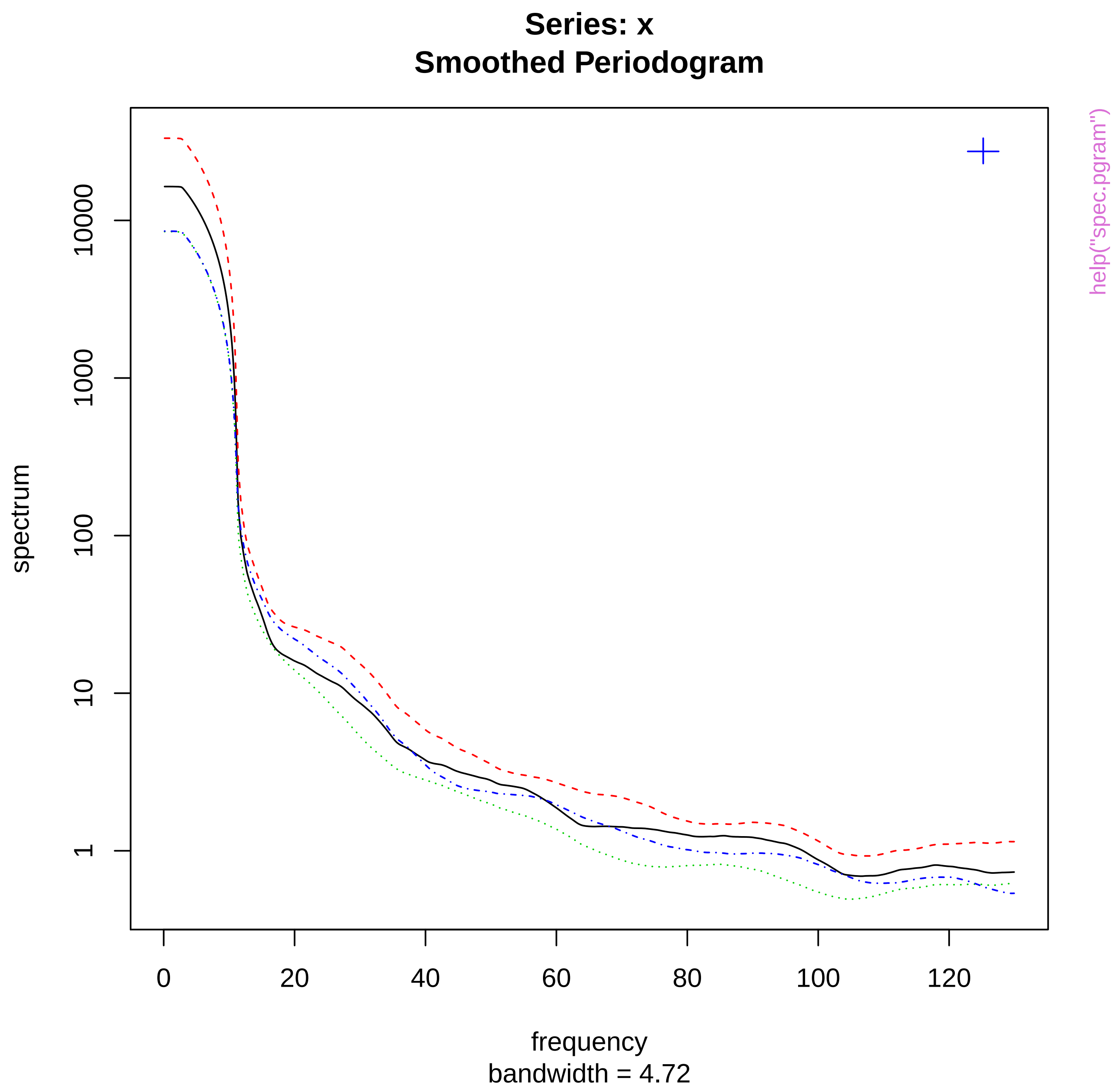
Series: ts.union(mdeaths, fdeaths) -- Phase spectrum
phase
3
2
1
0
−1
−2
−3
0
1
2
3
4
5
6
frequency
help("spec.pgram")

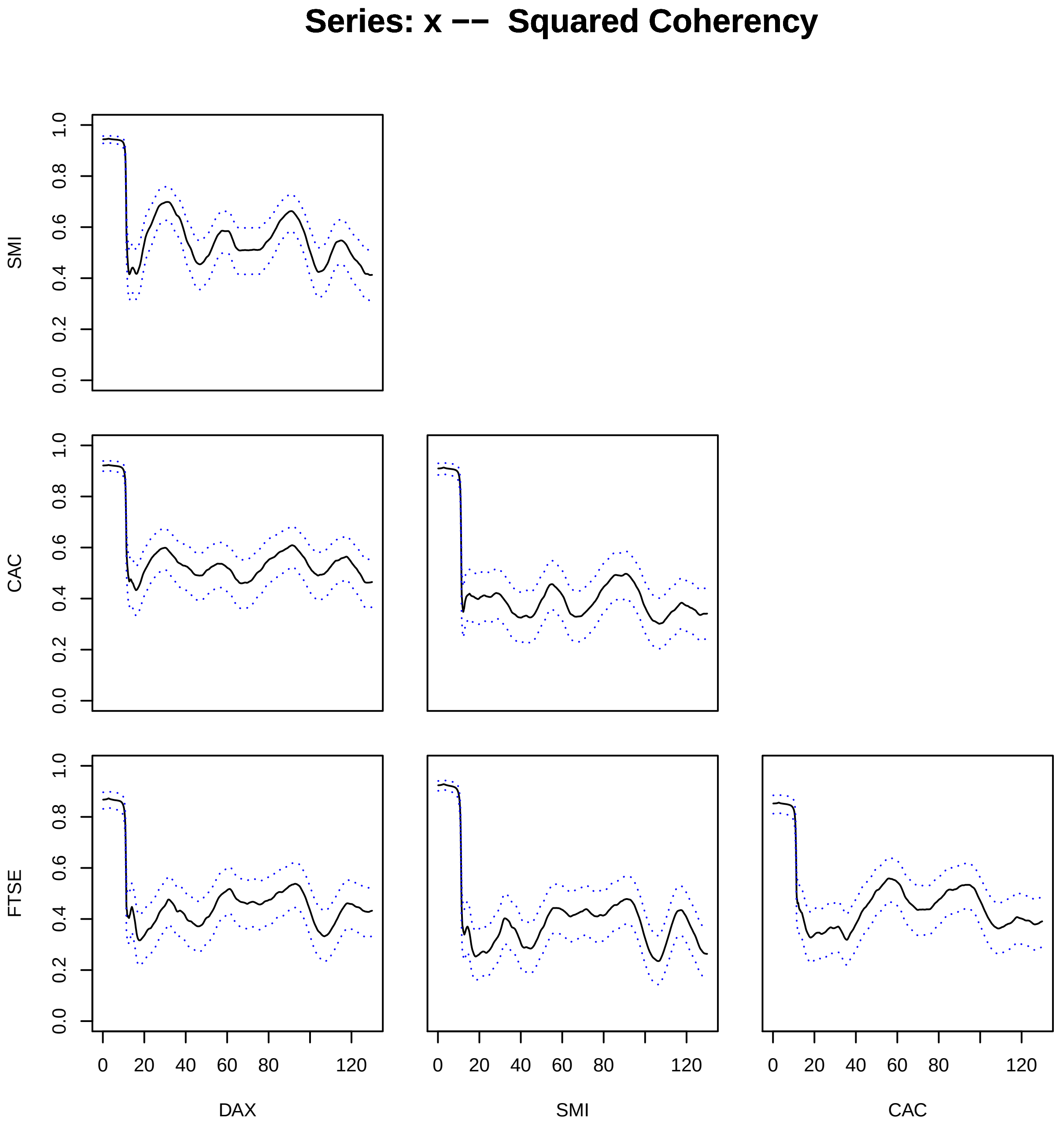


Series: ts.intersect(mdeaths, lag(fdeaths, 4)) -- Squared Coherency
squared coherency
frequency
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4
5
6
help("spec.pgram")

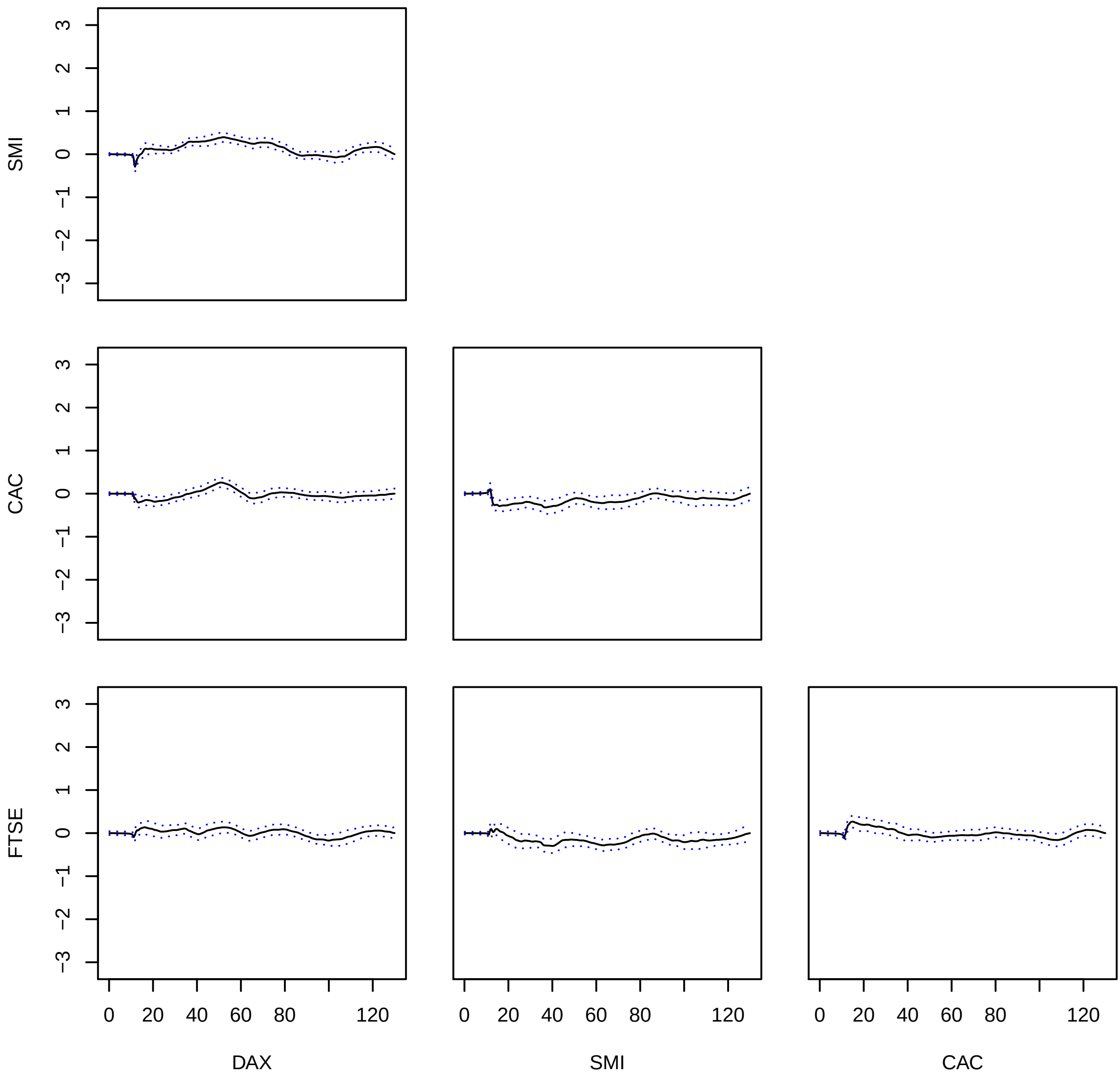


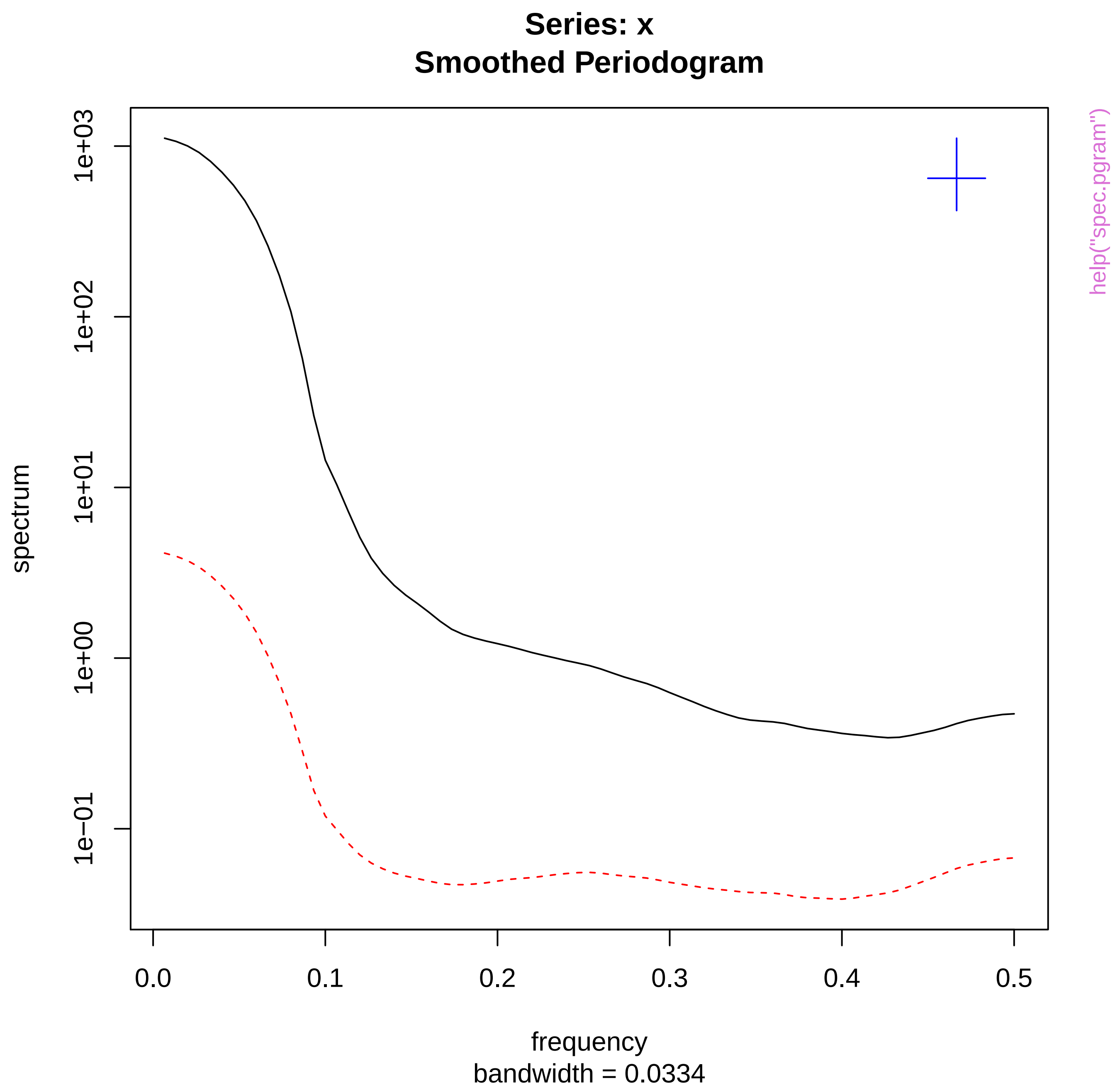
Series: ts.intersect(mdeaths, lag(fdeaths, 4)) -- Phase spectrum
phase
frequency
0
1
2
3
4
5
6
−3
−2
−1
0
1
2
3
help("spec.pgram")

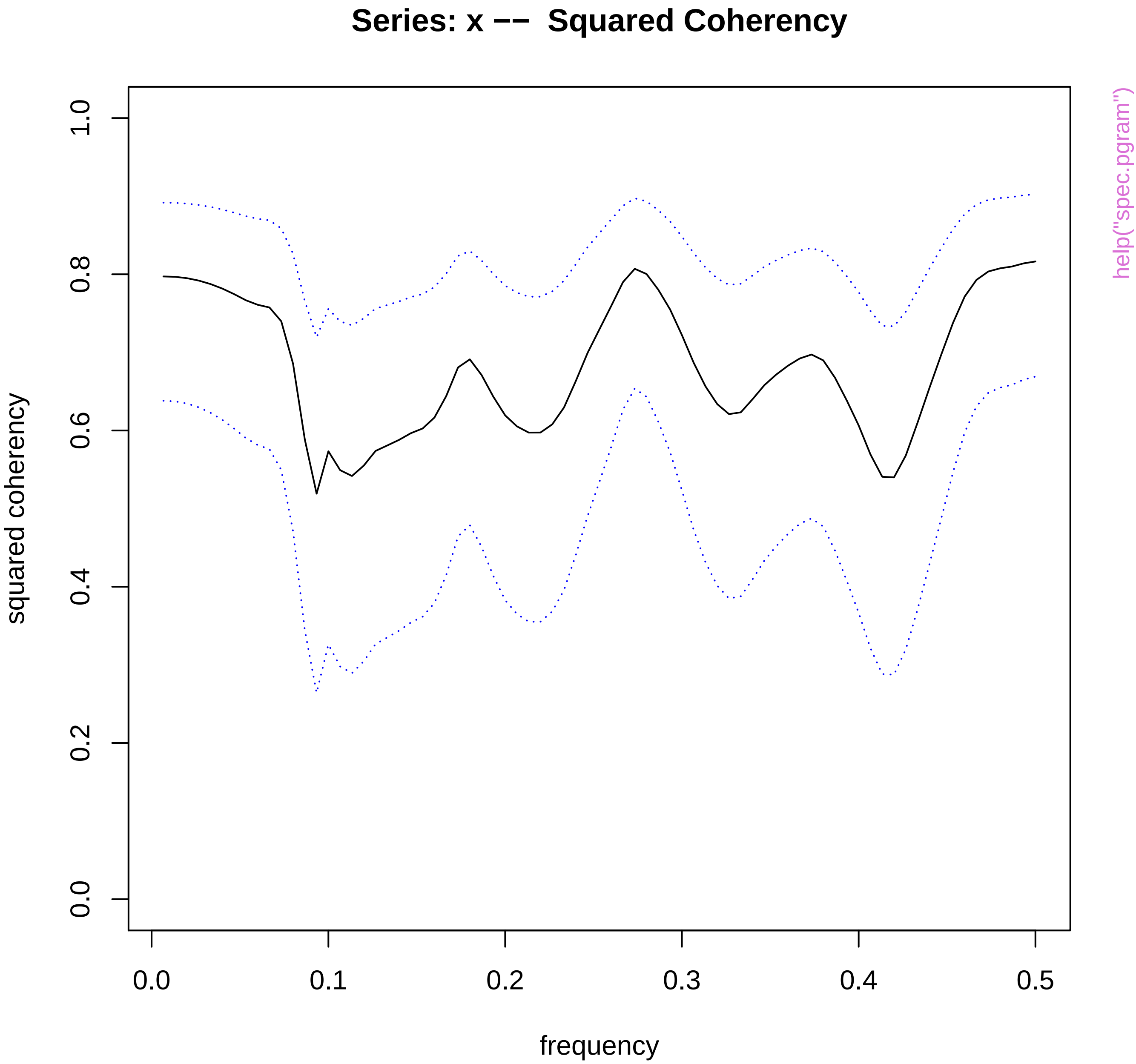

Series: x
Smoothed Periodogram
spectrum
1
10
100
1000
10000
0
20
40
60
80
100
120
frequency
bandwidth = 4.72
help("spec.pgram")

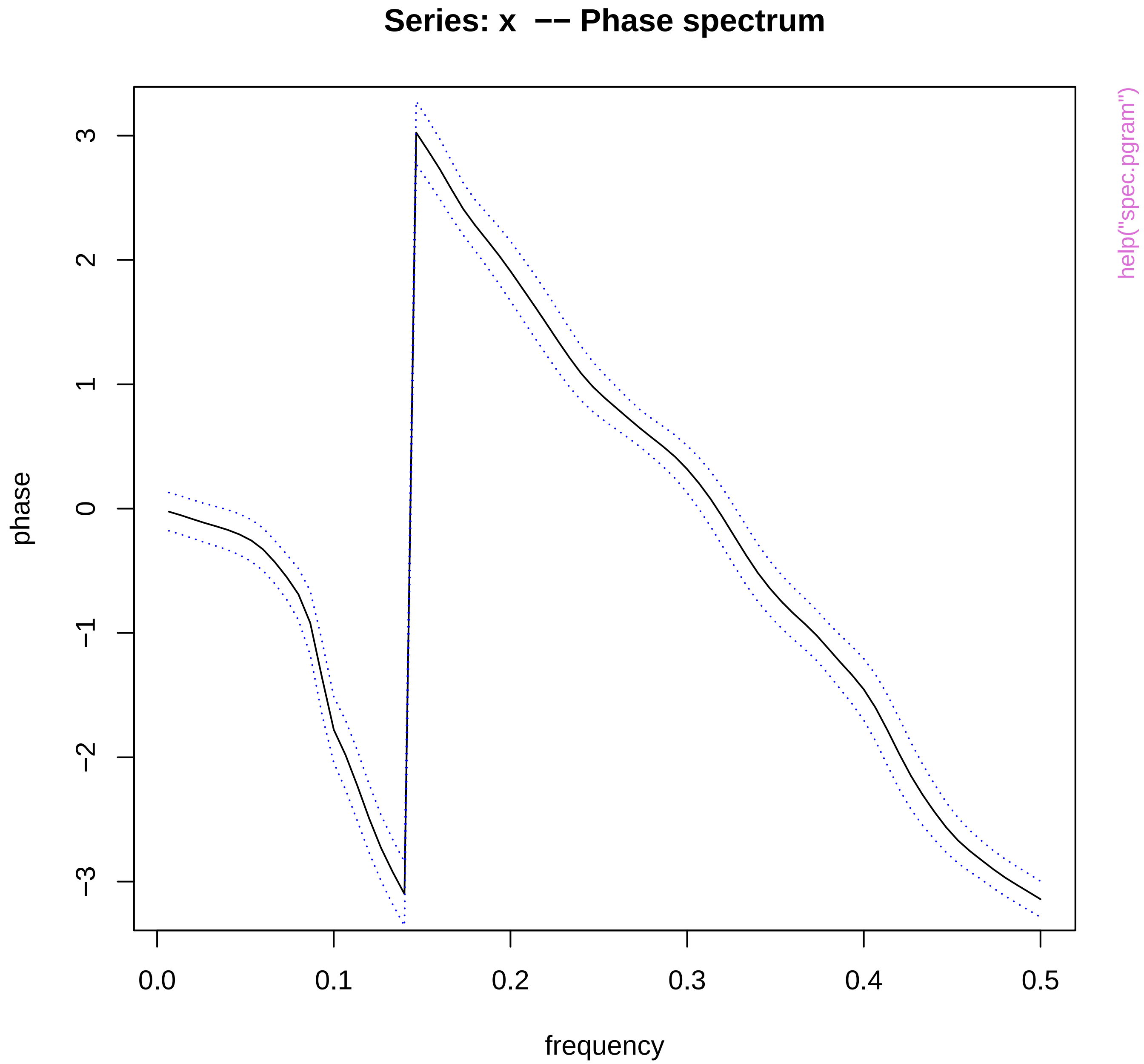

Series: x -- Squared Coherency
SMI
CAC
FTSE
DAX
SMI
CAC
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
120

Series: x -- Phase spectrum

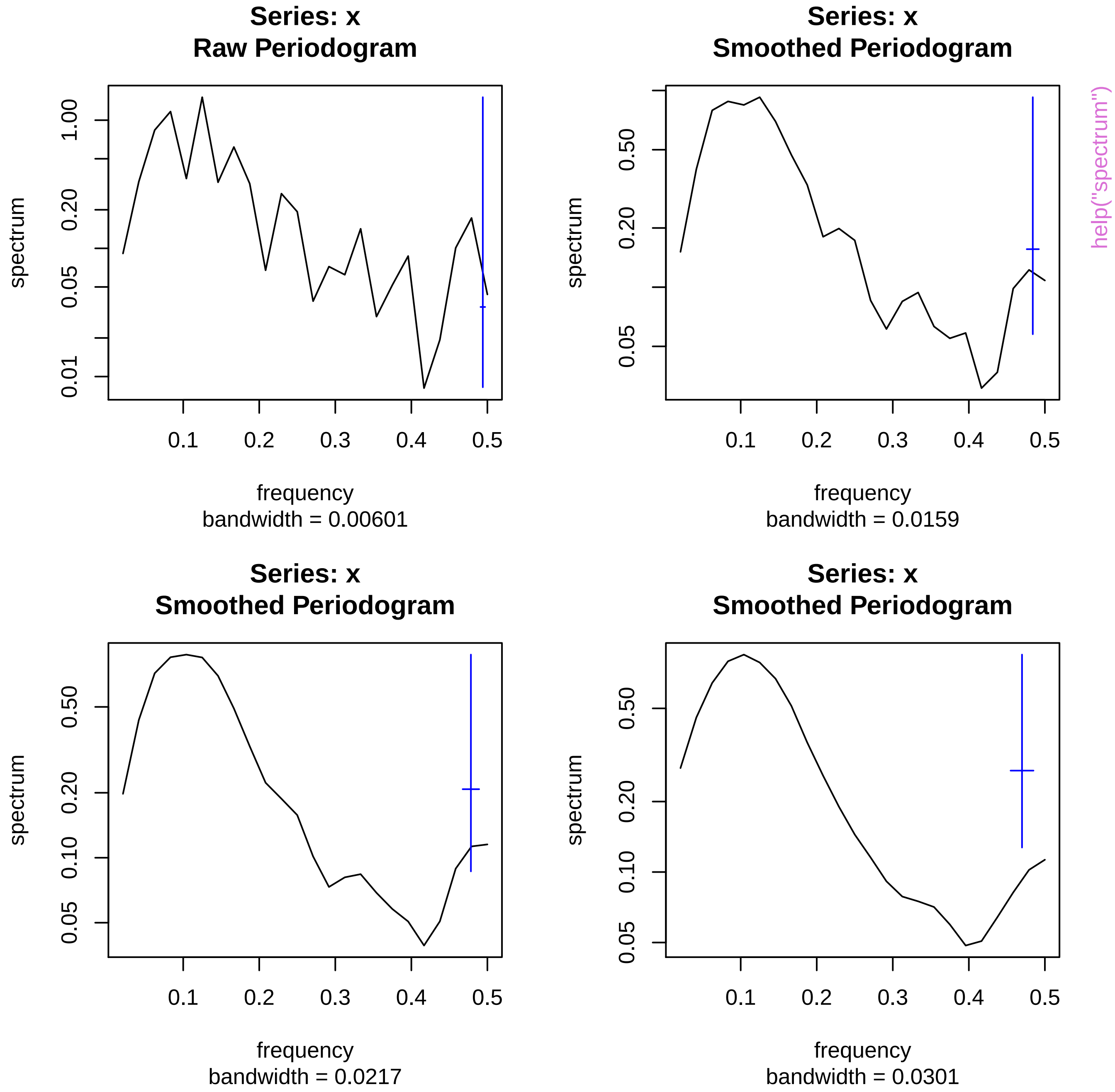


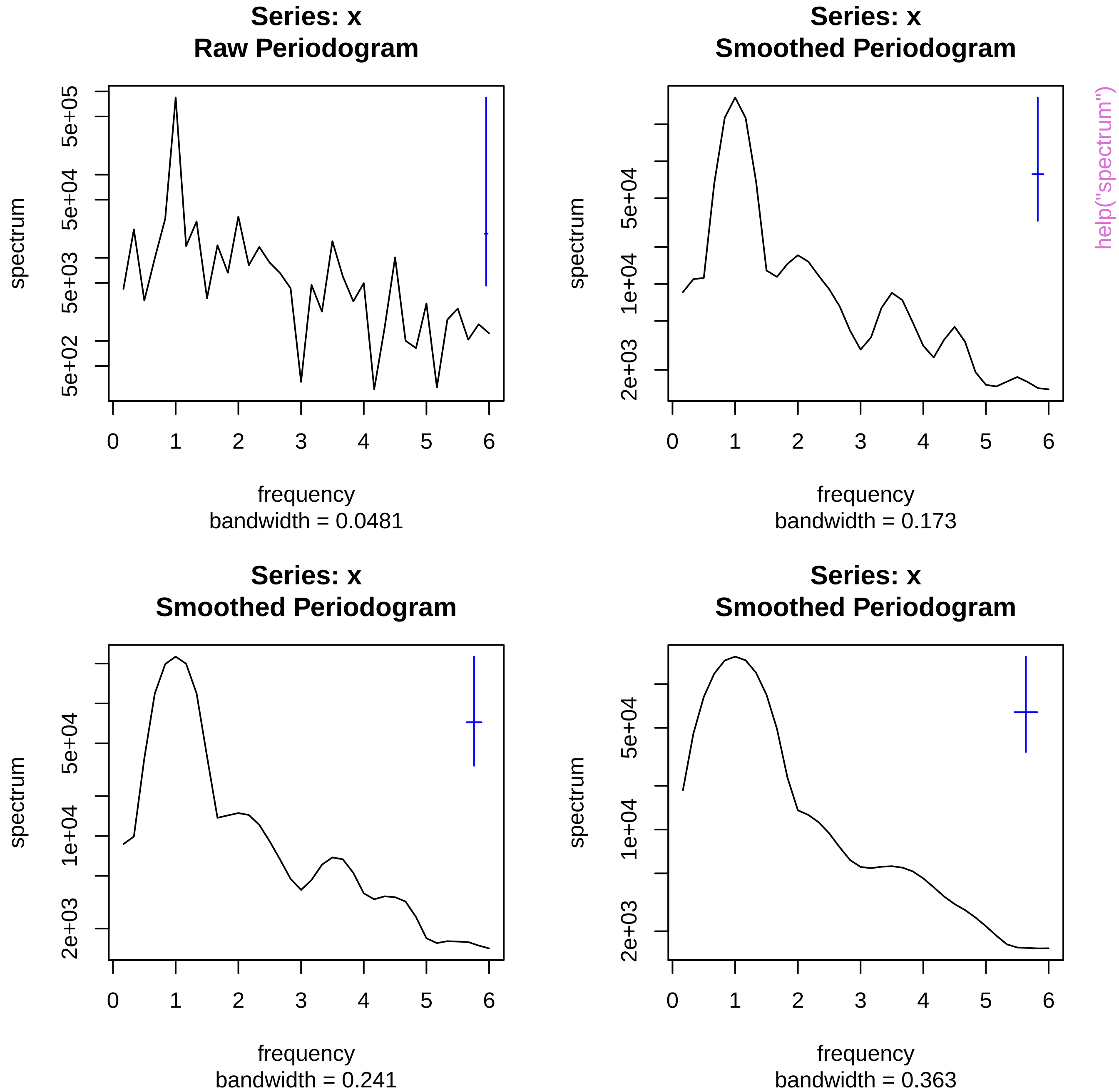

Series: x
Smoothed Periodogram
spectrum
1e+03
1e+02
1e+01
1e+00
1e−01
0.0
0.1
0.2
0.3
0.4
0.5
frequency
bandwidth = 0.0334
help("spec.pgram")


Series: x -- Squared Coherency
squared coherency
frequency
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.1
0.2
0.3
0.4
0.5
help("spec.pgram")

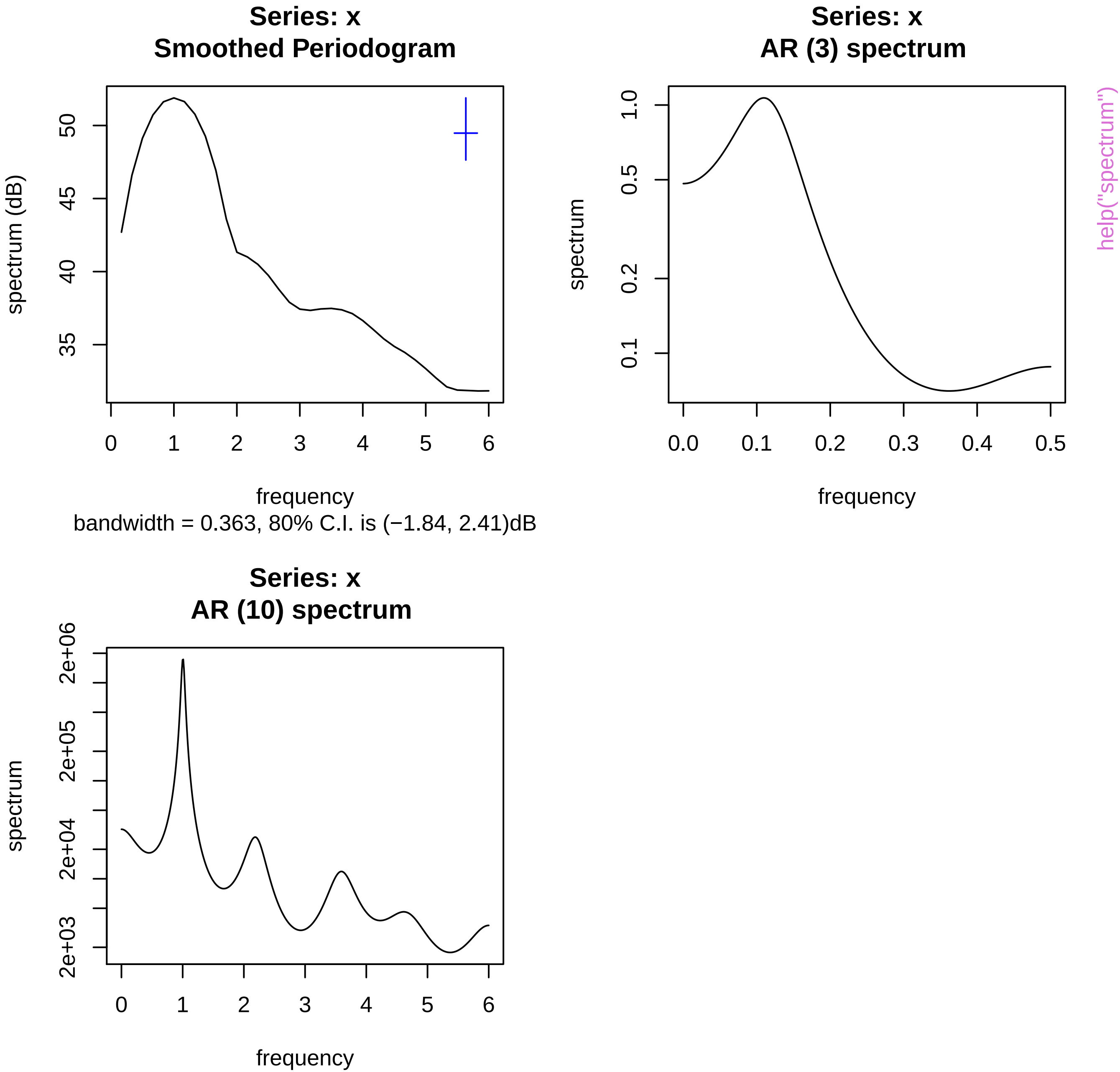


Series: x -- Phase spectrum
phase
frequency
3
2
1
0
−1
−2
−3
0.0
0.1
0.2
0.3
0.4
0.5
help("spec.pgram")

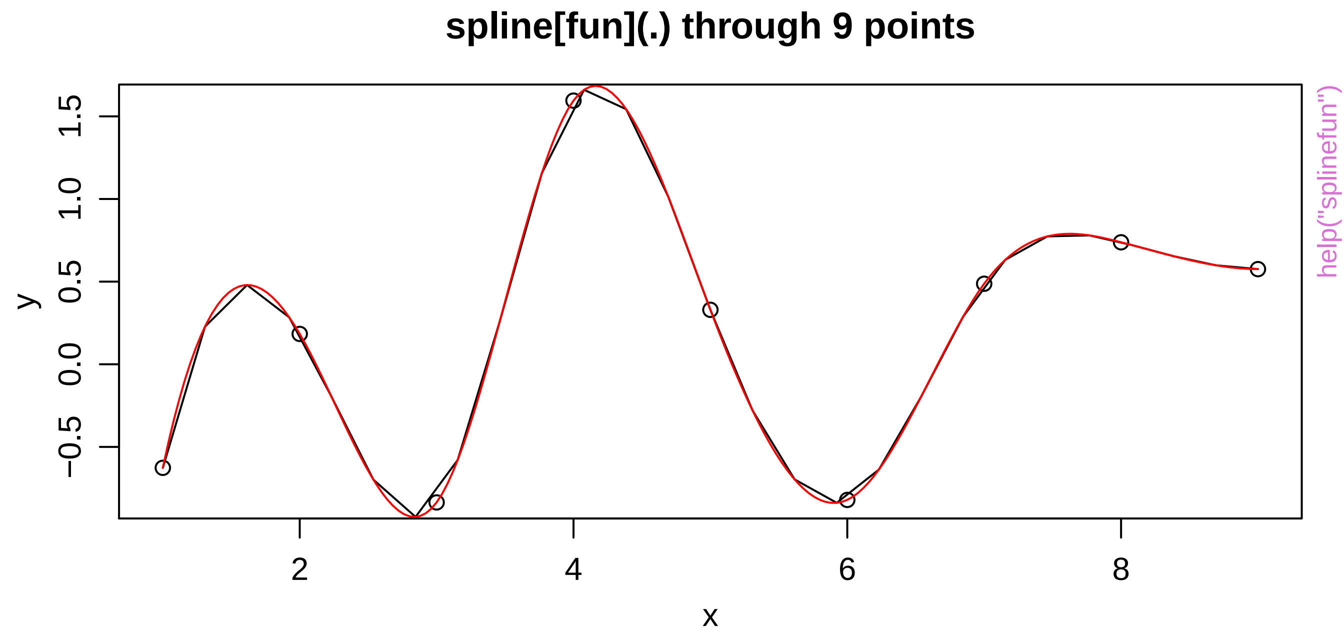

Series: x
Raw Periodogram
spectrum
1.00
0.20
0.05
0.01
0.1
0.2
0.3
0.4
0.5
frequency
bandwidth = 0.00601
Series: x
Smoothed Periodogram
spectrum
0.50
0.20
0.05
0.1
0.2
0.3
0.4
0.5
frequency
bandwidth = 0.0159
help("spectrum")
Series: x
Smoothed Periodogram
spectrum
0.50
0.20
0.10
0.05
0.1
0.2
0.3
0.4
0.5
frequency
bandwidth = 0.0217
Series: x
Smoothed Periodogram
spectrum
0.50
0.20
0.10
0.05
0.1
0.2
0.3
0.4
0.5
frequency
bandwidth = 0.0301

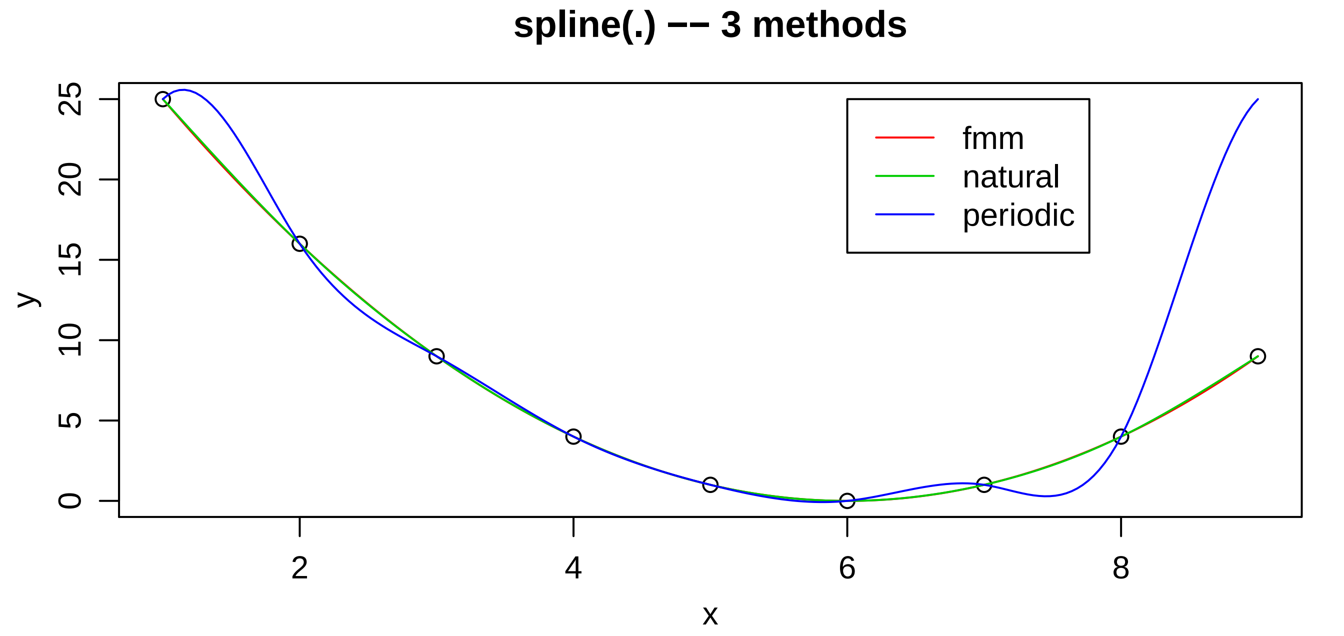


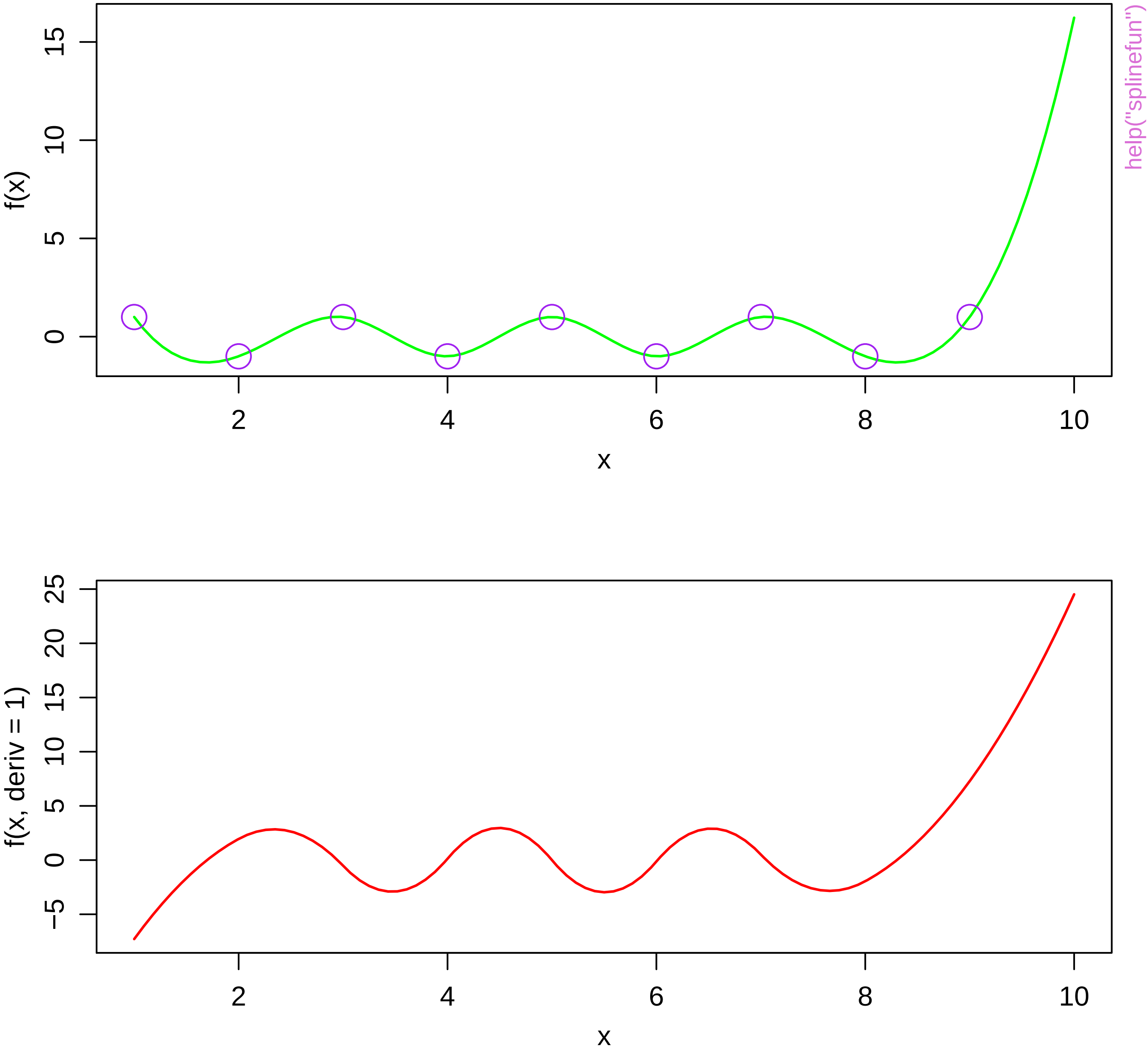
Series: x
Raw Periodogram
spectrum
5e+05
5e+04
5e+03
5e+02
0
1
2
3
4
5
6
frequency
bandwidth = 0.0481
Series: x
Smoothed Periodogram
spectrum
5e+04
1e+04
2e+03
0
1
2
3
4
5
6
frequency
bandwidth = 0.173
help("spectrum")
Series: x
Smoothed Periodogram
spectrum
5e+04
1e+04
2e+03
0
1
2
3
4
5
6
frequency
bandwidth = 0.241
Series: x
Smoothed Periodogram
spectrum
5e+04
1e+04
2e+03
0
1
2
3
4
5
6
frequency
bandwidth = 0.363



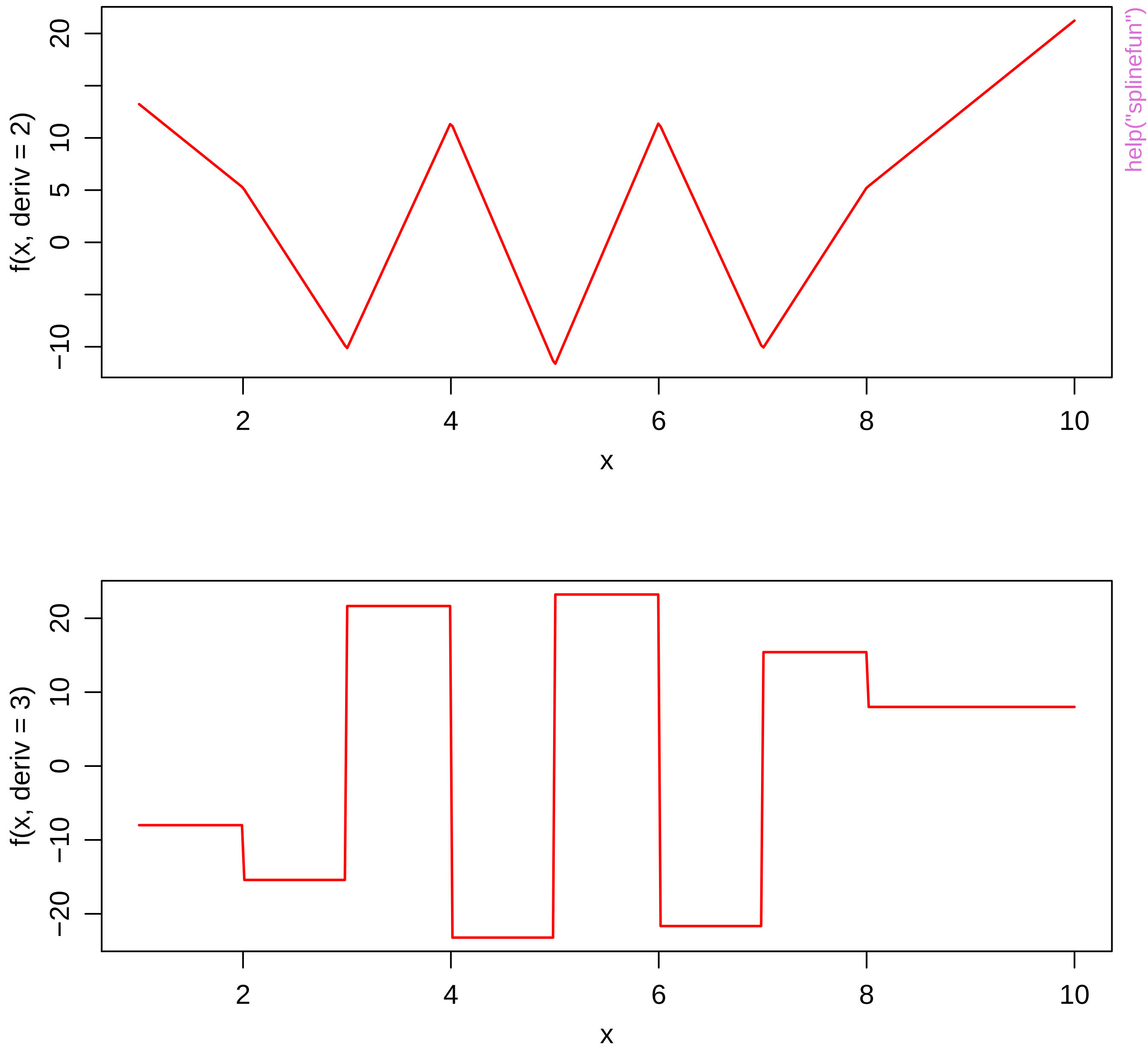
Series: x
Smoothed Periodogram
spectrum (dB)
35
40
45
50
0
1
2
3
4
5
6
frequency
bandwidth = 0.363, 80% C.I. is (−1.84, 2.41)dB
Series: x
AR (3) spectrum
spectrum
0.1
0.2
0.5
1.0
0.0
0.1
0.2
0.3
0.4
0.5
frequency
help("spectrum")
Series: x
AR (10) spectrum
spectrum
2e+03
2e+04
2e+05
2e+06
0
1
2
3
4
5
6
frequency


spline[fun](.) through 9 points
1.5
1.0
0.5
0.0
−0.5
y
2
4
6
8
x
help("splinefun")

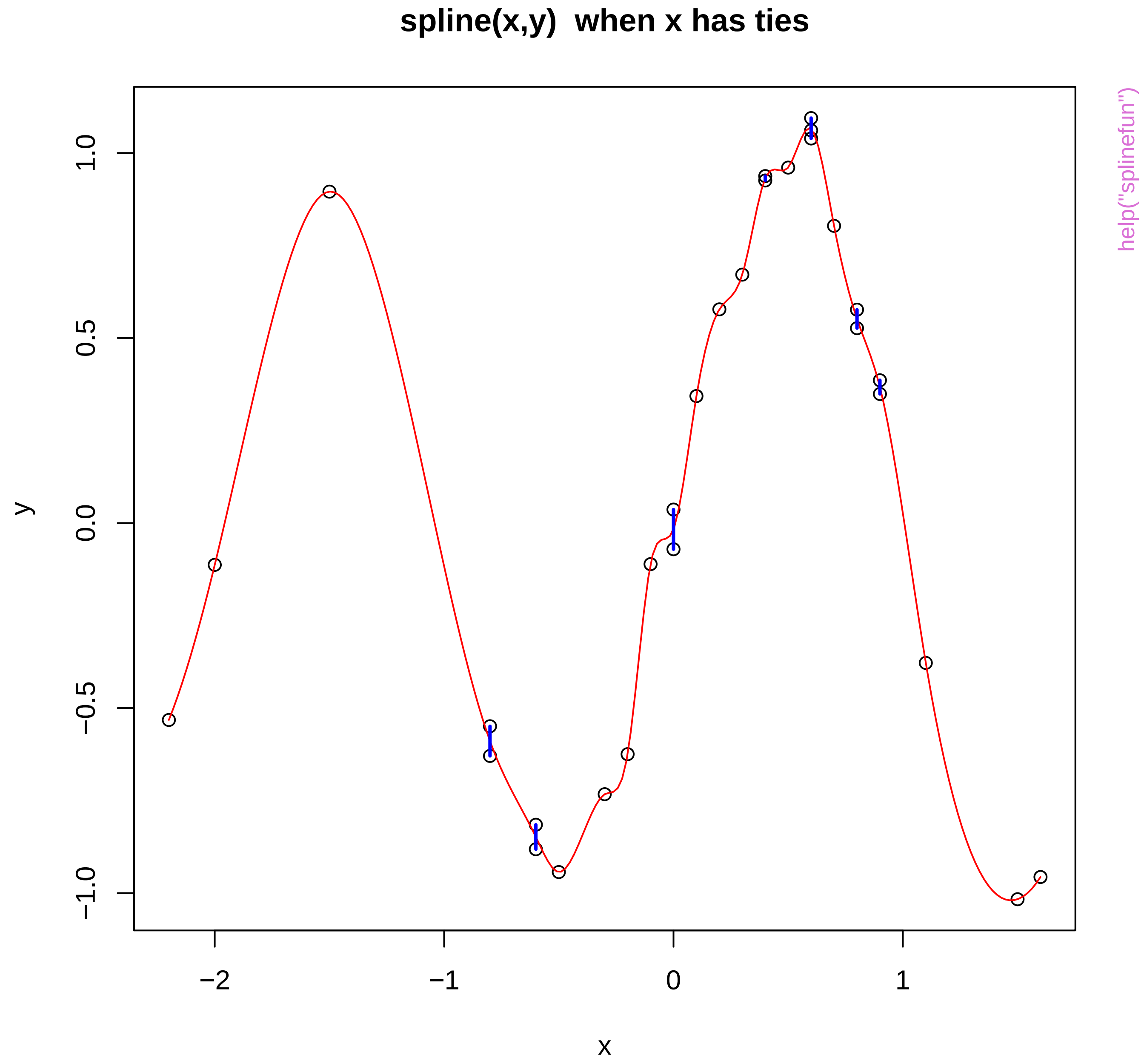

spline(.) −− 3 methods
25
20
15
10
5
0
y
2
4
6
8
x
fmm
natural
periodic



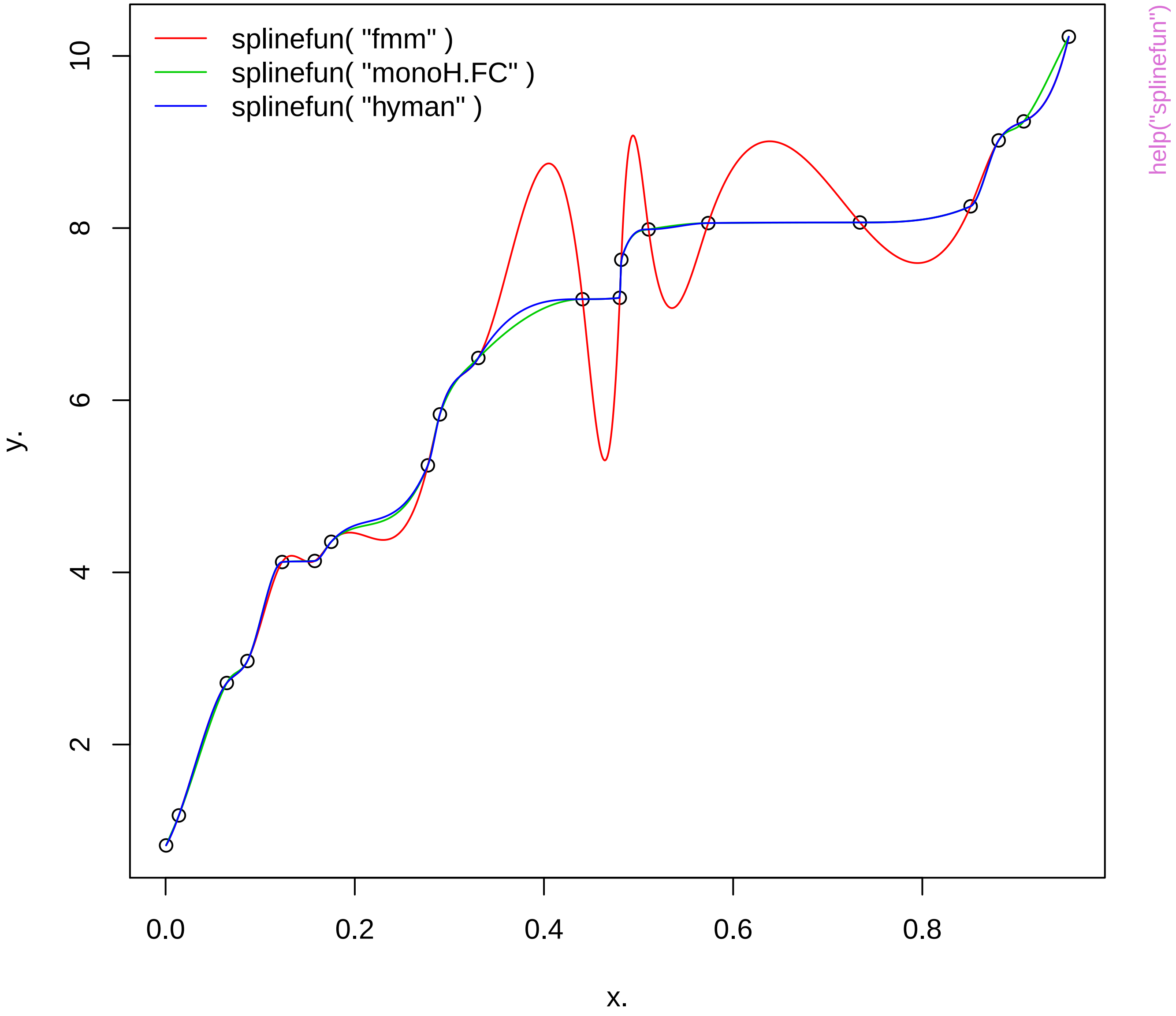
f(x)
0
5
10
15
2
4
6
8
10
x
help("splinefun")
f(x, deriv = 1)
−5
0
5
10
15
20
25
2
4
6
8
10
x

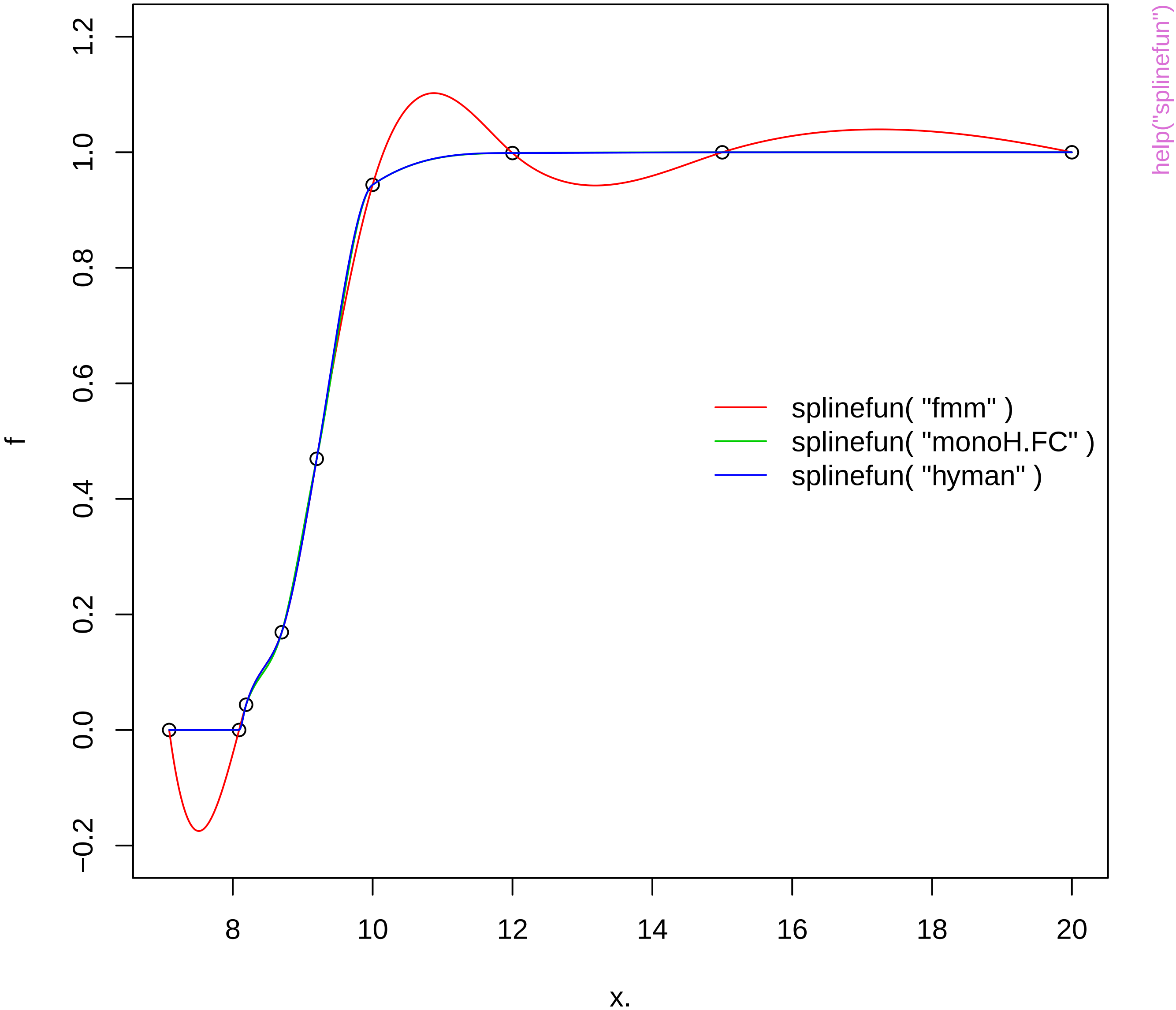


help("splinefun")
f(x, deriv = 2)
20
10
5
0
−10
2
4
6
8
10
x
f(x, deriv = 3)
20
10
0
−10
−20
2
4
6
8
10
x

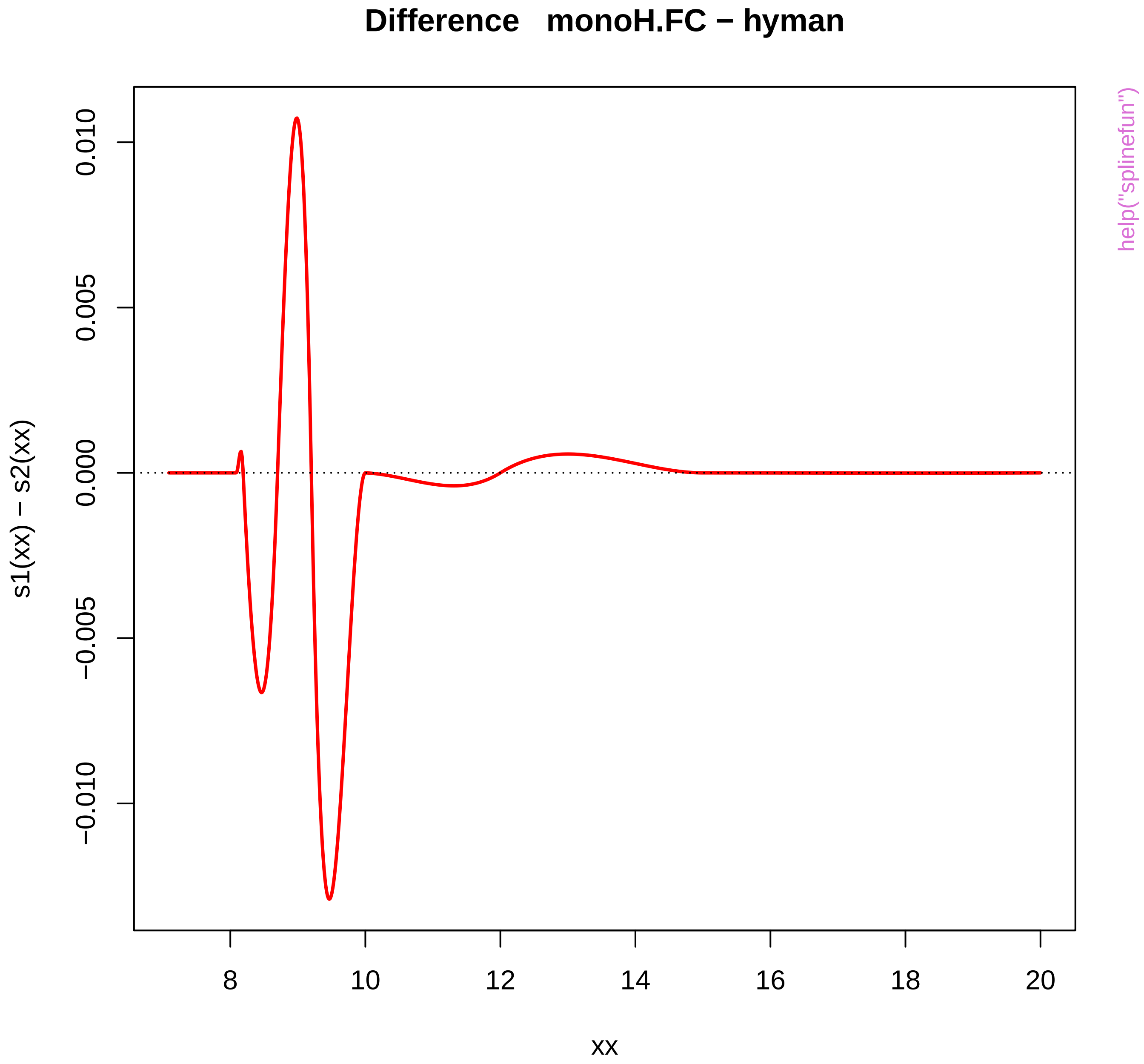


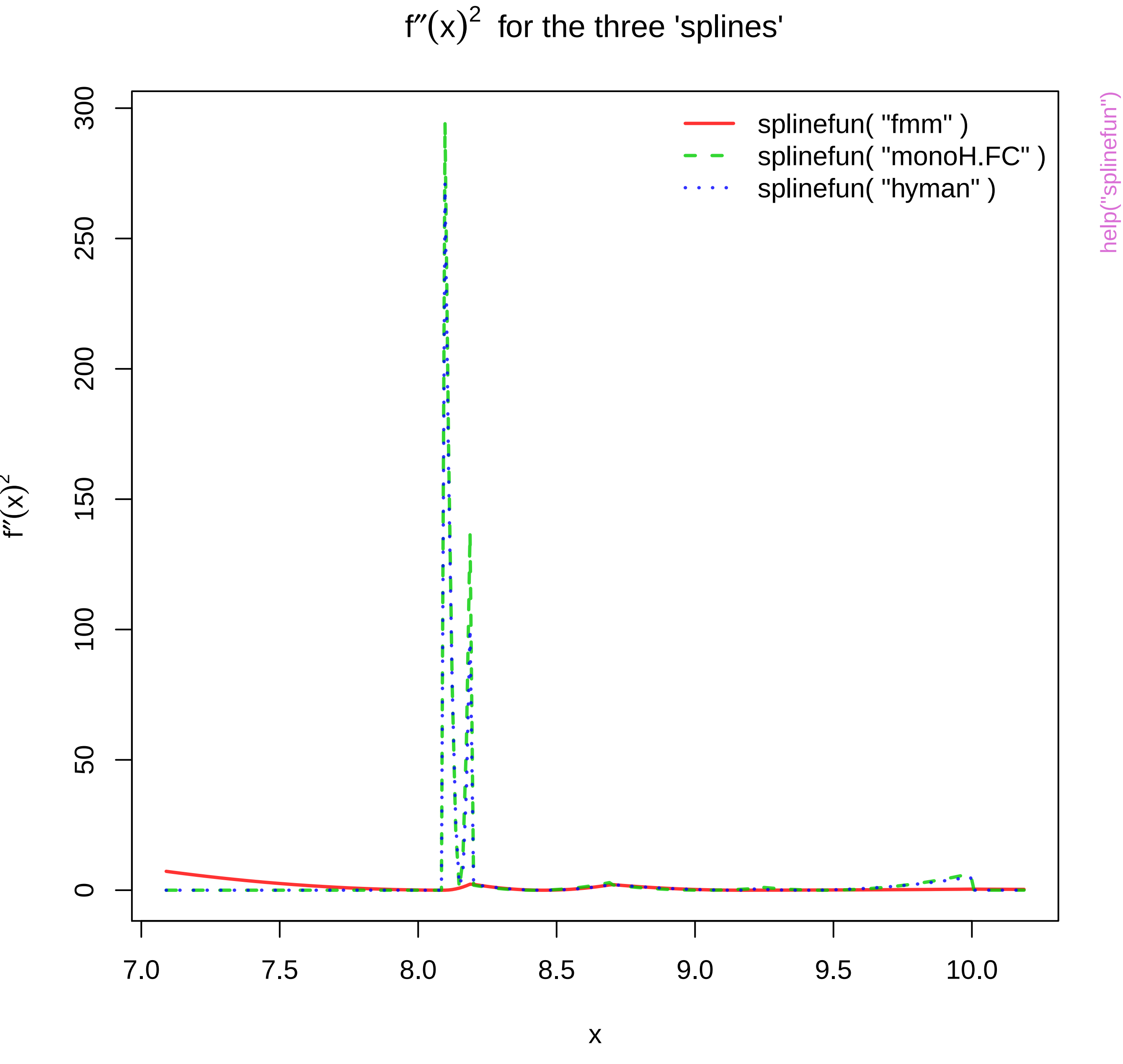
spline(x,y) when x has ties
y
1.0
0.5
0.0
−0.5
−1.0
−2
−1
0
1
x
help("splinefun")


splinefun("fmm")
splinefun("monoH.FC")
splinefun("hyman")
help("splinefun")
y.
x.
0.0
0.2
0.4
0.6
0.8
2
4
6
8
10

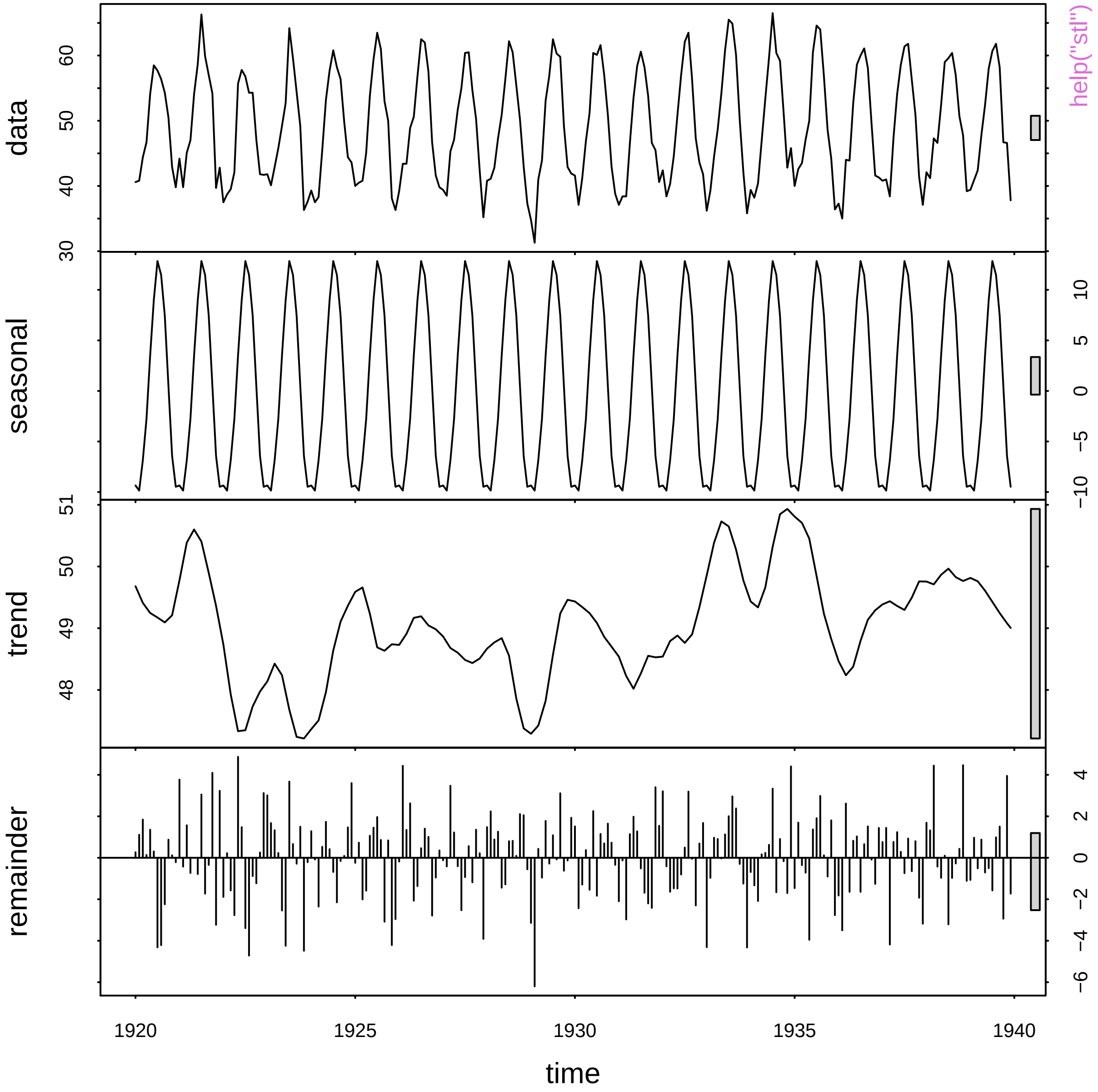


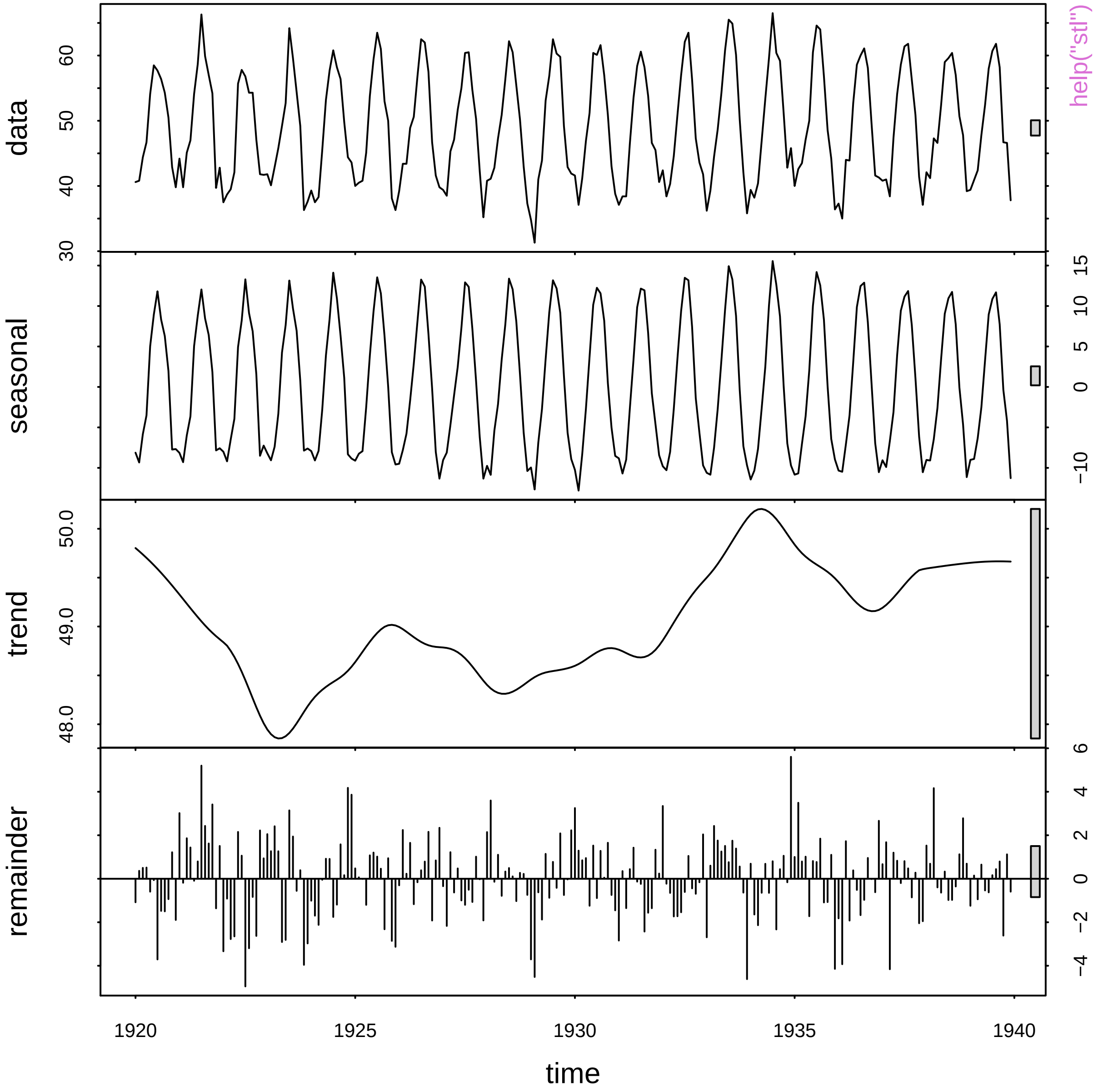
splinefun("fmm")
splinefun("monoH.FC")
splinefun("hyman")
f
x.
−0.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2
8
10
12
14
16
18
20
help("splinefun")


Difference   monoH.FC − hyman
s1(xx) − s2(xx)
0.010
0.005
0.000
−0.005
−0.010
8
10
12
14
16
18
20
xx
help("splinefun")

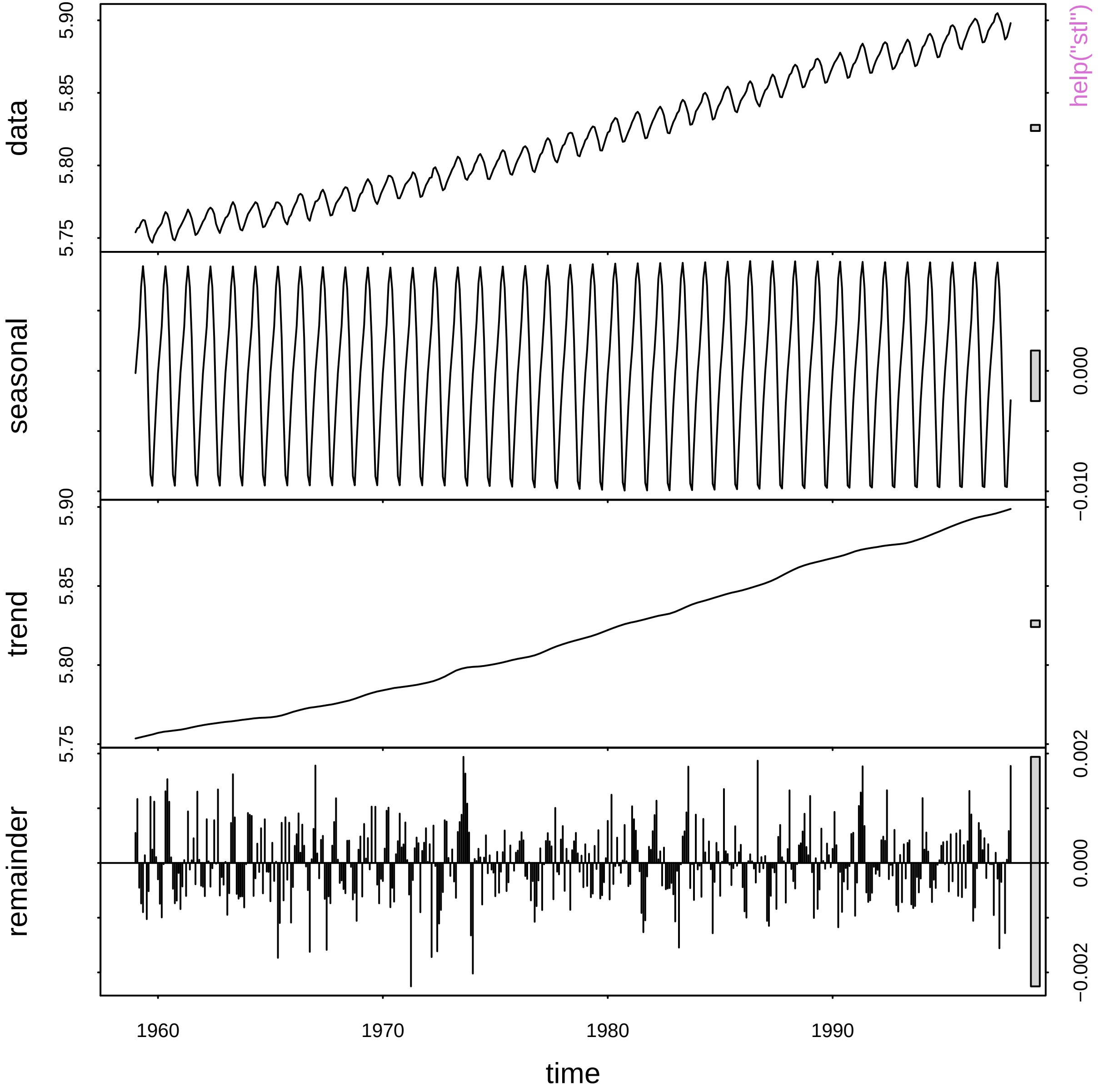


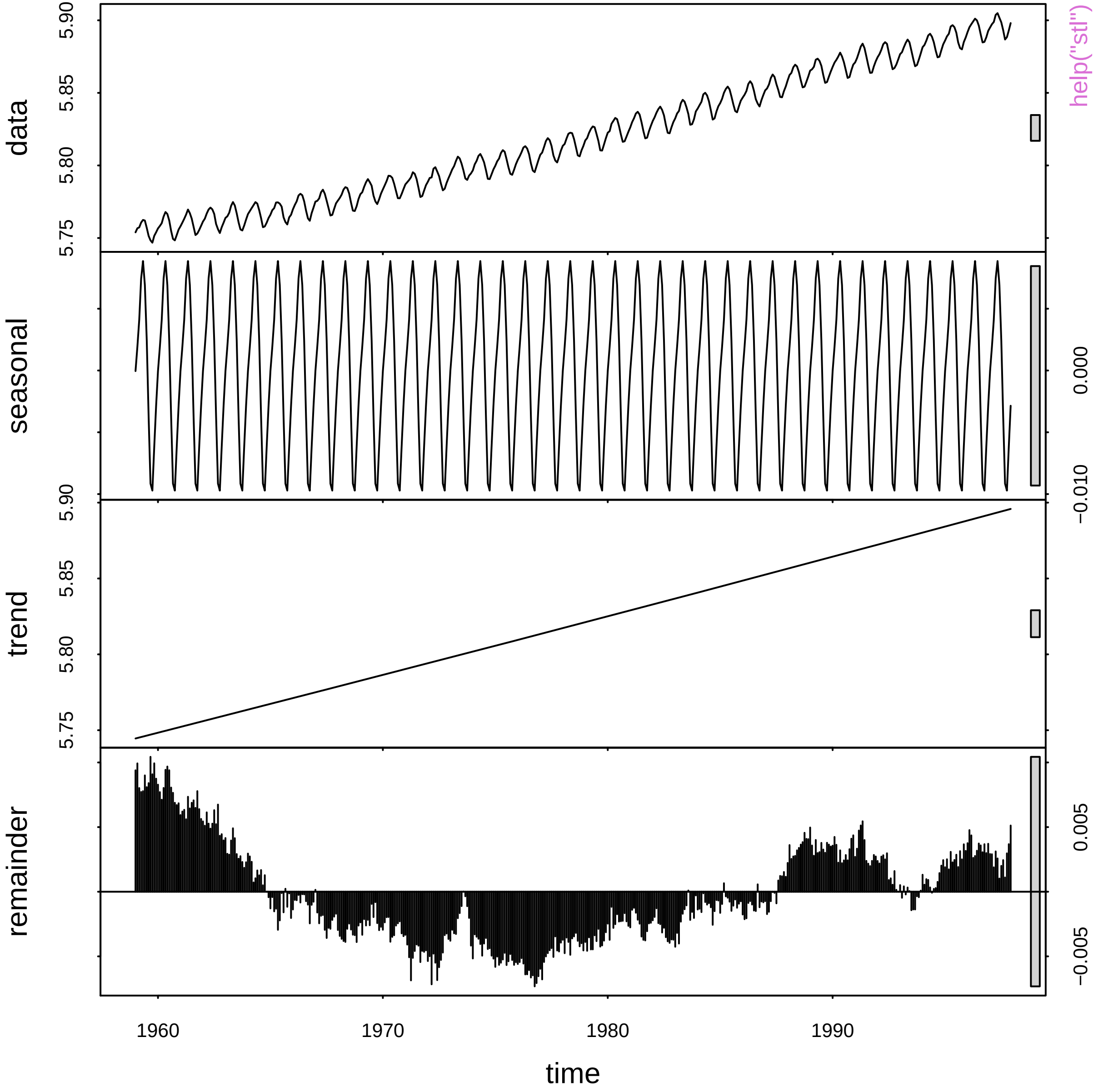
f″(x)^2 for the three 'splines'
splinefun("fmm")
splinefun("monoH.FC")
splinefun("hyman")
help("splinefun")
f″(x)^2
x
0
50
100
150
200
250
300
7.0
7.5
8.0
8.5
9.0
9.5
10.0

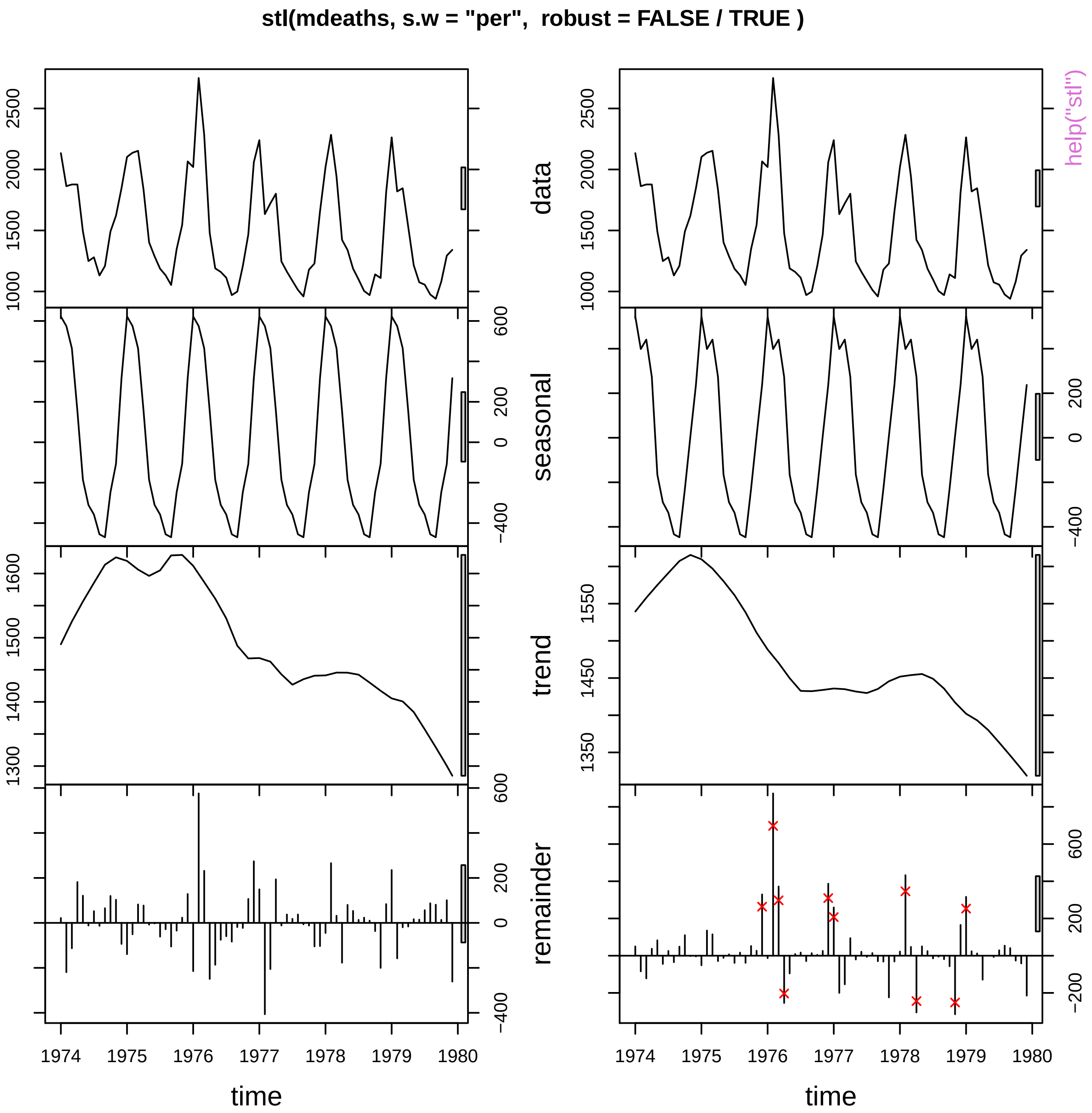

data
seasonal
trend
remainder
help("stl")
time
30
40
50
60
−10
−5
0
5
10
48
49
50
51
−6
−4
−2
0
2
4
1920
1925
1930
1935
1940



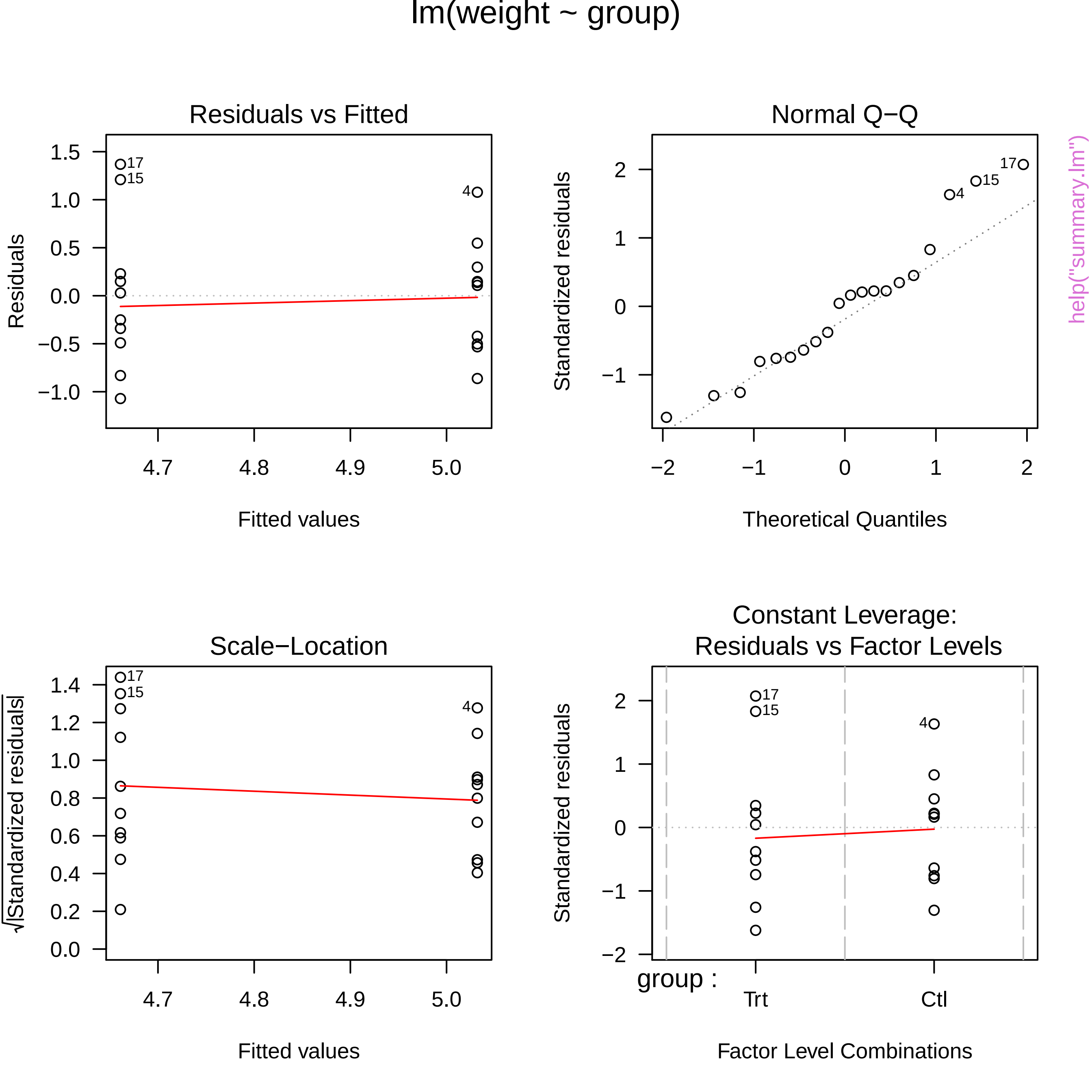
help("stl")
data
seasonal
trend
remainder
time
30
40
50
60
−10
0
5
10
15
48.0
49.0
50.0
−4
−2
0
2
4
6
1920
1925
1930
1935
1940

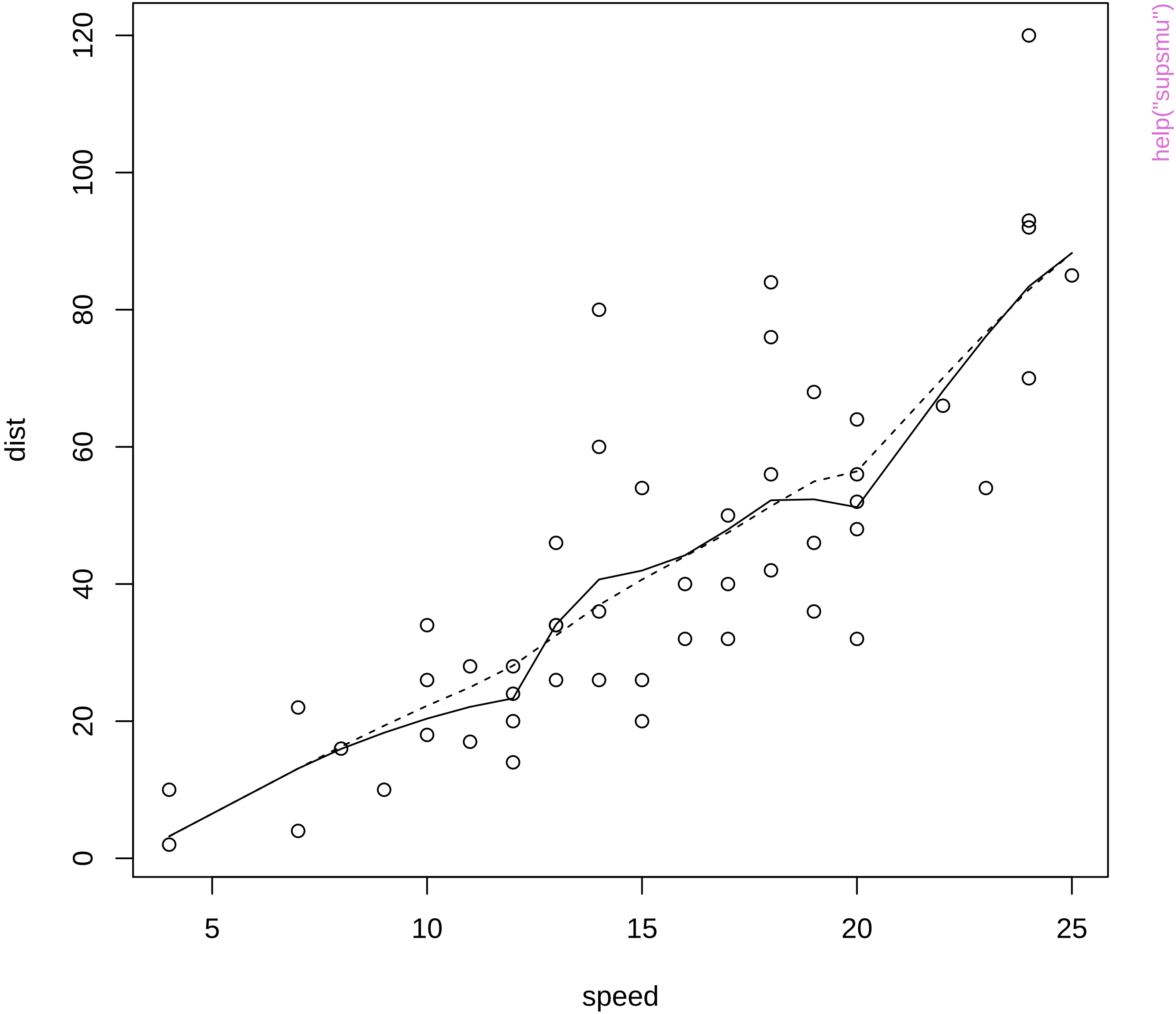

data
seasonal
trend
remainder
time
help("stl")
5.75
5.80
5.85
5.90
0.000
−0.010
0.002
−0.002
1960
1970
1980
1990


data
seasonal
trend
remainder
time
help("stl")
5.75
5.80
5.85
5.90
0.000
−0.010
0.005
−0.005
1960
1970
1980
1990

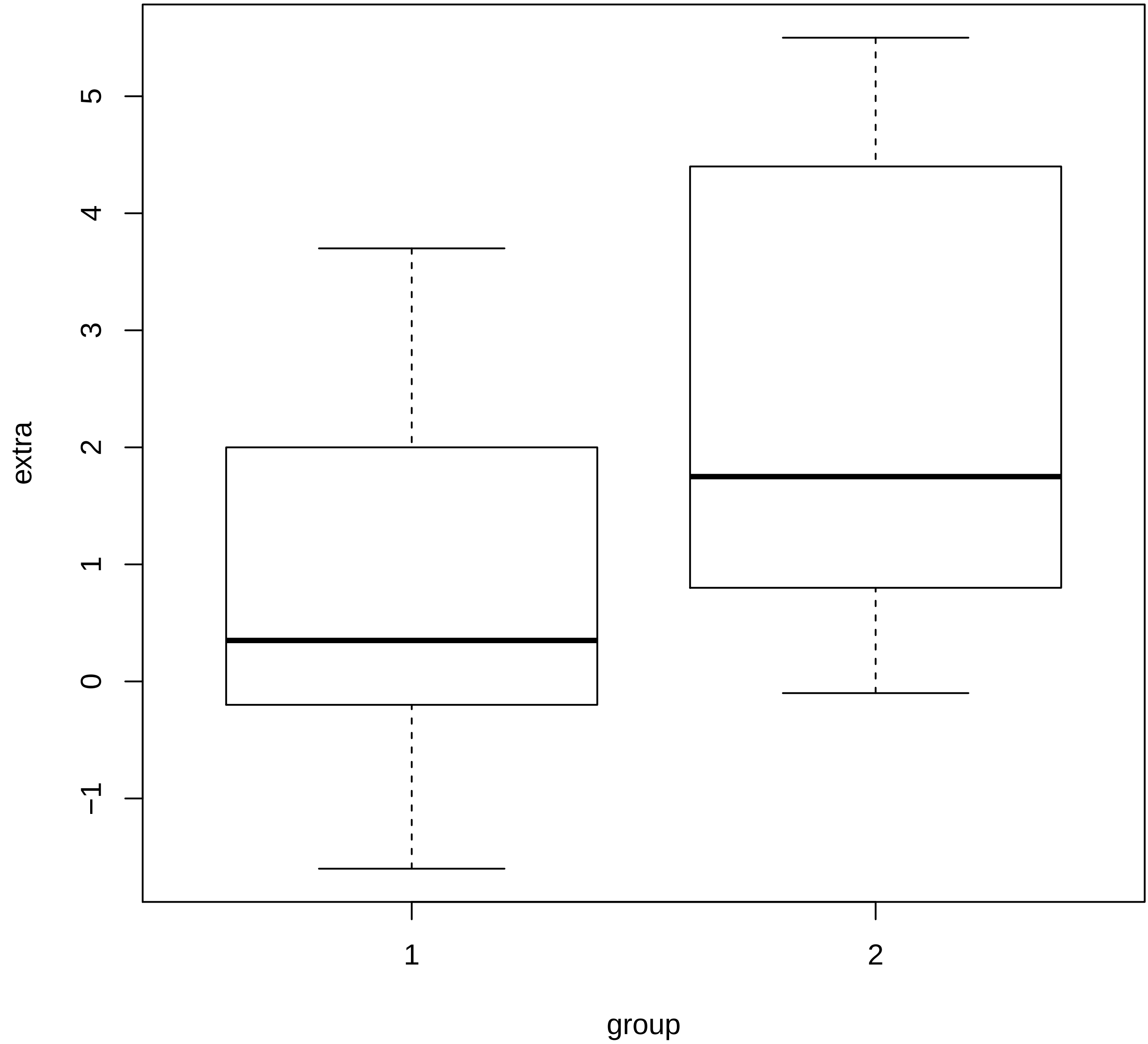


stl(mdeaths, s.w = "per", robust = FALSE / TRUE)
data
seasonal
trend
remainder
time
help("stl")
1974
1975
1976
1977
1978
1979
1980
1000
1500
2000
2500
600
200
0
−400
1300
1400
1500
1600
1350
1450
1550
−200

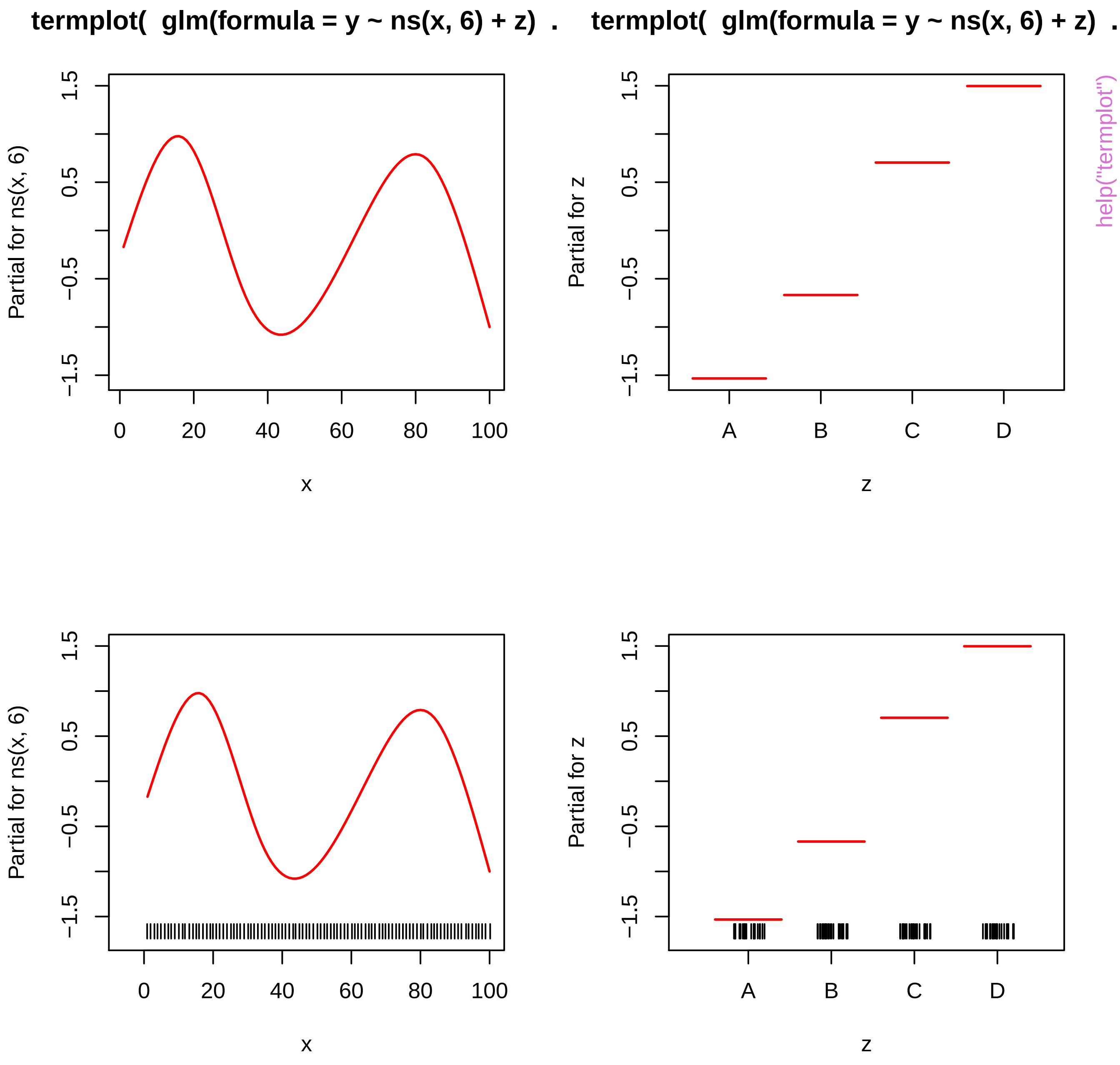

lm(weight ~ group)
Residuals vs Fitted
Residuals
Fitted values
17
15
4
Normal Q−Q
Standardized residuals
Theoretical Quantiles
help("summary.lm")
Scale−Location
√|Standardized residuals|
Constant Leverage:
Residuals vs Factor Levels
group :
Trt
Ctl
Factor Level Combinations

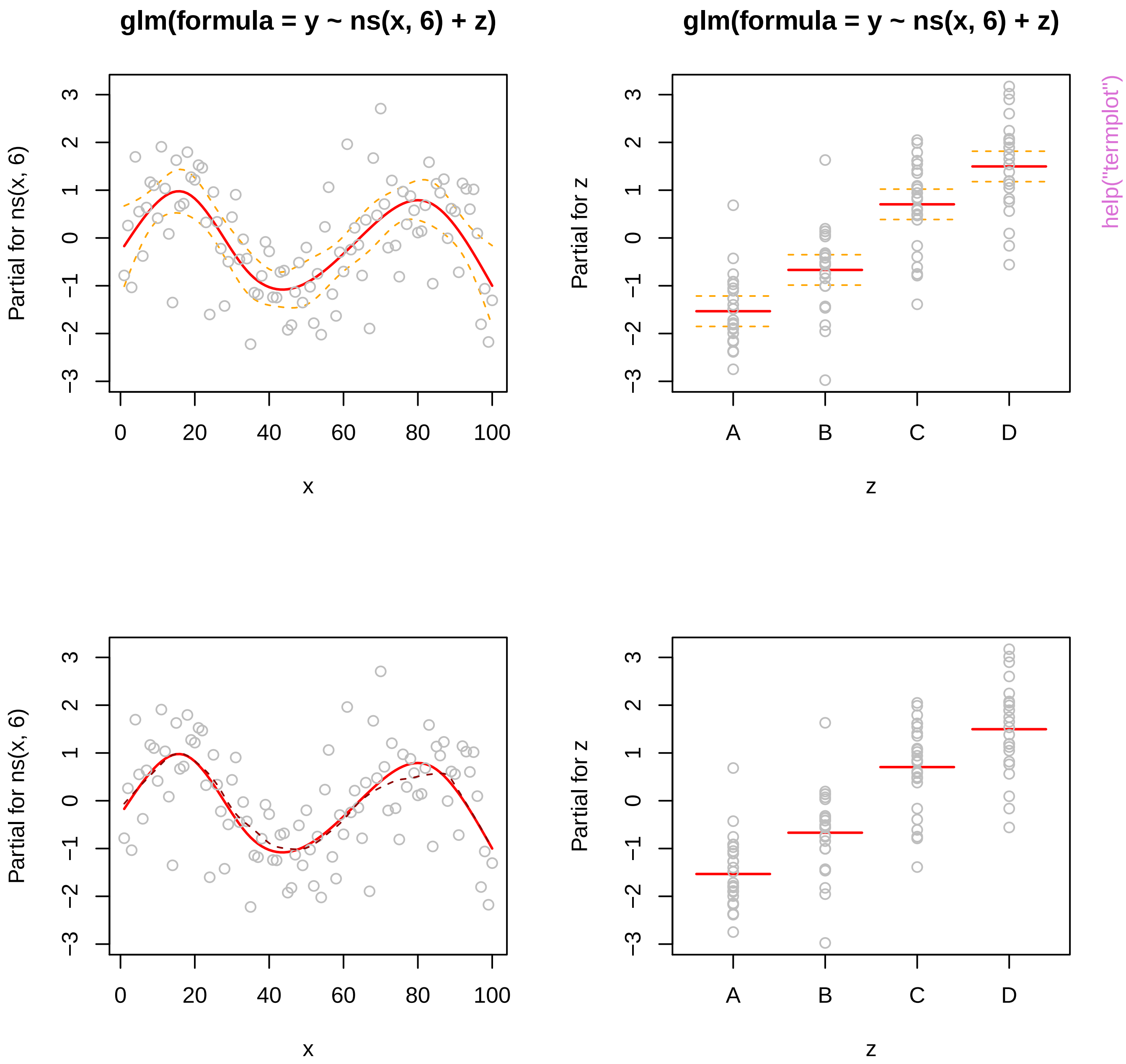


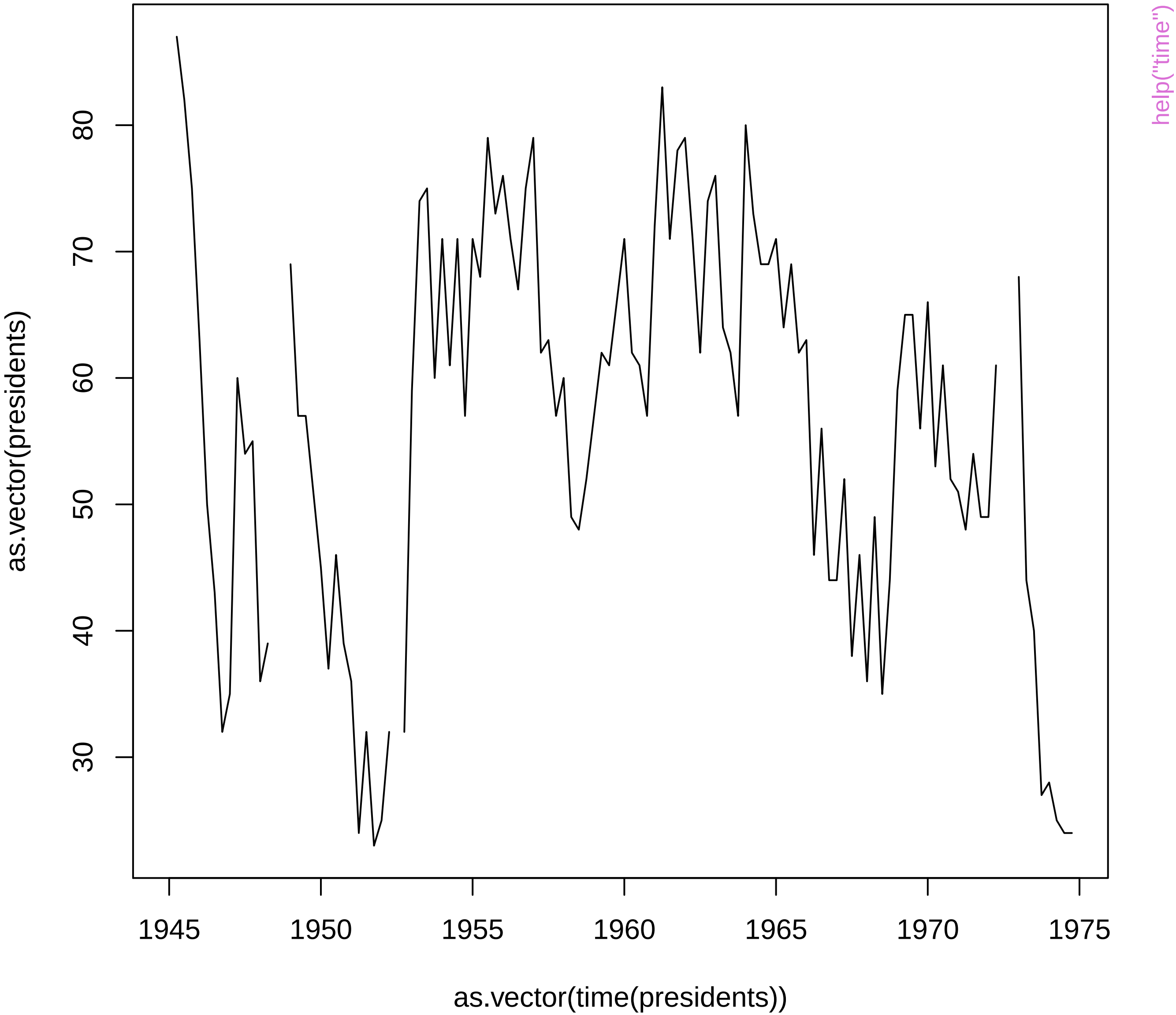
dist
speed
0
20
40
60
80
100
120
5
10
15
20
25
help("supsmu")



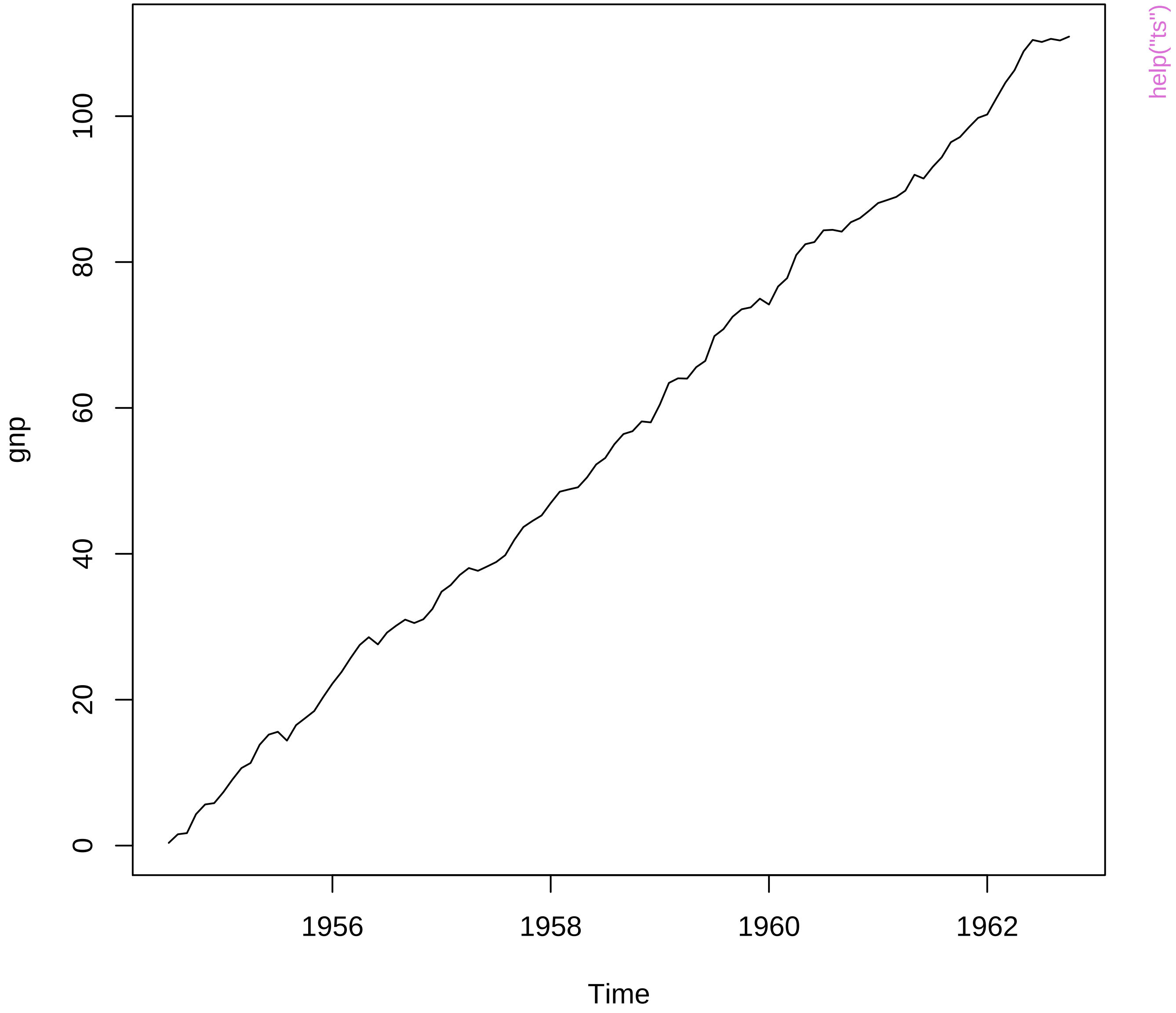
help("t.test")

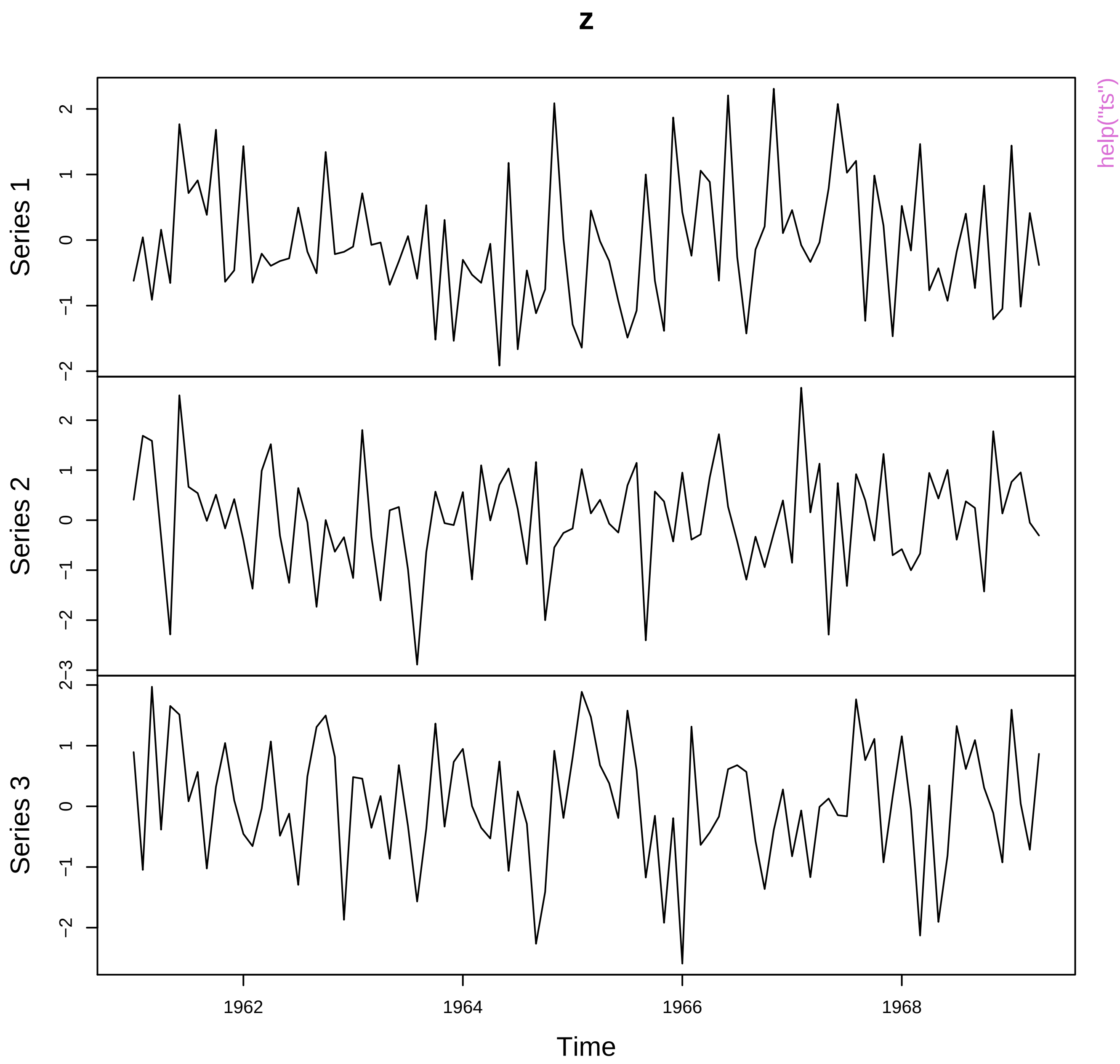

termplot(glm(formula = y ~ ns(x, 6) + z) .
termplot(glm(formula = y ~ ns(x, 6) + z) .
help("termplot")
Partial for ns(x, 6)
Partial for z
1.5
0.5
−0.5
−1.5
0
20
40
60
80
100
x
A
B
C
D
z

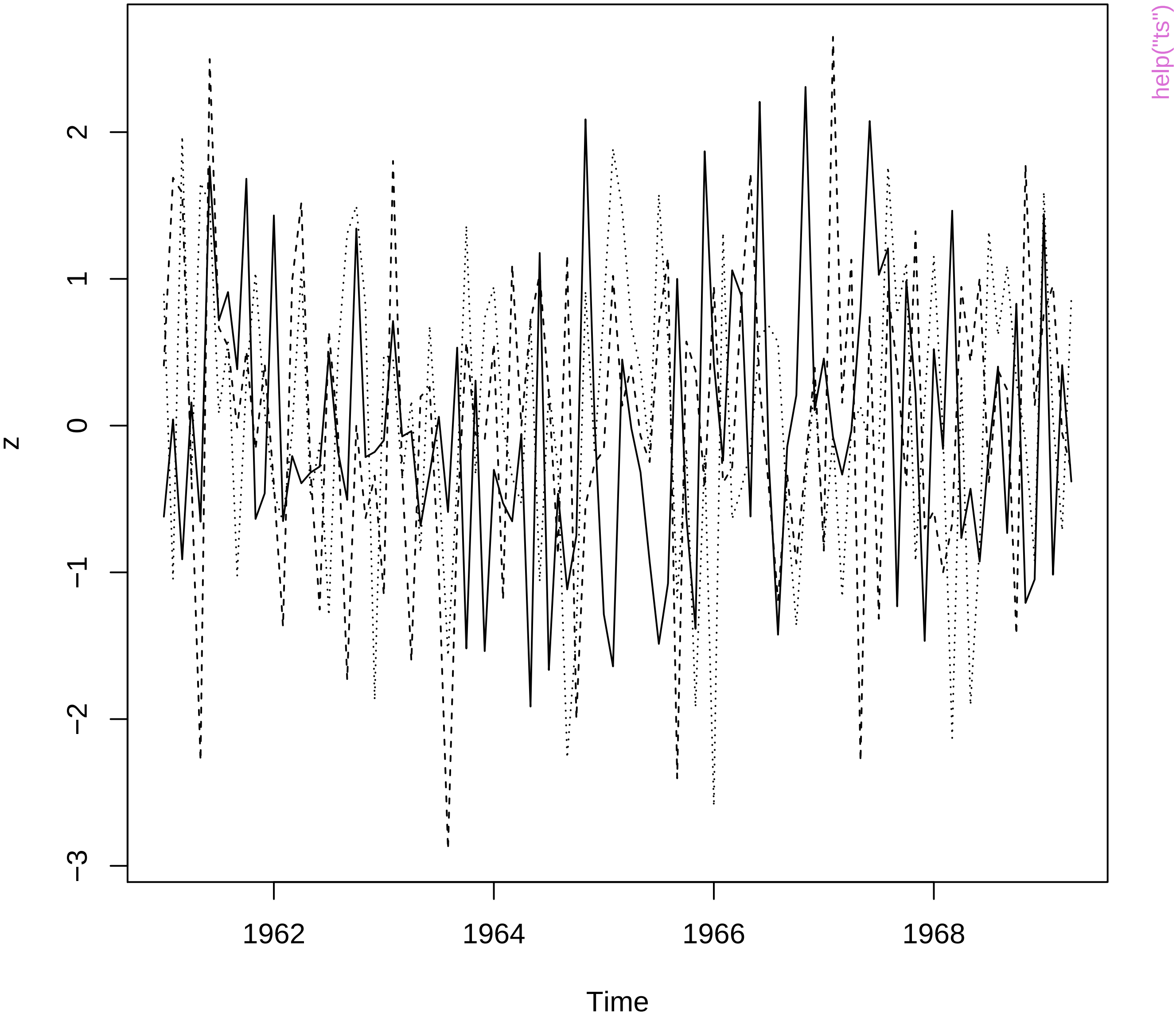

glm(formula = y ~ ns(x, 6) + z)
glm(formula = y ~ ns(x, 6) + z)
help("termplot")
Partial for ns(x, 6)
Partial for z
−3
−2
−1
0
1
2
3
0
20
40
60
80
100
x
A
B
C
D
z
Partial for ns(x, 6)
Partial for z
x
z



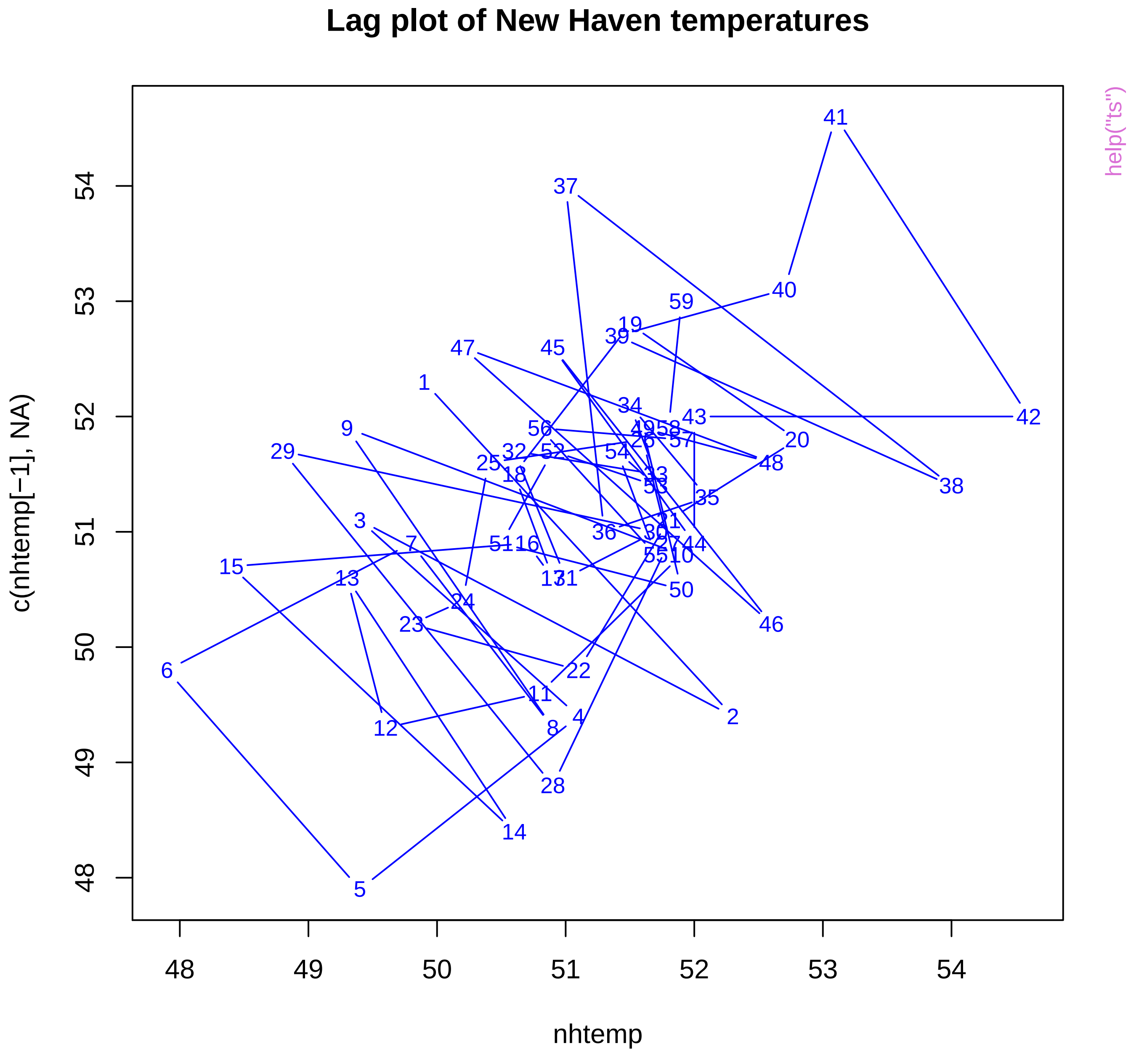
30
40
50
60
70
80
as.vector(presidents)
1945
1950
1955
1960
1965
1970
1975
as.vector(time(presidents))
help("time")


gnp
0
20
40
60
80
100
1956
1958
1960
1962
Time
help("ts")

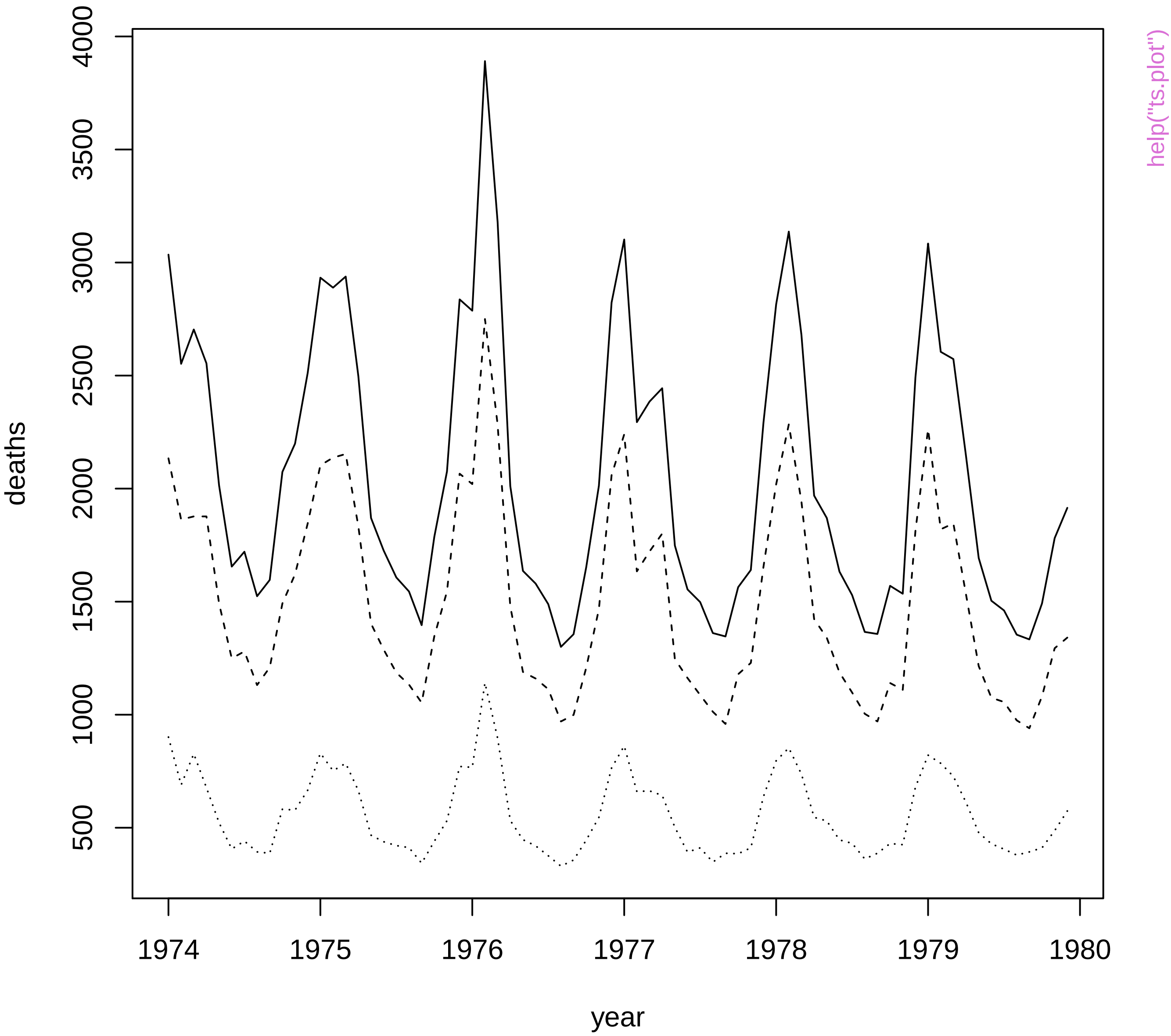

z
Series 1
Series 2
Series 3
2
1
0
−1
−2
−3
1962
1964
1966
1968
Time
help("ts")

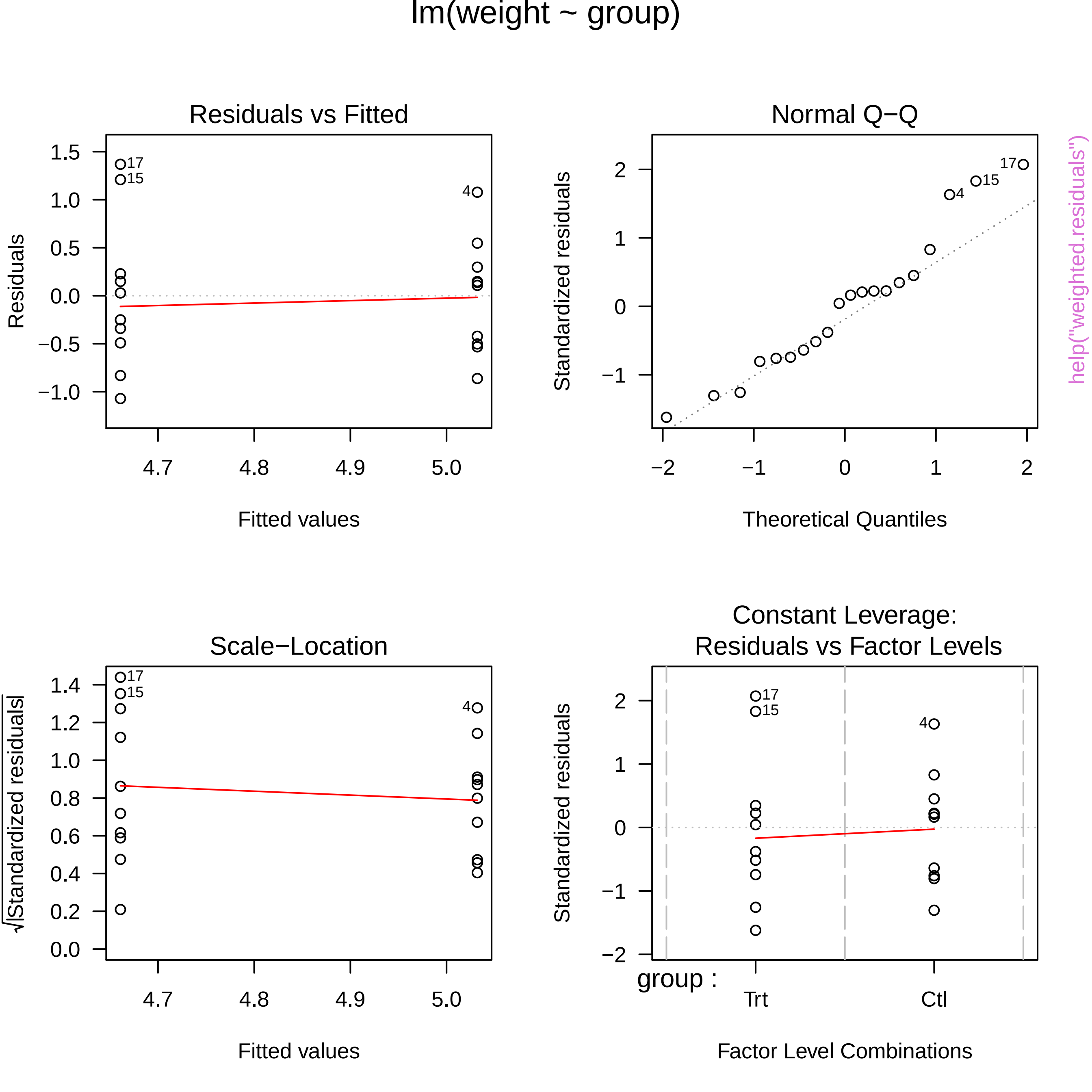


z
Time
1962
1964
1966
1968
−3
−2
−1
0
1
2
help("ts")

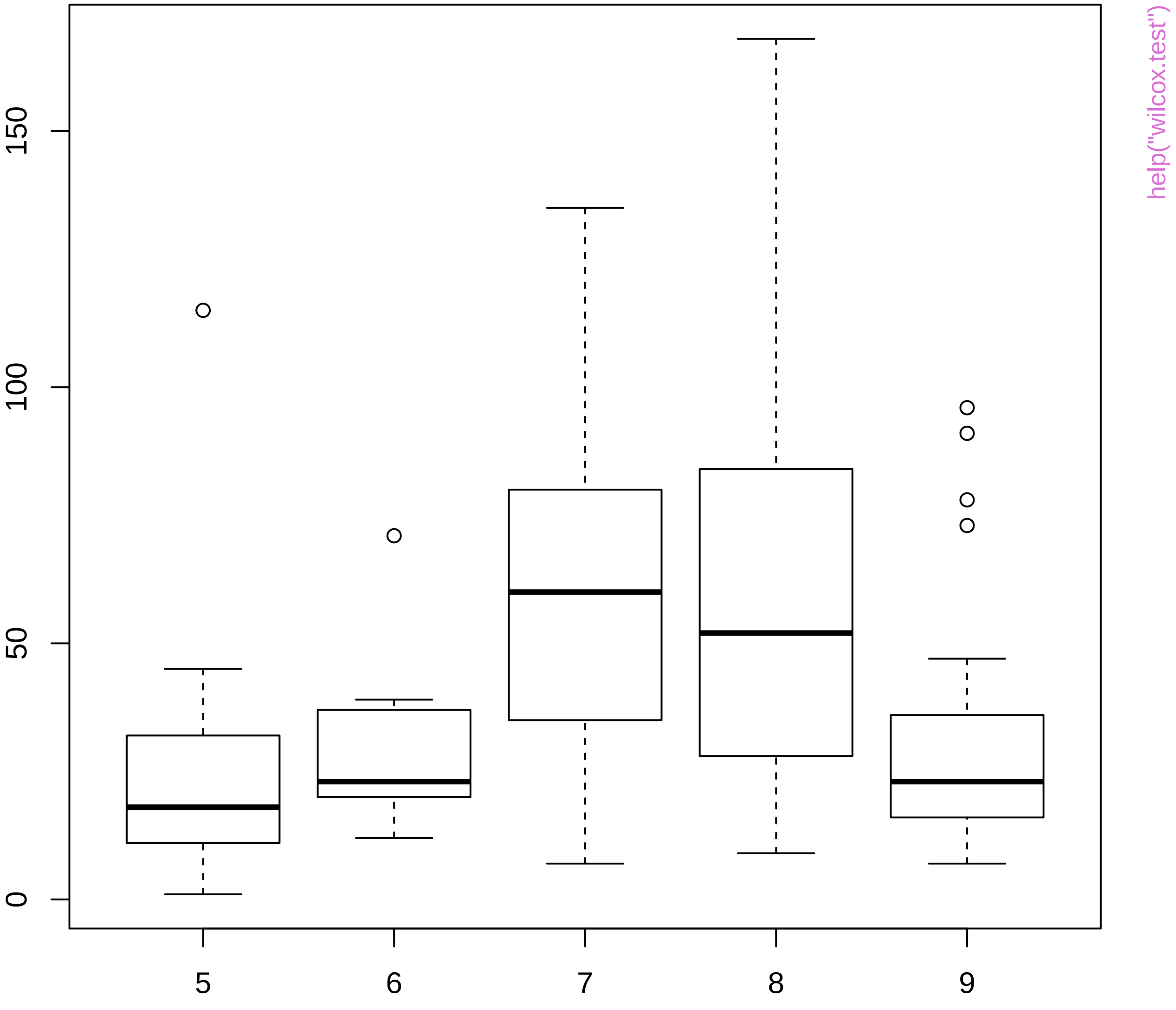


Lag plot of New Haven temperatures
c(nhtemp[-1], NA)
nhtemp
48
49
50
51
52
53
54
help("ts")


4000
3500
3000
2500
2000
1500
1000
500
deaths
1974
1975
1976
1977
1978
1979
1980
year
help("ts.plot")



lm(weight ~ group)
Residuals vs Fitted
Residuals
Fitted values
Normal Q−Q
Standardized residuals
Theoretical Quantiles
help("weighted.residuals")
Scale−Location
√|Standardized residuals|
Fitted values
Constant Leverage:
Residuals vs Factor Levels
Standardized residuals
group :
Trt
Ctl
Factor Level Combinations



0
50
100
150
5
6
7
8
9
help("wilcox.test")