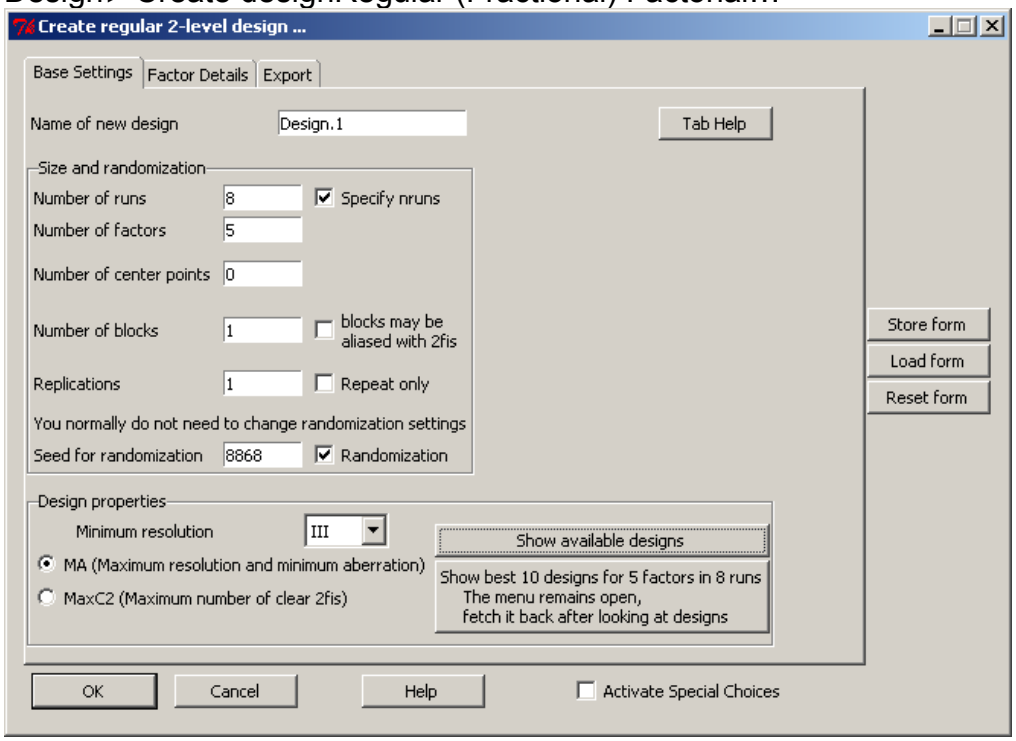
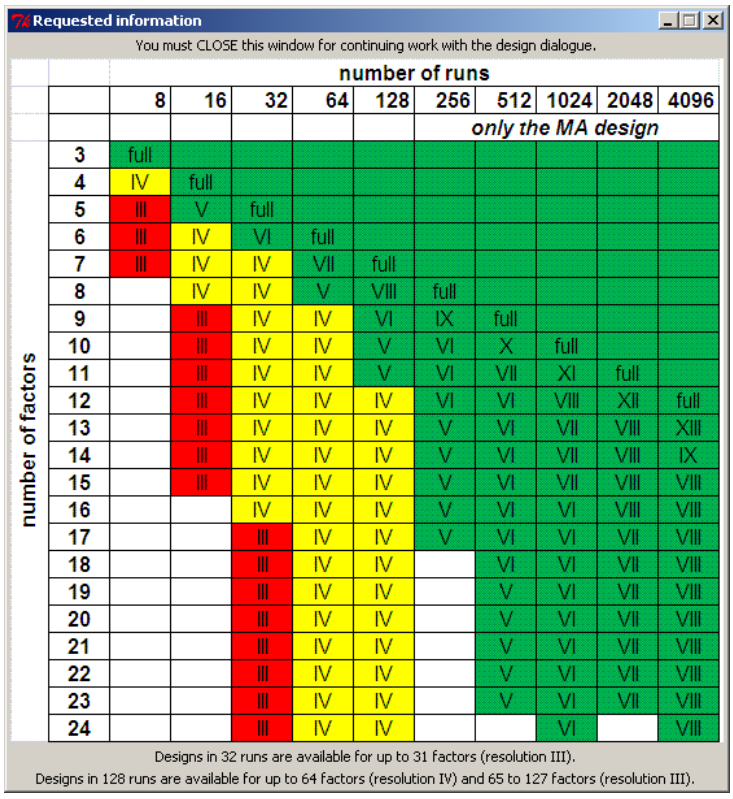
Biomass Experiment

```
>library("Rcmdr")
```

Tools►Load Rcmdr plig-in(s)…►RcmdrPlugin.DoE

Design►Create designRegular (Fractional) Factorial…

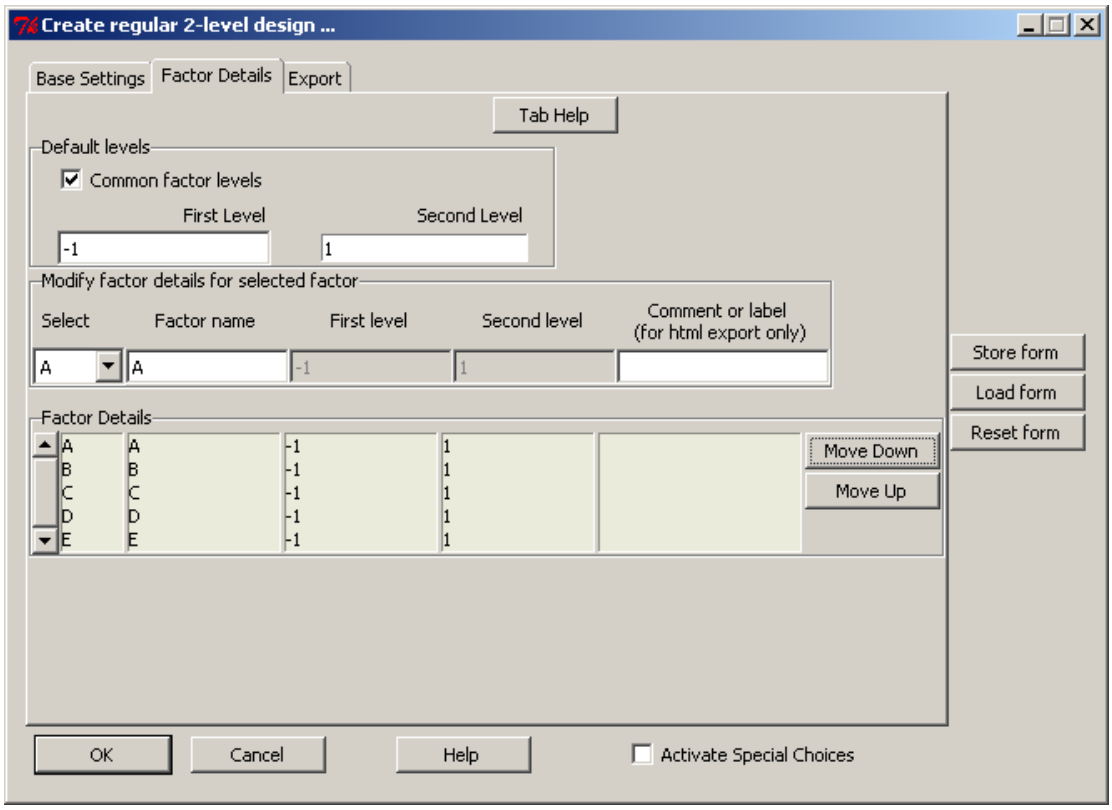


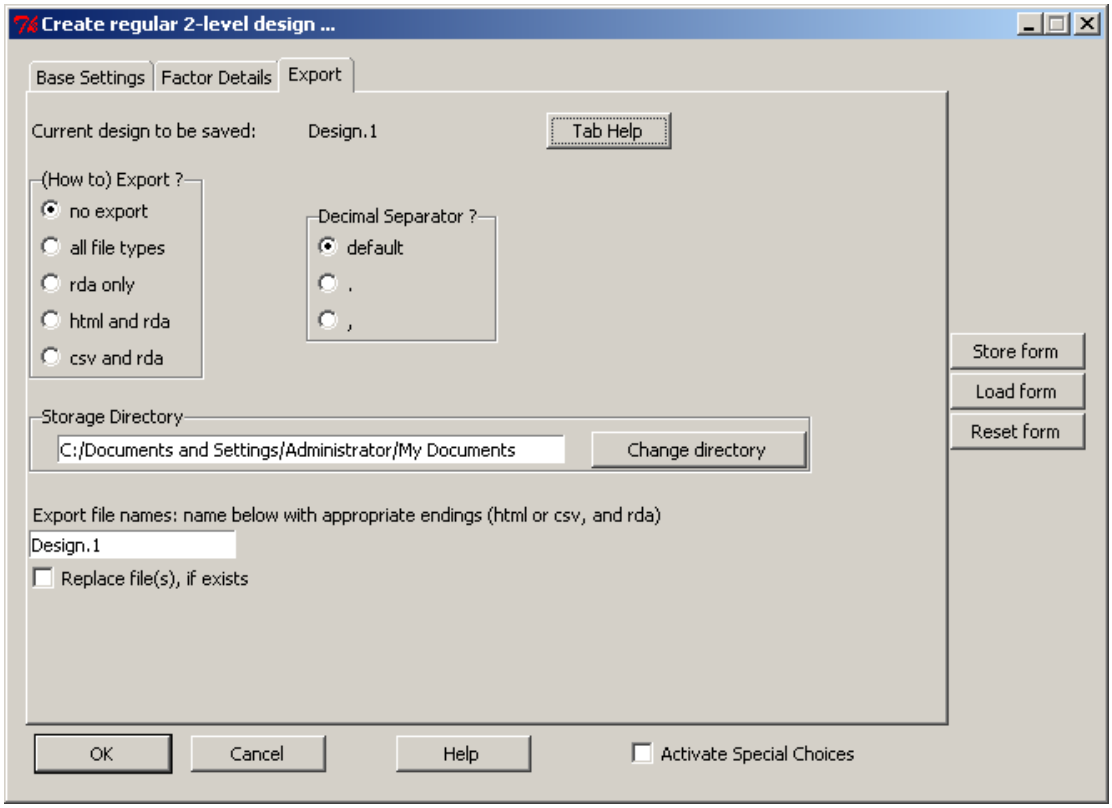


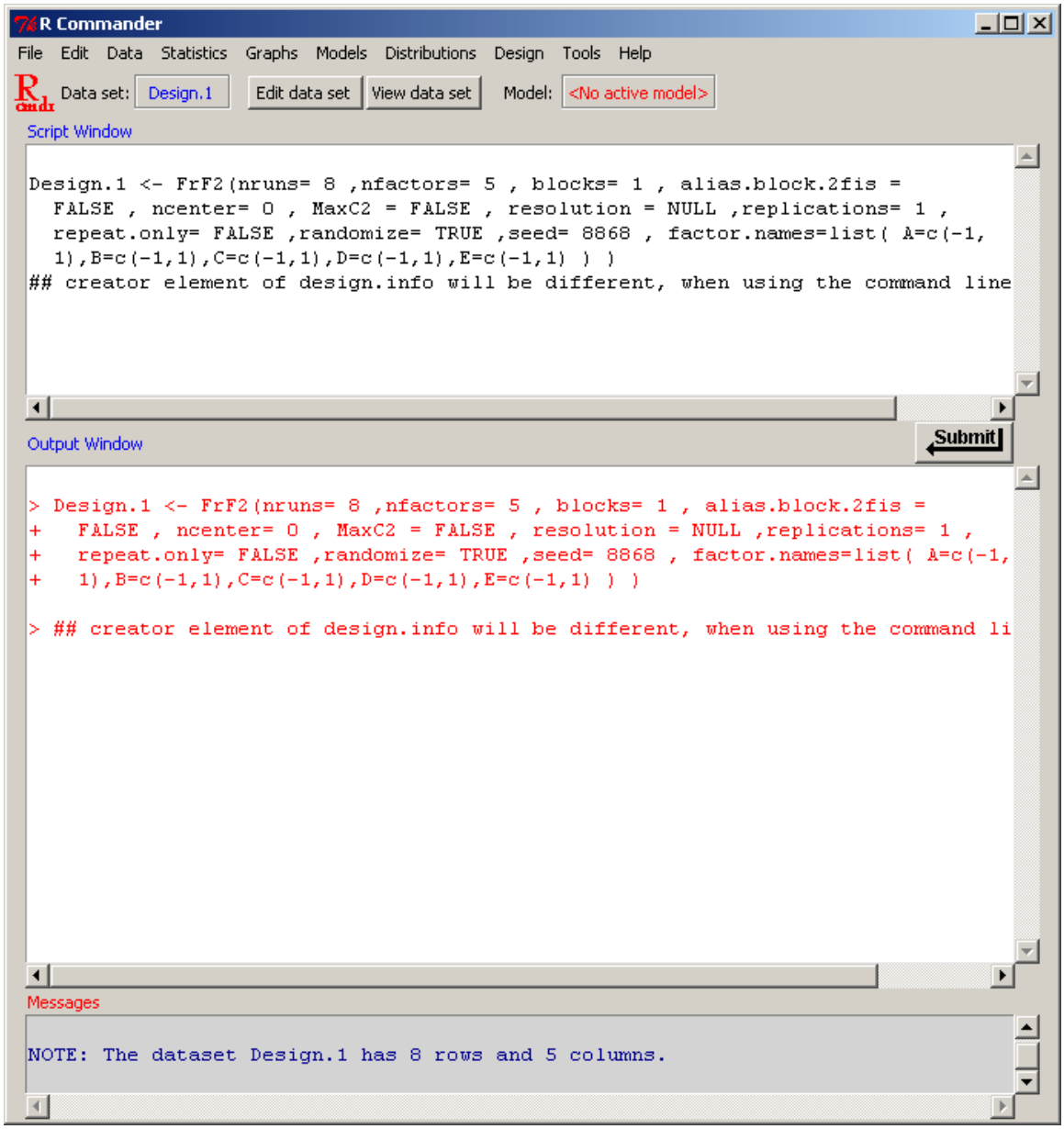
number of runs

number of factors	8	16	32	64	128	256	512	1024	2048	4096
						only the MA design				
3	full									
4	IV	full								
5	III	V	full							
6	III	IV	VI	full						
7	III	IV	IV	VII	full					
8		IV	IV	V	VIII	full				
9		III	IV	IV	VI	IX	full			
10		III	IV	IV	V	VI	X	full		
11		III	IV	IV	V	VI	VII	XI	full	
12		III	IV	IV	IV	VI	VI	VIII	XII	full
13		III	IV	IV	IV	V	VI	VII	VIII	XIII
14		III	IV	IV	IV	V	VI	VII	VIII	IX
15		III	IV	IV	IV	V	VI	VII	VIII	VIII
16			IV	IV	IV	V	VI	VI	VIII	VIII
17			III	IV	IV	V	VI	VI	VII	VIII
18			III	IV	IV		VI	VI	VII	VIII
19			III	IV	IV		V	VI	VII	VIII
20			III	IV	IV		V	VI	VII	VIII
21			III	IV	IV		V	VI	VII	VIII
22			III	IV	IV		V	VI	VII	VIII
23			III	IV	IV		V	VI	VII	VIII
24			III	IV	IV			VI		VIII

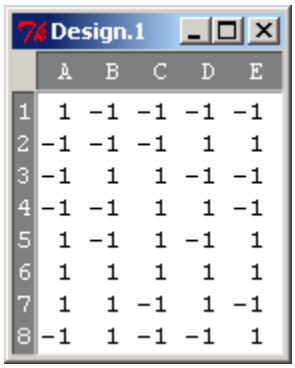
Designs in 32 runs are available for up to 31 factors (resolution III).
Designs in 128 runs are available for up to 64 factors (resolution IV) and 65 to 127 factors (resolution III).


Create regular 2-level design ...
Base Settings
Factor Details
Export
Tab Help
Default levels
Common factor levels
First Level
Second Level
-1
1
Modify factor details for selected factor
Select
Factor name
First level
Second level
Comment or label (for html export only)
A
A
-1
1
Store form
Load form
Reset form
Factor Details
A A -1 1
B B -1 1
C C -1 1
D D -1 1
E E -1 1
Move Down
Move Up
OK
Cancel
Help
Activate Special Choices

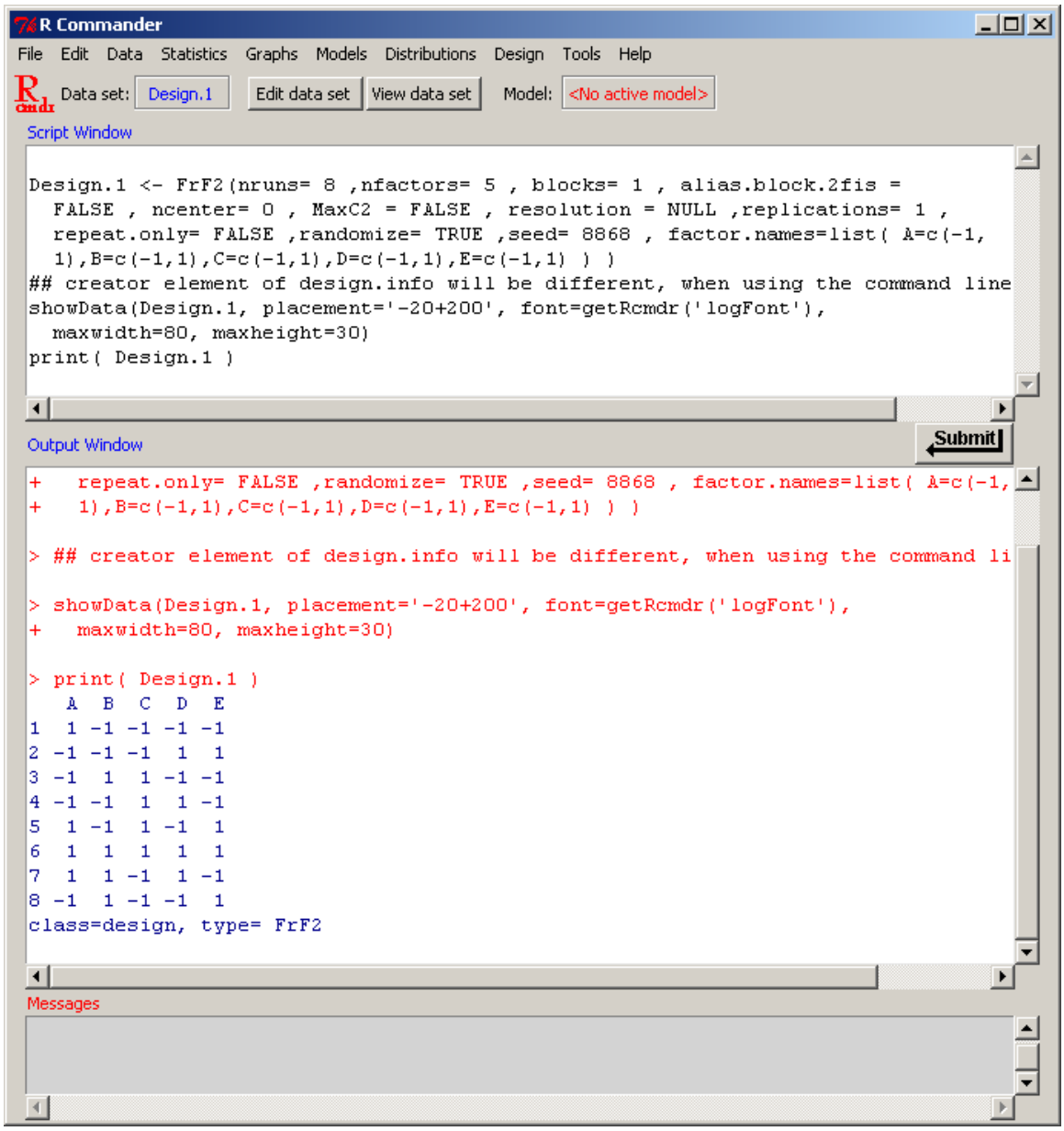

Create regular 2-level design ...
Base Settings
Factor Details
Export
Current design to be saved:
Design.1
Tab Help
(How to) Export ?
no export
all file types
rda only
html and rda
csv and rda
Decimal Separator ?
default
.
,
Store form
Load form
Reset form
Storage Directory
C:/Documents and Settings/Administrator/My Documents
Change directory
Export file names: name below with appropriate endings (html or csv, and rda)
Design.1
Replace file(s), if exists
OK
Cancel
Help
Activate Special Choices



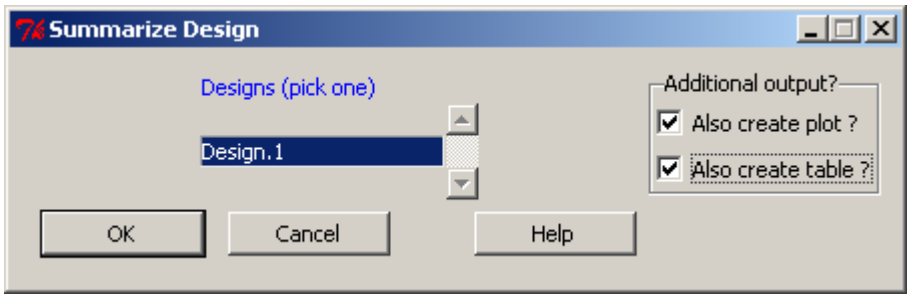
Design►Inspect Design►Display Active Design

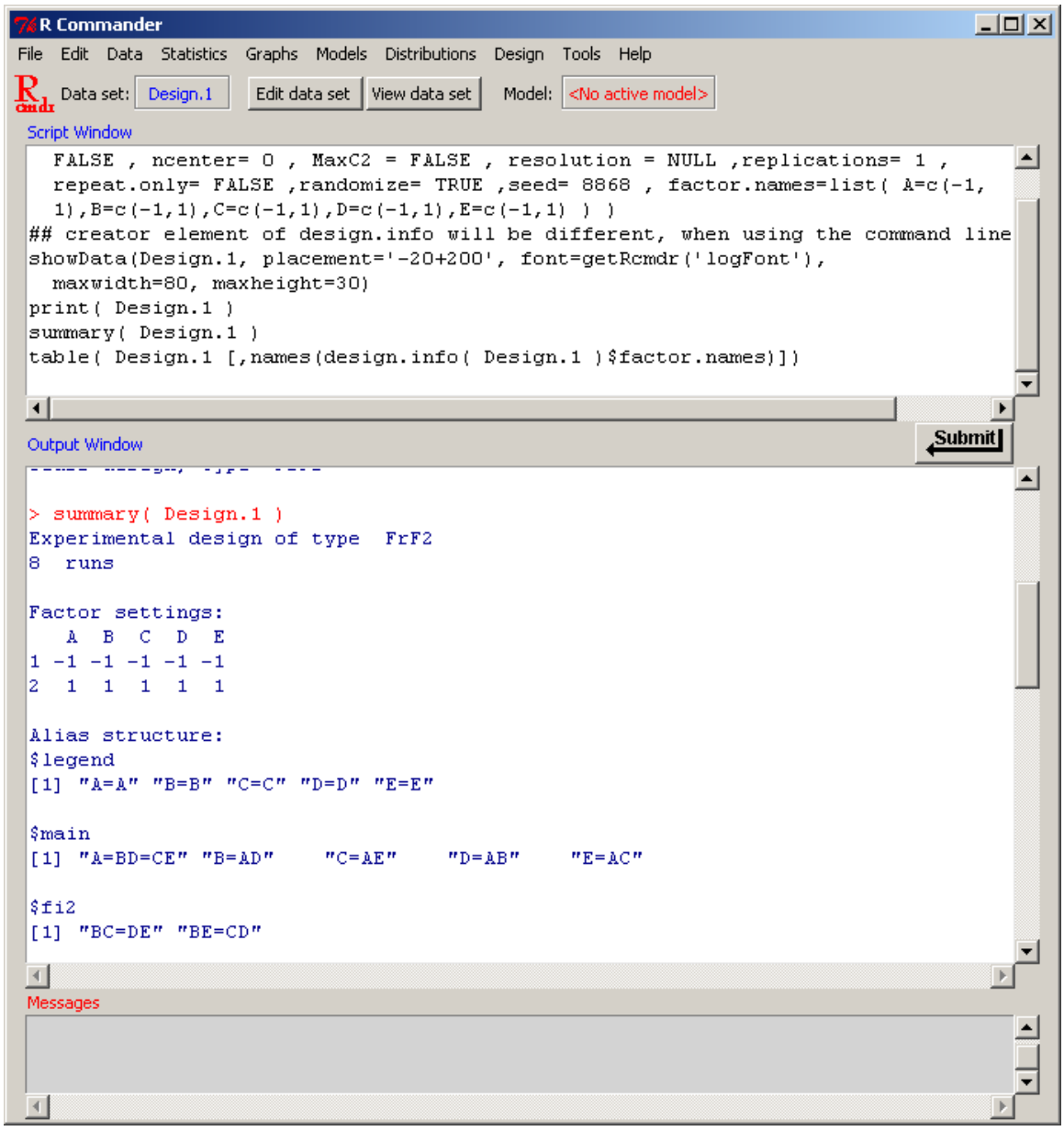


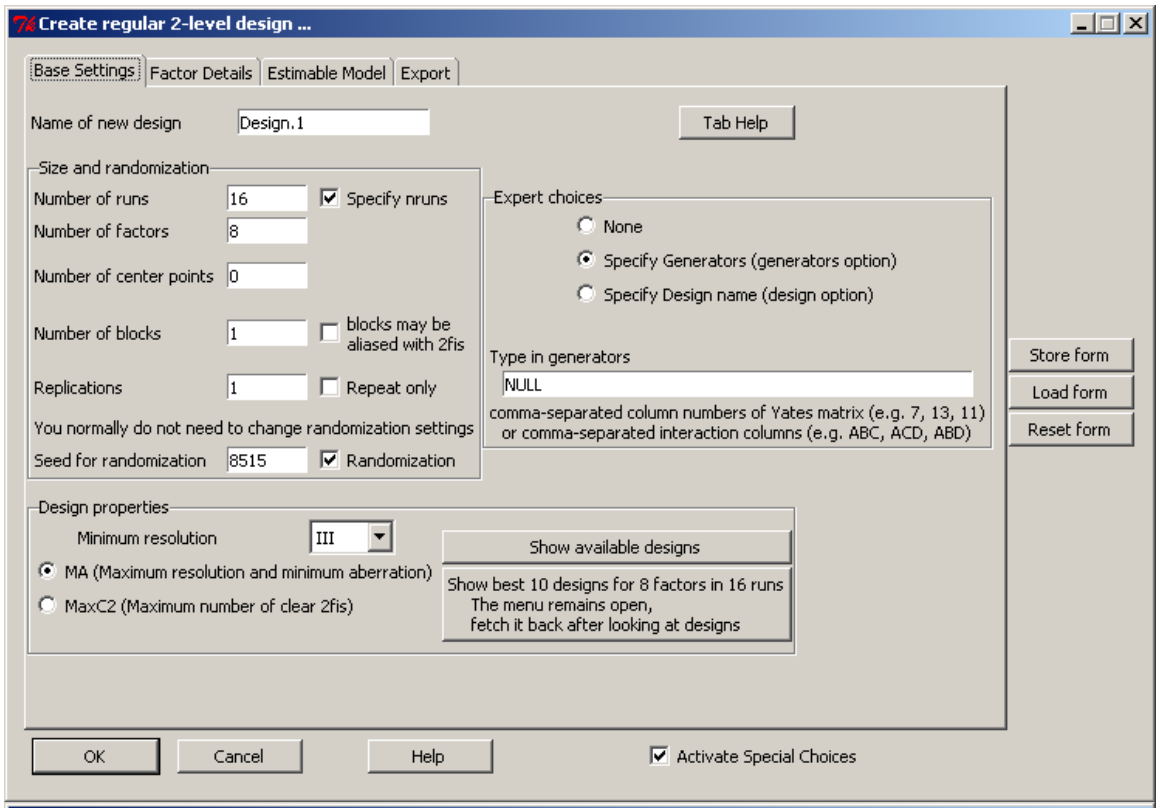
	A	B	C	D	E
1	1	-1	-1	-1	-1
2	-1	-1	-1	1	1
3	-1	1	1	-1	-1
4	-1	-1	1	1	-1
5	1	-1	1	-1	1
6	1	1	1	1	1
7	1	1	-1	1	-1
8	-1	1	-1	-1	1

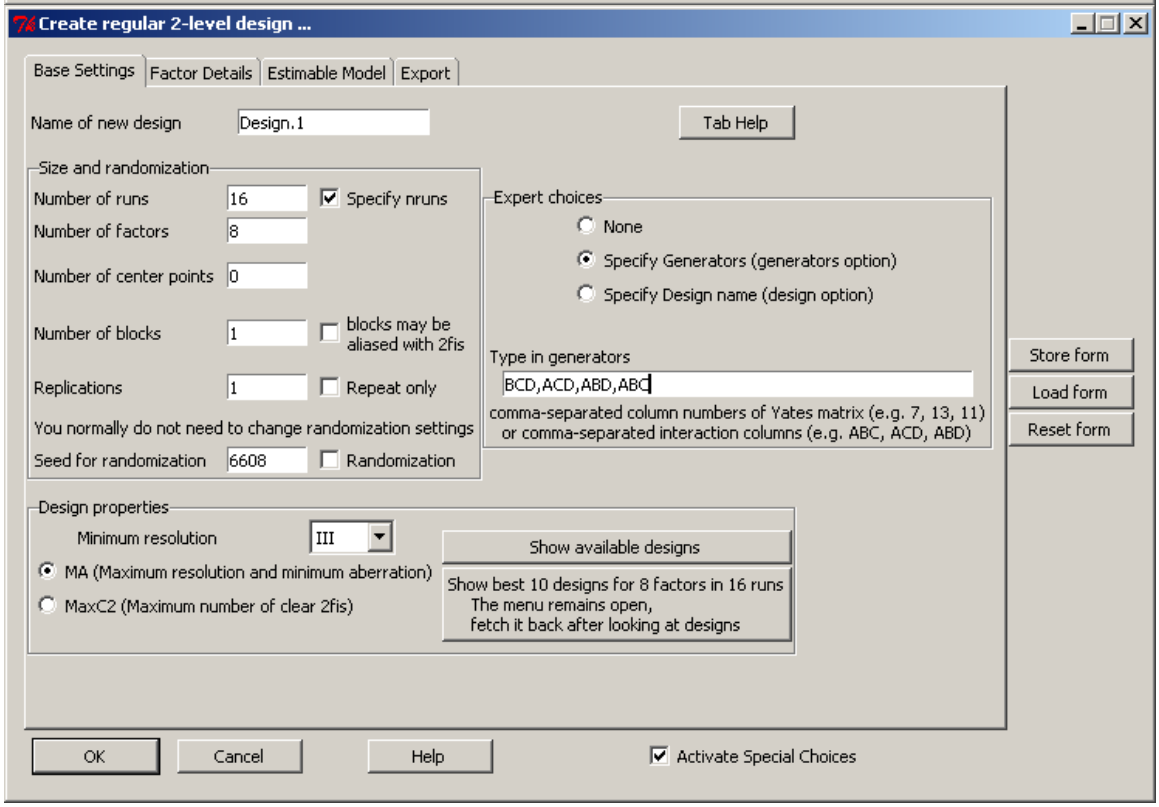


Design►Inspect Design►Summarize design




R Commander
File Edit Data Statistics Graphs Models Distributions Design Tools Help
Data set: Design.1
Edit data set
View data set
Model: <No active model>
Script Window
FALSE , ncenter= 0 , MaxC2 = FALSE , resolution = NULL ,replications= 1 ,
repeat.only= FALSE ,randomize= TRUE ,seed= 8868 , factor.names=list(A=c(-1,
1),B=c(-1,1),C=c(-1,1),D=c(-1,1),E=c(-1,1)))
creator element of design.info will be different, when using the command line
showData(Design.1, placement='-20+200', font=getRcmdr('logFont'),
maxwidth=80, maxheight=30)
print(Design.1)
summary(Design.1)
table(Design.1 [,names(design.info(Design.1)$factor.names)])
Output Window
Submit
> summary(Design.1)
Experimental design of type FrF2
8 runs
Factor settings:
A B C D E
1 -1 -1 -1 -1 -1
2 1 1 1 1 1
Alias structure:
$legend
[1] "A=A" "B=B" "C=C" "D=D" "E=E"
$main
[1] "A=BD=CE" "B=AD" "C=AE" "D=AB" "E=AC"
$fi2
[1] "BC=DE" "BE=CD"
Messages


Create regular 2-level design ...
Base Settings
Factor Details
Estimable Model
Export
Name of new design
Design.1
Tab Help
Size and randomization
Number of runs
16
Specify nruns
Number of factors
8
Number of center points
0
Number of blocks
1
blocks may be aliased with 2fis
Replications
1
Repeat only
You normally do not need to change randomization settings
Seed for randomization
8515
Randomization
Expert choices
None
Specify Generators (generators option)
Specify Design name (design option)
Type in generators
NULL
comma-separated column numbers of Yates matrix (e.g. 7, 13, 11)
or comma-separated interaction columns (e.g. ABC, ACD, ABD)
Store form
Load form
Reset form
Design properties
Minimum resolution
III
MA (Maximum resolution and minimum aberration)
MaxC2 (Maximum number of clear 2fis)
Show available designs
Show best 10 designs for 8 factors in 16 runs
The menu remains open,
fetch it back after looking at designs
OK
Cancel
Help
Activate Special Choices


Create regular 2-level design ...
Base Settings
Factor Details
Estimable Model
Export
Name of new design
Design.1
Tab Help
Size and randomization
Number of runs
16
Specify nruns
Number of factors
8
Number of center points
0
Number of blocks
1
blocks may be aliased with 2fis
Replications
1
Repeat only
You normally do not need to change randomization settings
Seed for randomization
6608
Randomization
Expert choices
None
Specify Generators (generators option)
Specify Design name (design option)
Type in generators
BCD,ACD,ABD,ABC
comma-separated column numbers of Yates matrix (e.g. 7, 13, 11)
or comma-separated interaction columns (e.g. ABC, ACD, ABD)
Store form
Load form
Reset form
Design properties
Minimum resolution
III
MA (Maximum resolution and minimum aberration)
MaxC2 (Maximum number of clear 2fis)
Show available designs
Show best 10 designs for 8 factors in 16 runs
The menu remains open,
fetch it back after looking at designs
OK
Cancel
Help
Activate Special Choices

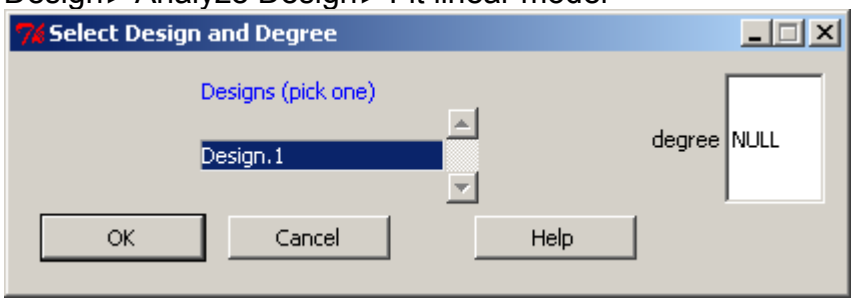

R Commander
File Edit Data Statistics Graphs Models Distributions Design Tools Help
Data set: Design.1
Edit data set
View data set
Model: <No active model>
Script Window
fix(Design.1)
summary(Design.1)
Design.1 <- FrF2(nruns = 16 ,nfactors = 8 , blocks = 1 , alias.block.2fis =
FALSE , ncenter = 0 , hard= NULL , generators = c("BCD","ACD","ABD","ABC"
) , design = NULL ,replications= 1 ,repeat.only= FALSE ,randomize= TRUE ,
seed= 8515 , factor.names=list(A=c(-1,1),B=c(-1,1),C=c(-1,1),D=c(-1,1),
E=c(-1,1),F=c(-1,1),G=c(-1,1),H=c(-1,1)) , catlg = catlg)
creator element of design.info will be different, when using the command line
summary(Design.1)
Output Window
Submit
Experimental design of type FrF2.generators
16 runs
Factor settings:
A B C D E F G H
1 -1 -1 -1 -1 -1 -1 -1 -1
2 1 1 1 1 1 1 1 1
Alias structure:
$legend
[1] "A=A" "B=B" "C=C" "D=D" "E=E" "F=F" "G=G" "H=H"
$main
character(0)
$fi2
[1] "AB=CH=DG=EF" "AC=BH=DF=EG" "AD=BG=CF=EH" "AE=BF=CG=DH" "AF=BE=CD=GH"
[6] "AG=BD=CE=FH" "AH=BC=DE=FG"
Messages
WARNING: design was generated with RcmdrPlugin.DoE

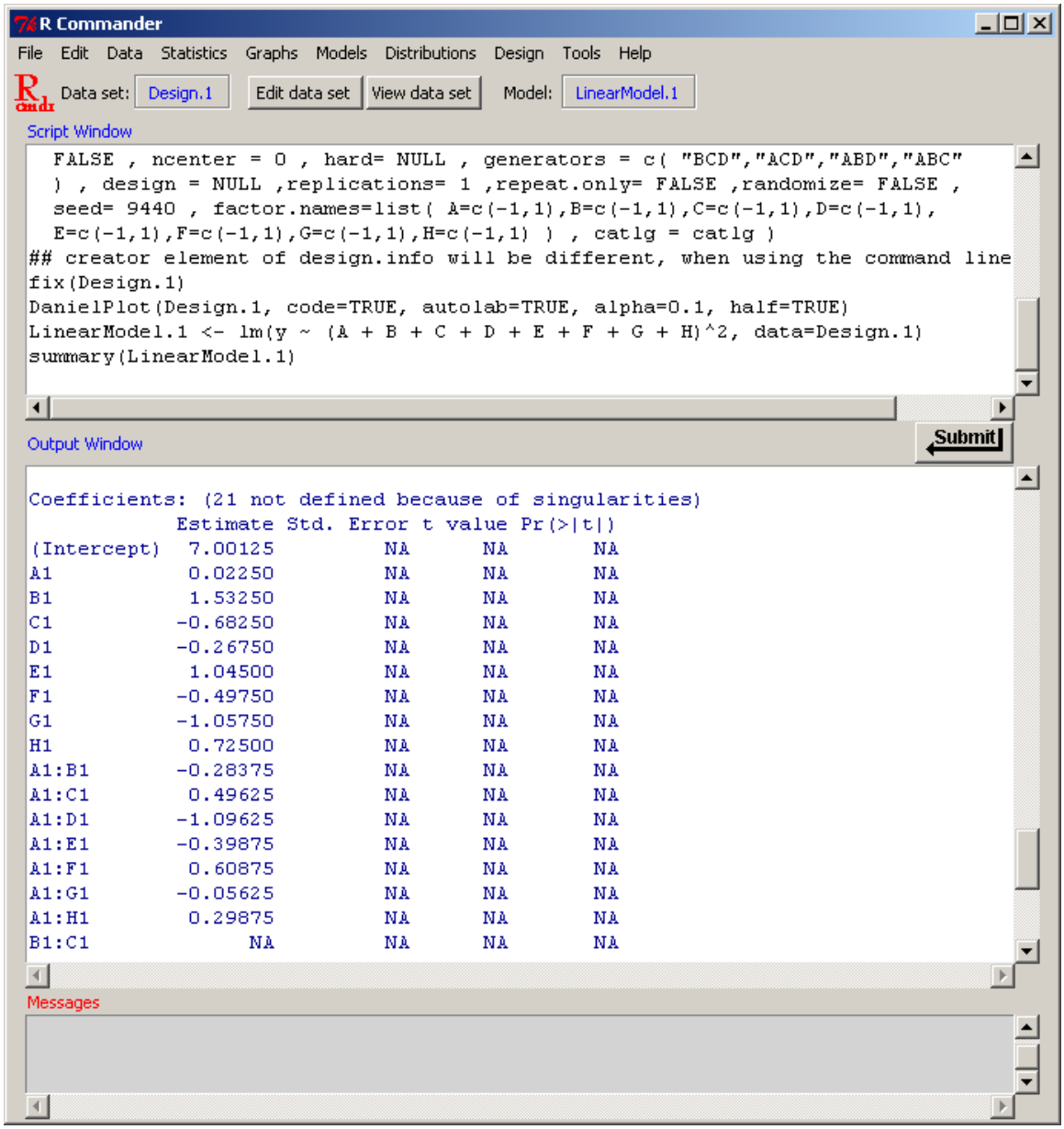
Edit data set

Data Editor

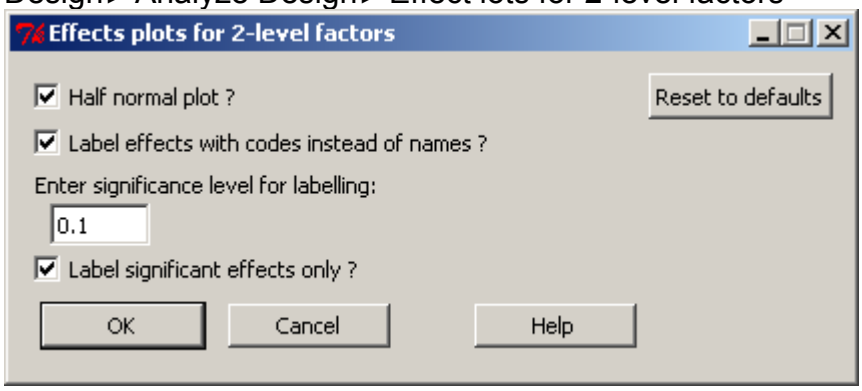
	A	B	C	D	E	F	G	H	y
1	-1	-1	-1	-1	-1	-1	-1	-1	5.75
2	1	-1	-1	-1	-1	1	1	1	6.7
3	-1	1	-1	-1	1	-1	1	1	11.12
4	1	1	-1	-1	1	1	-1	-1	10.67
5	-1	-1	1	-1	1	1	-1	1	4.92
6	1	-1	1	-1	1	-1	1	-1	5.35
7	-1	1	1	-1	-1	1	1	-1	2.81
8	1	1	1	-1	-1	-1	-1	1	10.83
9	-1	-1	-1	1	1	1	1	-1	6.08
10	1	-1	-1	1	1	-1	-1	1	7.27
11	-1	1	-1	1	-1	1	-1	1	9.68
12	1	1	-1	1	-1	-1	1	-1	4.2
13	-1	-1	1	1	-1	-1	1	1	3.9
14	1	-1	1	1	-1	1	-1	-1	3.78
15	-1	1	1	1	1	-1	-1	-1	11.57
16	1	1	1	1	1	1	1	1	7.39
17									
18									
19									

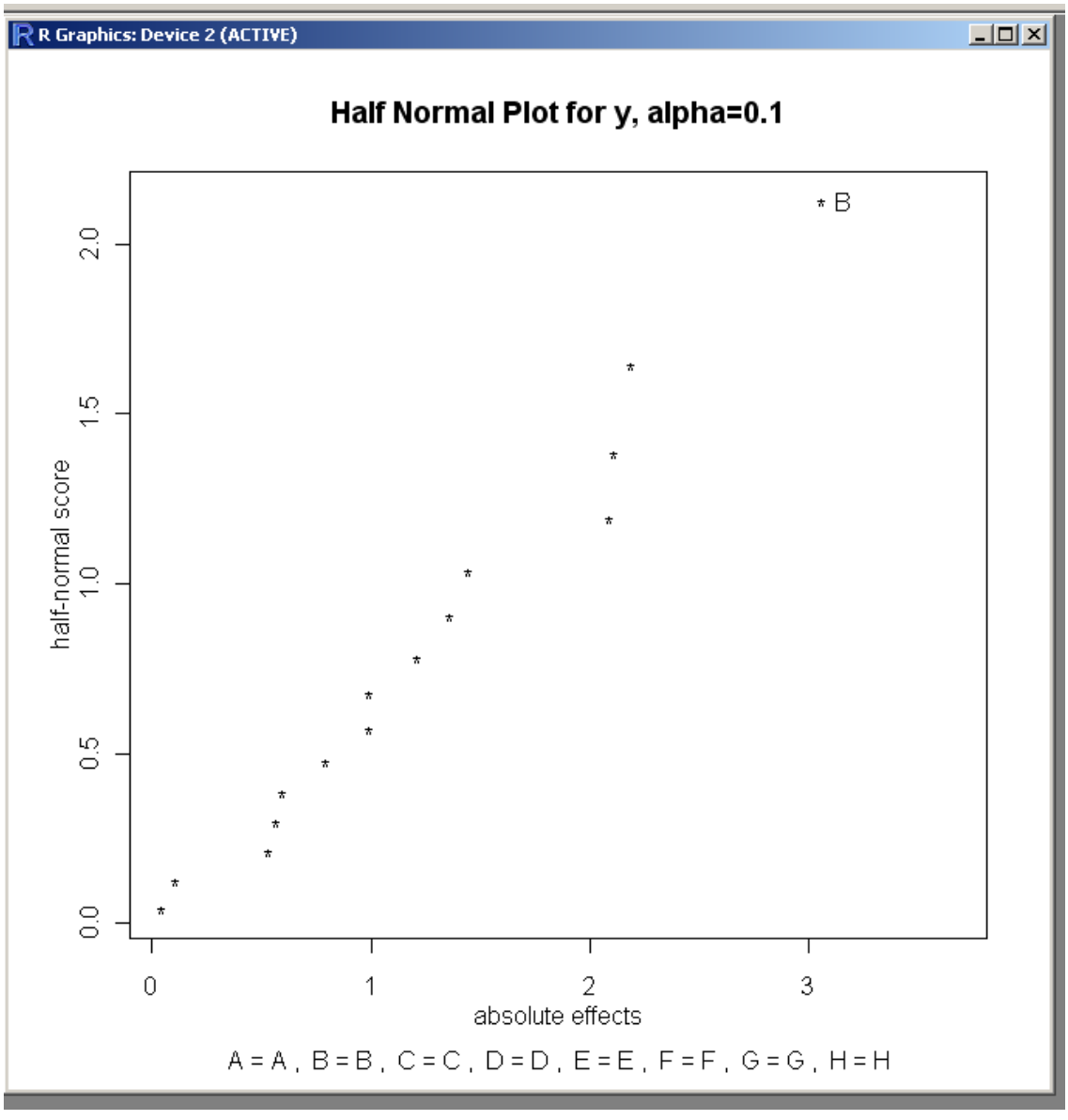
Design►Analyze Design►Fit linear model



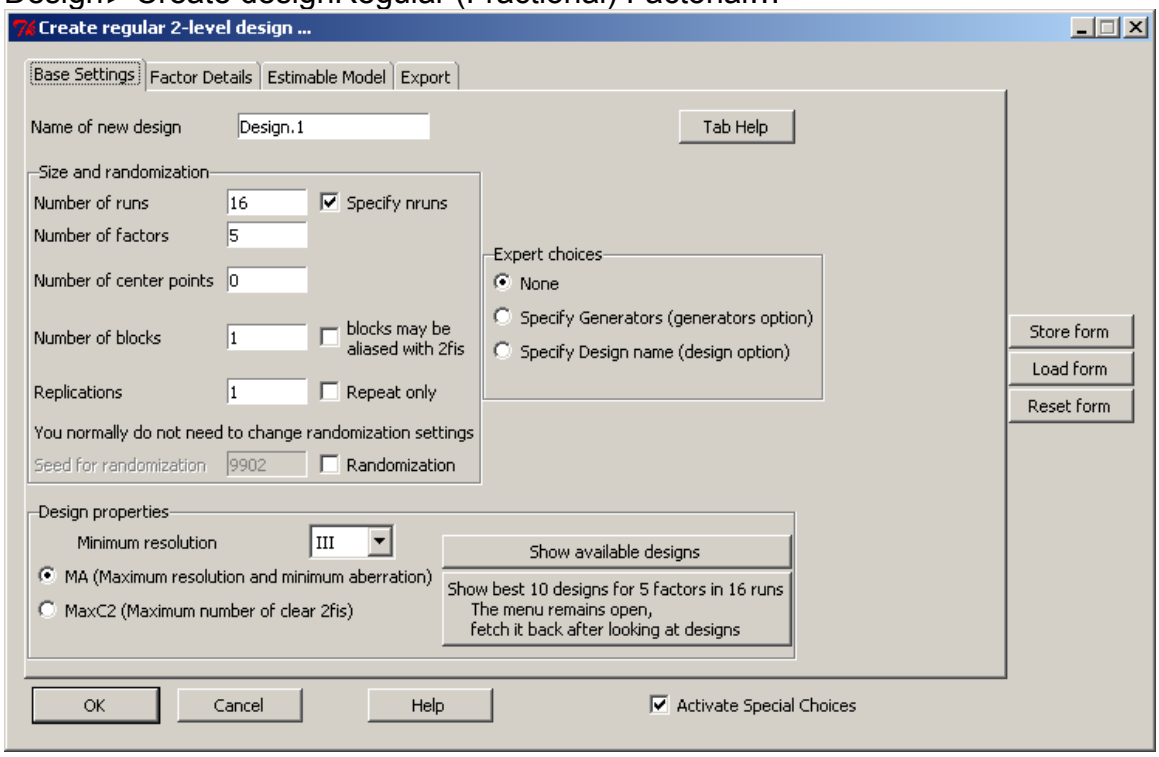

R Commander
File Edit Data Statistics Graphs Models Distributions Design Tools Help
Data set: Design.1
Edit data set
View data set
Model: LinearModel.1
Script Window
FALSE , ncenter = 0 , hard= NULL , generators = c("BCD","ACD","ABD","ABC") , design = NULL ,replications= 1 ,repeat.only= FALSE ,randomize= FALSE , seed= 9440 , factor.names=list(A=c(-1,1),B=c(-1,1),C=c(-1,1),D=c(-1,1), E=c(-1,1),F=c(-1,1),G=c(-1,1),H=c(-1,1)) , catlg = catlg)
creator element of design.info will be different, when using the command line
fix(Design.1)
DanielPlot(Design.1, code=TRUE, autolab=TRUE, alpha=0.1, half=TRUE)
LinearModel.1 <- lm(y ~ (A + B + C + D + E + F + G + H)^2, data=Design.1)
summary(LinearModel.1)
Output Window
Submit
Coefficients: (21 not defined because of singularities)
Estimate Std. Error t value Pr(>|t|)
(Intercept) 7.00125 NA NA NA
A1 0.02250 NA NA NA
B1 1.53250 NA NA NA
C1 -0.68250 NA NA NA
D1 -0.26750 NA NA NA
E1 1.04500 NA NA NA
F1 -0.49750 NA NA NA
G1 -1.05750 NA NA NA
H1 0.72500 NA NA NA
A1:B1 -0.28375 NA NA NA
A1:C1 0.49625 NA NA NA
A1:D1 -1.09625 NA NA NA
A1:E1 -0.39875 NA NA NA
A1:F1 0.60875 NA NA NA
A1:G1 -0.05625 NA NA NA
A1:H1 0.29875 NA NA NA
B1:C1 NA NA NA NA
Messages

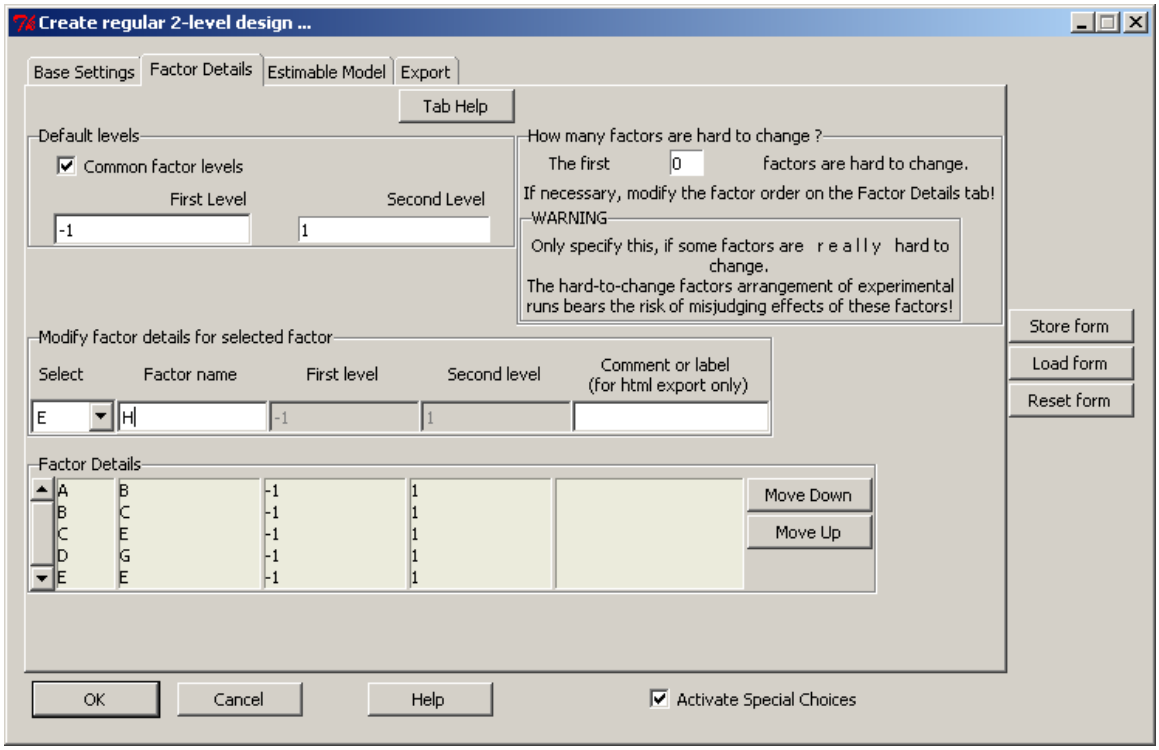
Design►Analyze Design►Effect lots for 2-level factors





Design►Create designRegular (Fractional) Factorial…



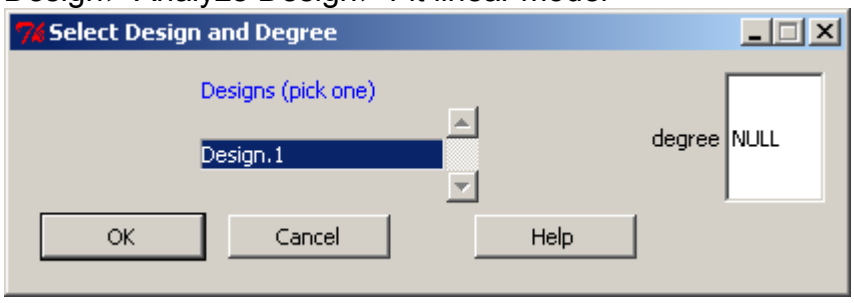


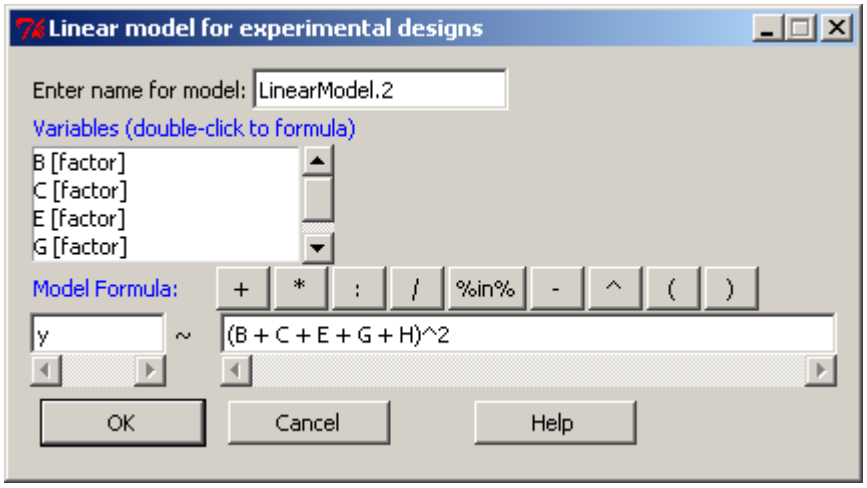
Edit data set

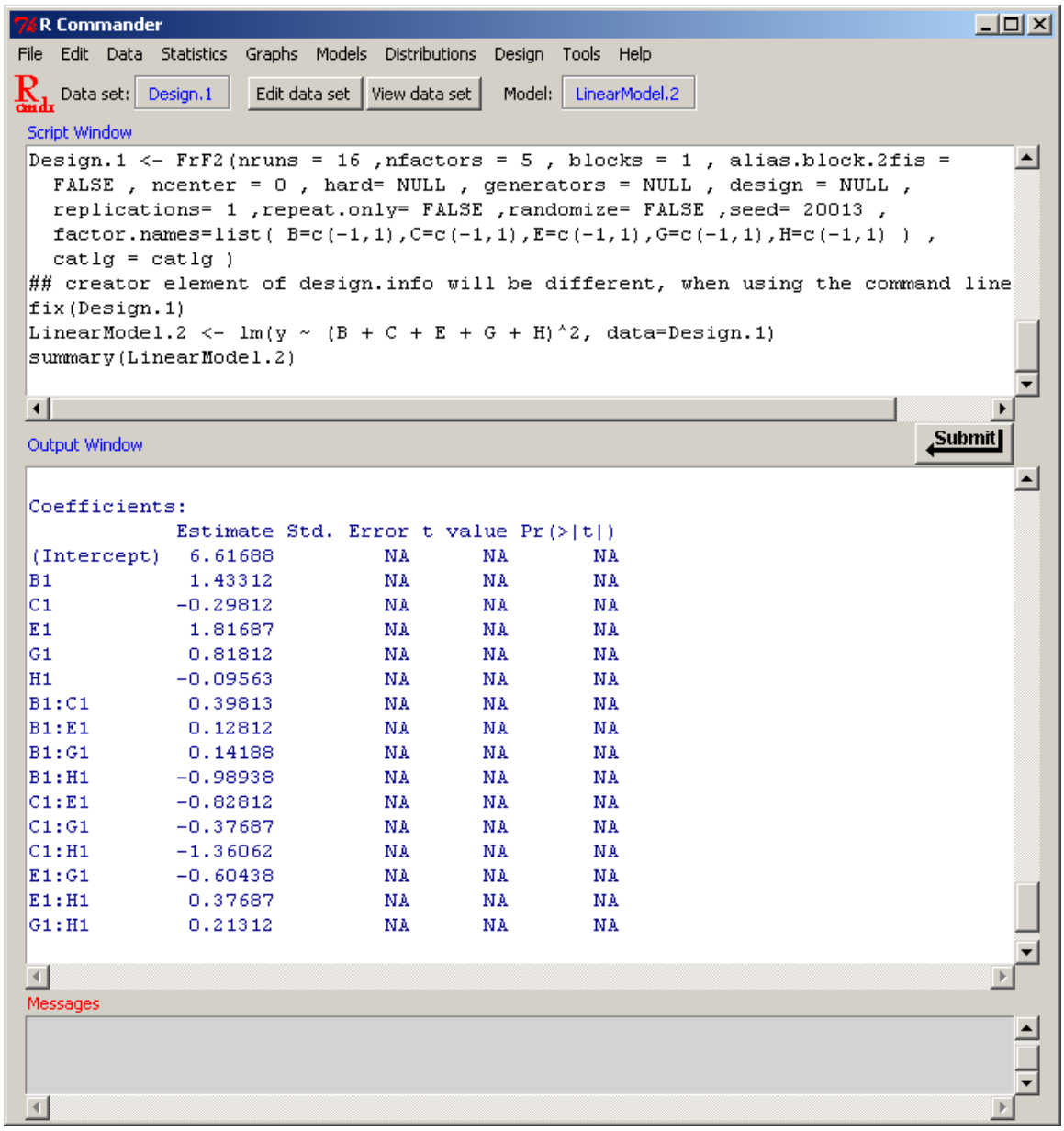
Data Editor

	B	C	E	G	H	y	var7	var8
1	-1	-1	-1	-1	1	3.37		
2	1	-1	-1	-1	-1	3.55		
3	-1	1	-1	-1	-1	3.78		
4	1	1	-1	-1	1	2.81		
5	-1	-1	1	-1	-1	5.53		
6	1	-1	1	-1	1	10.43		
7	-1	1	1	-1	1	5.35		
8	1	1	1	-1	-1	11.57		
9	-1	-1	-1	1	-1	2.93		
10	1	-1	-1	1	1	7.23		
11	-1	1	-1	1	1	3.9		
12	1	1	-1	1	-1	10.83		
13	-1	-1	1	1	1	11.69		
14	1	-1	1	1	-1	10.59		
15	-1	1	1	1	-1	4.92		
16	1	1	1	1	1	7.39		
17								
18								
19								

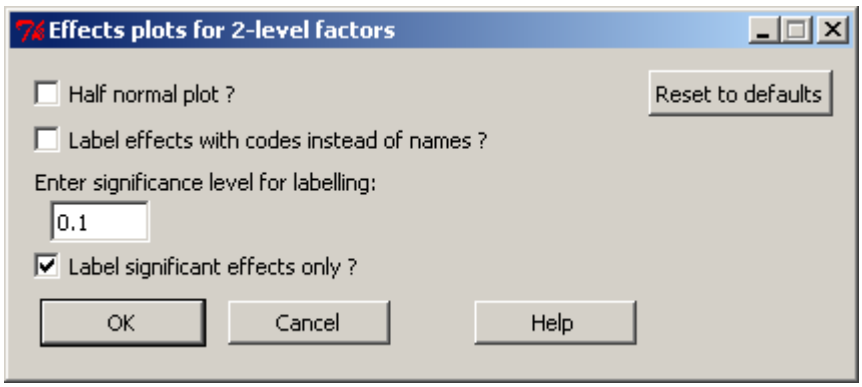
Design►Analyze Design►Fit linear model

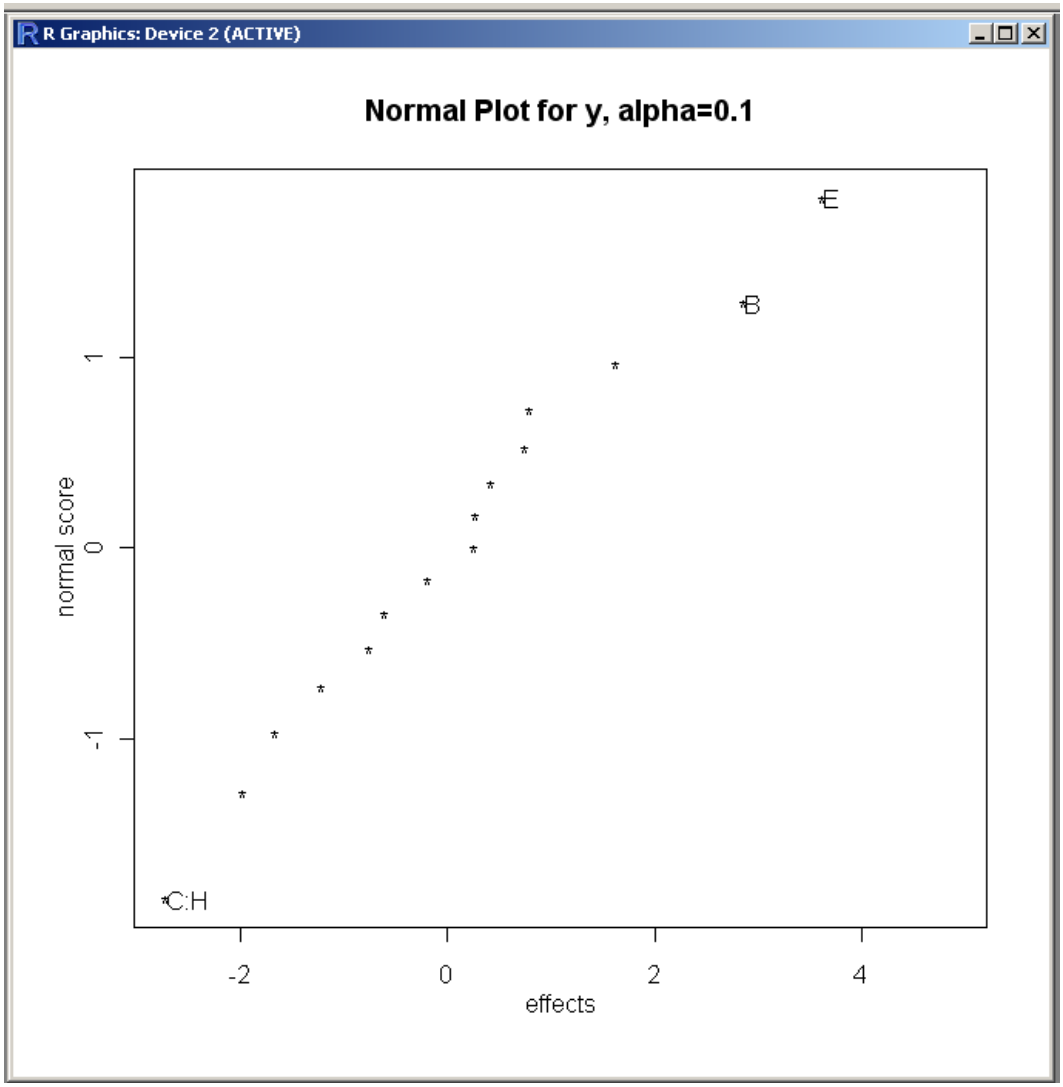




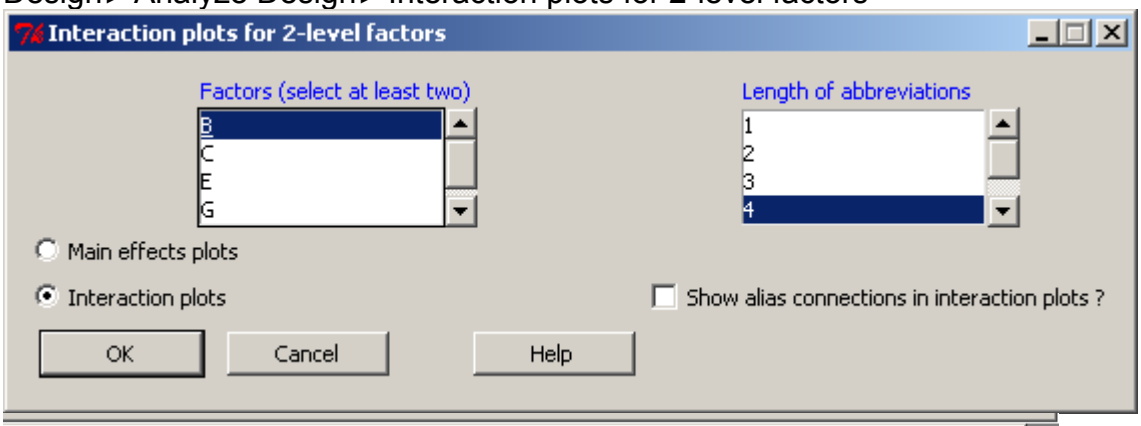

R Commander
File Edit Data Statistics Graphs Models Distributions Design Tools Help
Data set: Design.1
Edit data set
View data set
Model: LinearModel.2
Script Window
Design.1 <- FrF2(nruns = 16 ,nfactors = 5 , blocks = 1 , alias.block.2fis =
FALSE , ncenter = 0 , hard= NULL , generators = NULL , design = NULL ,
replications= 1 ,repeat.only= FALSE ,randomize= FALSE ,seed= 20013 ,
factor.names=list(B=c(-1,1),C=c(-1,1),E=c(-1,1),G=c(-1,1),H=c(-1,1)) ,
catlg = catlg)
creator element of design.info will be different, when using the command line
fix(Design.1)
LinearModel.2 <- lm(y ~ (B + C + E + G + H)^2, data=Design.1)
summary(LinearModel.2)
Output Window
Submit
Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 6.61688 NA NA NA
B1 1.43312 NA NA NA
C1 -0.29812 NA NA NA
E1 1.81687 NA NA NA
G1 0.81812 NA NA NA
H1 -0.09563 NA NA NA
B1:C1 0.39813 NA NA NA
B1:E1 0.12812 NA NA NA
B1:G1 0.14188 NA NA NA
B1:H1 -0.98938 NA NA NA
C1:E1 -0.82812 NA NA NA
C1:G1 -0.37687 NA NA NA
C1:H1 -1.36062 NA NA NA
E1:G1 -0.60438 NA NA NA
E1:H1 0.37687 NA NA NA
G1:H1 0.21312 NA NA NA
Messages

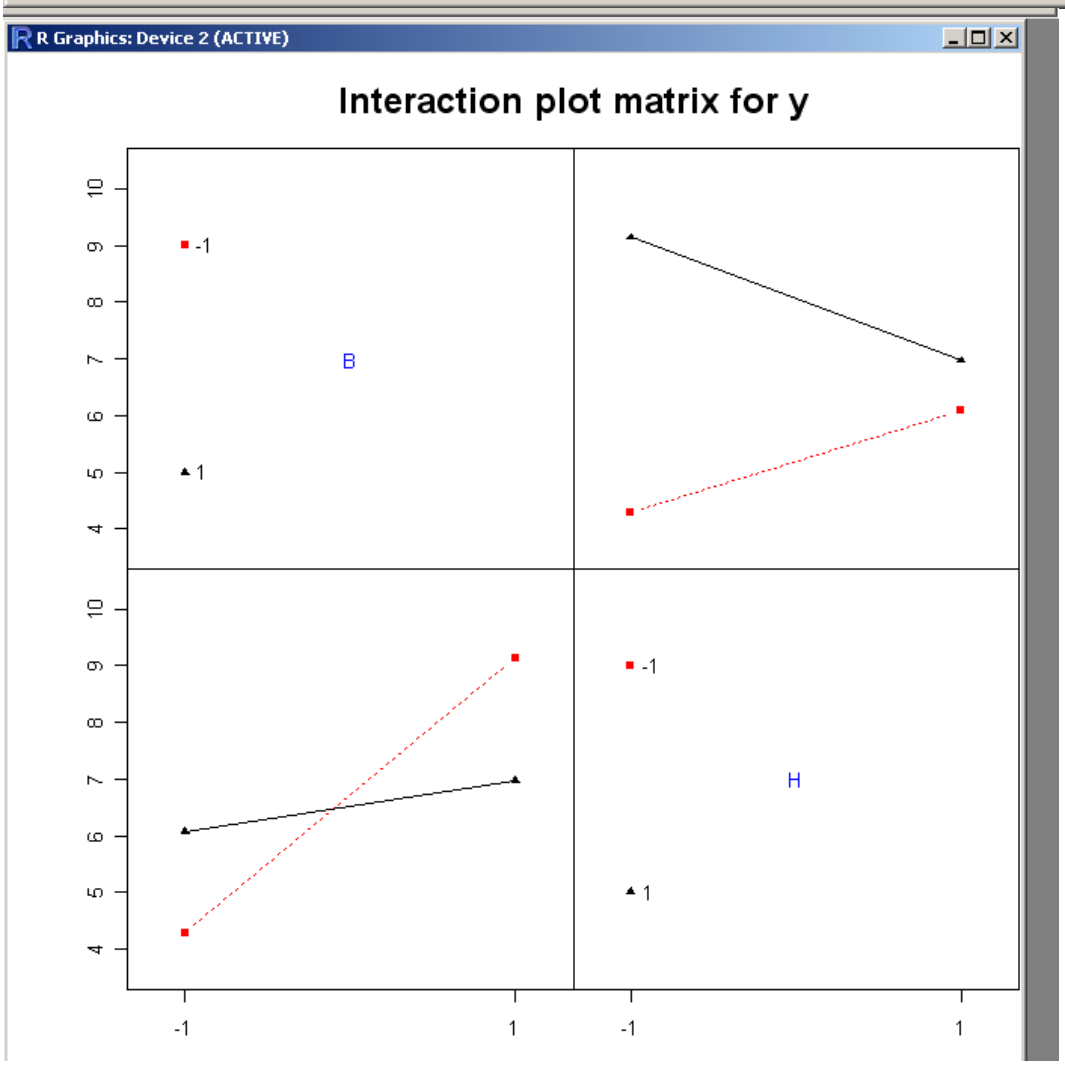
Design►Analyze Design►Effect lots for 2-level factors



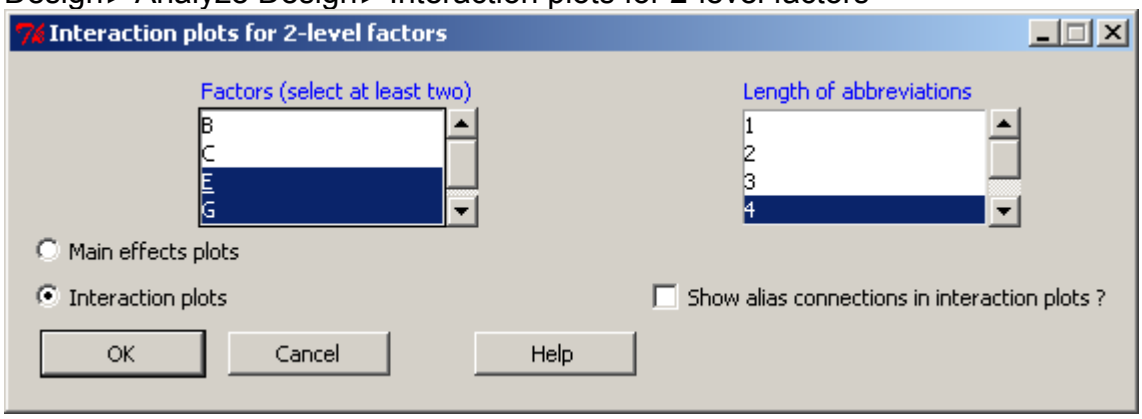


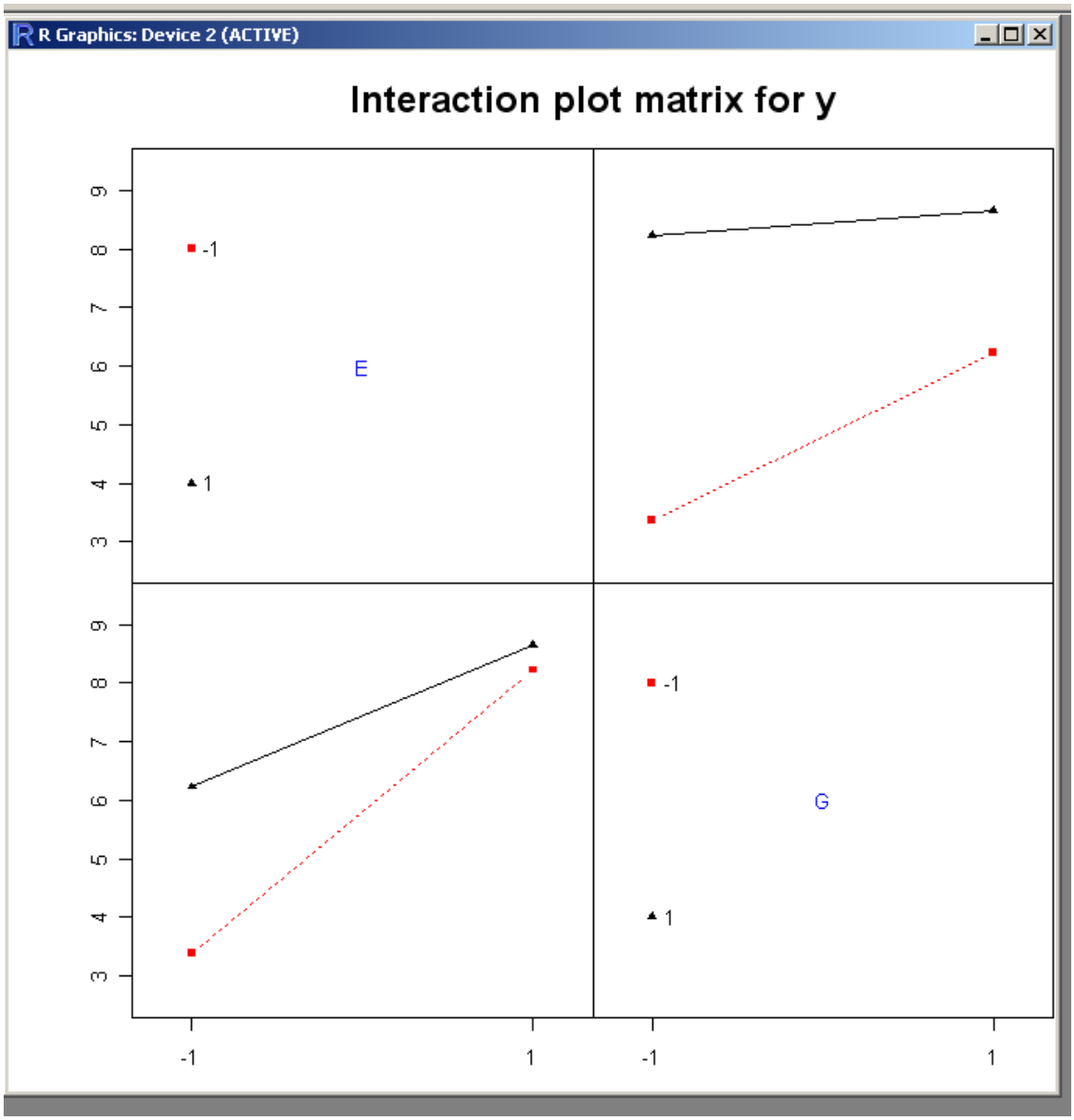
Design►Analyze Design►Interaction plots for 2-level factors





Design►Analyze Design►Interaction plots for 2-level factors





Design►Analyze Design►Interaction plots for 2-level factors