

Basic discrete choice models in R

P. Mariel

eman ta zabal zazu



Universidad
del País Vasco

Euskal Herriko
Unibertsitatea

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Petr Mariel (University of the Basque Country UPV/EHU)



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R is a language and environment for statistical computing and graphics.

It is available as Free Software in source code form.

It compiles and runs on a wide variety of UNIX platforms and similar systems, Windows and MacOS.



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Strengths (P. Dalgaard, R, Core Team) :

- Compact expression of ideas, one-liners
- Easy construction of simulation studies
- Operation on model objects (e.g. prediction on new data)
- The flexible graphics system



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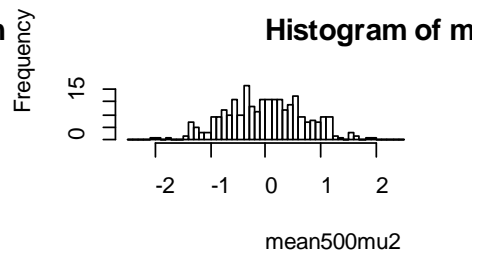
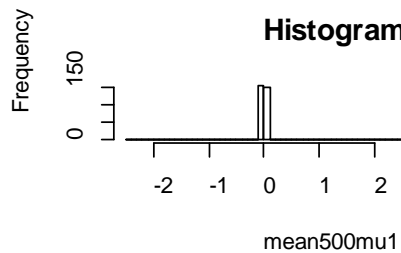
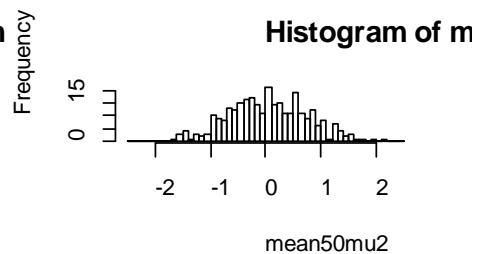
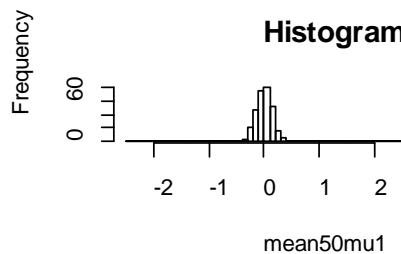
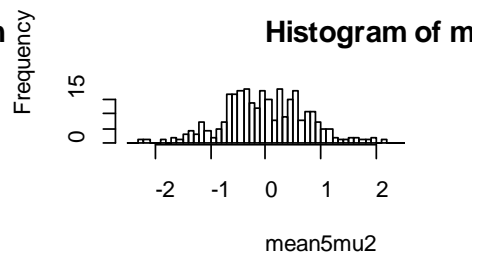
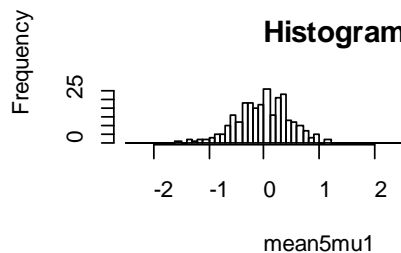
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Limitations (P. Dalgaard, R, Core Team) :

- The rapid prototyping aspects of the R language conspire against its efficiency.
- Maintenance relies on a small group of semi-volunteers, making strategic decisions difficult.

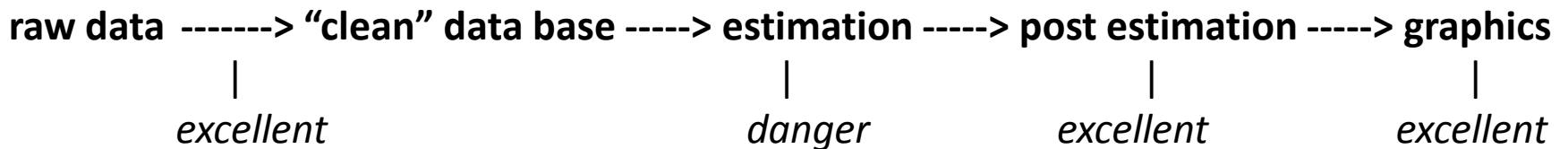


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Personal experience:



```
x[x >= 14] <- 20
```

local maxima
speed
multiprocessing



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Package **optimx()** unifies a number of tools under a single calling syntax

Possible methods: 'Nelder-Mead', 'BFGS', 'CG', 'L-BFGS-B', 'nlm', 'nlminb', 'spg', 'ucminf', 'newuoa', 'bobyqa', 'nmkb', 'hjk', 'Rcgmin', or 'Rvmmin'

Package **maxLik()**

- Newton-Raphson (NR)
- Berndt-Hall-Hausman (BHHH)
- Broyden-Fletcher-Goldfarb-Shanno (BFGS)
- Nelder-Mead (NM).

CFSQP?



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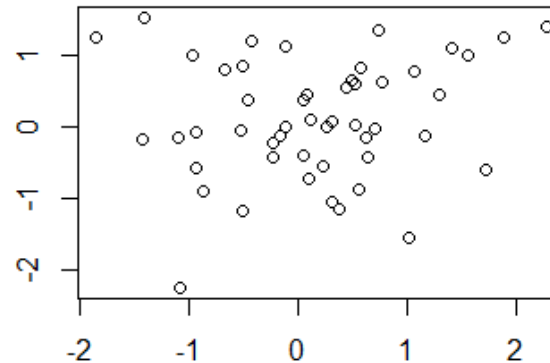


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genoud() ... GENetic Optimization Using Derivatives ... is an R function that combines **evolutionary algorithm** methods with a **derivative based** (quasi-Newton) **method** to solve difficult optimization problems.

An **evolutionary algorithm** uses a collection of **heuristic rules** to modify a population of trial solutions in such a way that each generation of trial values tends to be, on average, better than its predecessor.

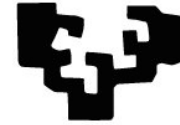




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RPL				
<i>Number of observations:</i>	1000			
<i>Number of individuals:</i>	200			
<i>Number of choices per individual:</i>	5			
<i>Number of random draws:</i>	50			
Starting values	True values	Zeros		
Method	Execution Time	Execution Time		Parallel computation
hjkb (Hooke-Jeeves)	0:14	No convergence		No
nlm	0:22	0:36		No
spg (spectral projected gradient method)	0:25	0:48		No
BFGS	0:26	0:35		No
ucminf (General-Purpose Unconstrained Non-Linear Optimization)	0:26	0:29		No
L-BFGS-B	0:29	0:38		No
newuoa (Powell)	0:30	No convergence		No
bobyqa (Powell)	0:30	No convergence		No
nmkb (Nelder-Mead)	0:33	0:36		No
nlinb	0:41	No convergence		No
nlimb	0:42	No convergence		No
Nelder-Mead	0:48	0:47		No
CG (conjugate gradients)	1:18	1:34		No
genoud (population=100)	1:22	1:59		Yes (4 CPUs)
genoud (population=100)	0:45	1:02		Yes (20 CPUs)



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Conclusions

- 1) R as a teaching tool
- 2) R as research tool in DCE
- 3) Optimizer: robustness + speed + parallel computation

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Thank you very much for your attention