

# Package ‘ars’

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**Title** Adaptive Rejection Sampling

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**Depends** R (>= 2.4.0)

**Description** Adaptive Rejection Sampling, Original version

**License** GPL (>= 2)

**Repository** CRAN

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ars *Adaptive Rejection Sampling*

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## Description

Adaptive Rejection Sampling from log-concave density functions

## Usage

```
ars(n=1, f, fprima, x=c(-4, 1, 4), ns=100, m=3, emax=64, lb=FALSE, ub=FALSE, xlb=0, xub=0, ...)
```

**Arguments**

n	sample size
f	function that computes $\log(f(u, \dots))$ , for given u, where f(u) is proportional to the density we want to sample from
fprima	$d/du \log(f(u, \dots))$
x	some starting points in which $\log(f(u, \dots))$ is defined
ns	maximum number of points defining the hulls
m	number of starting points
emax	large value for which it is possible to compute an exponential
lb	boolean indicating if there is a lower bound to the domain
xlb	value of the lower bound
ub	boolean indicating if there is an upper bound to the domain
xub	value of the upper bound
...	arguments to be passed to f and fprima

**Details****ifault codes, subroutine initial**

- 0: successful initialisation
- 1: not enough starting points
- 2: ns is less than m
- 3: no abscissae to left of mode (if lb = false)
- 4: no abscissae to right of mode (if ub = false)
- 5: non-log-concavity detect

**ifault codes, subroutine sample**

- 0: successful sampling
- 5: non-concavity detected
- 6: random number generator generated zero
- 7: numerical instability

**Value**

a sampled value from density

**Author(s)**

Paulino Perez Rodriguez, original C++ code from Arnost Komarek based on ars.f written by P. Wild and W. R. Gilks

## References

Gilks, W.R., P. Wild. (1992) Adaptive Rejection Sampling for Gibbs Sampling, *Applied Statistics* 41:337–348.

## Examples

```
library(ars)

#Example 1: sample 20 values from the normal distribution N(2,3)
f<-function(x,mu=0,sigma=1){-1/(2*sigma^2)*(x-mu)^2}
fprima<-function(x,mu=0,sigma=1){-1/sigma^2*(x-mu)}
mysample<-ars(20,f,fprima,mu=2,sigma=3)
mysample
hist(mysample)

#Example 2: sample 20 values from a gamma(2,0.5)
f1<-function(x,shape,scale=1){(shape-1)*log(x)-x/scale}
f1prima<-function(x,shape,scale=1){(shape-1)/x-1/scale}
mysample1<-ars(20,f1,f1prima,x=4.5,m=1,lb=TRUE,xlb=0,shape=2,scale=0.5)
mysample1
hist(mysample1)

#Example 3: sample 20 values from a beta(1.3,2.7) distribution
f2<-function(x,a,b){(a-1)*log(x)+(b-1)*log(1-x)}
f2prima<-function(x,a,b){(a-1)/x-(b-1)/(1-x)}
mysample2<-ars(20,f2,f2prima,x=c(0.3,0.6),m=2,lb=TRUE,xlb=0,ub=TRUE,xub=1,a=1.3,b=2.7)
mysample2
hist(mysample2)
```

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