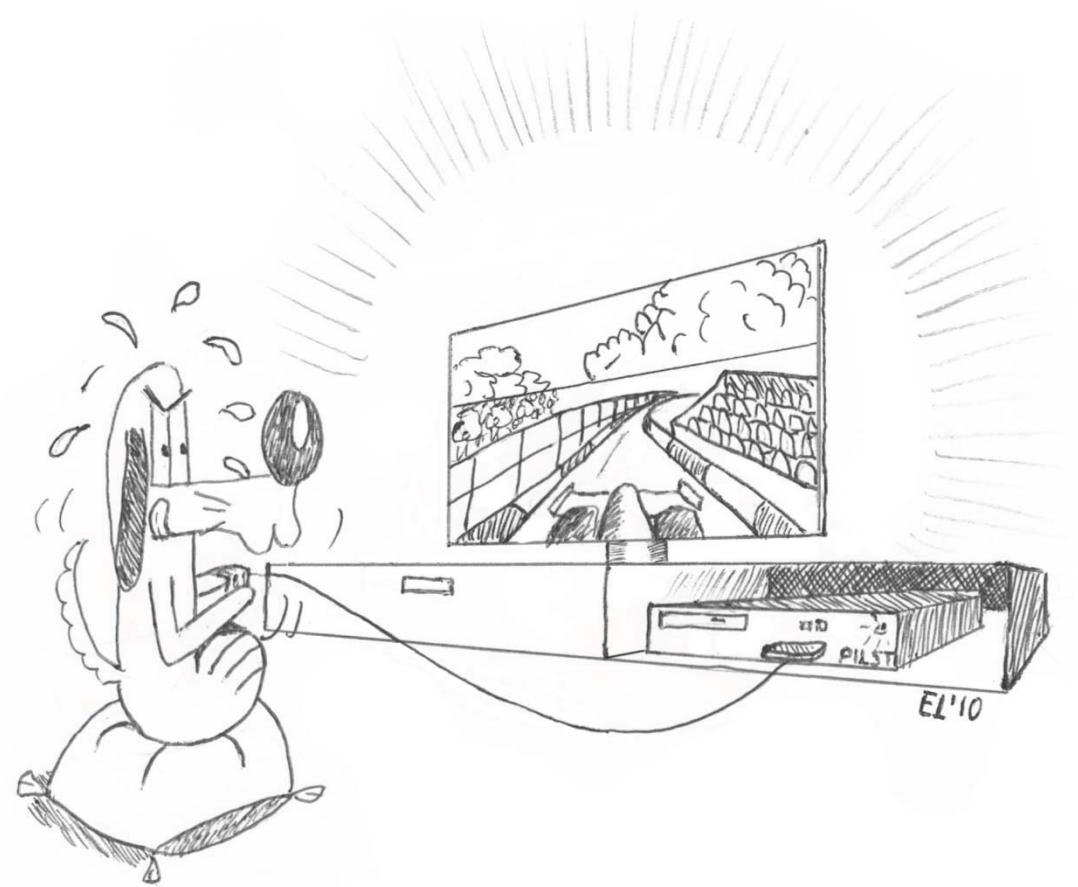


# Bonus Simulation

Jean-Yves Le Boudec  
2015



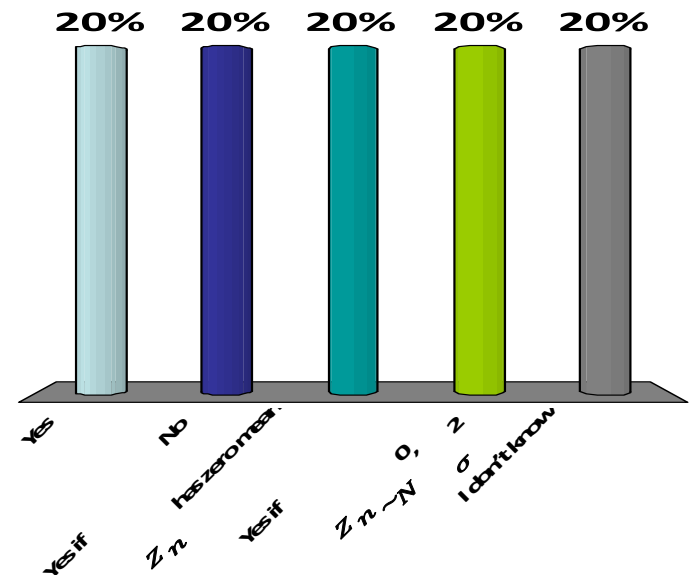
The sequence  $X_n$  is a random walk, i.e.

$$X_n = Z_1 + Z_2 + \dots + Z_n$$

where  $Z_n$  is iid.

Is the sequence  $X_n$  stationary ?

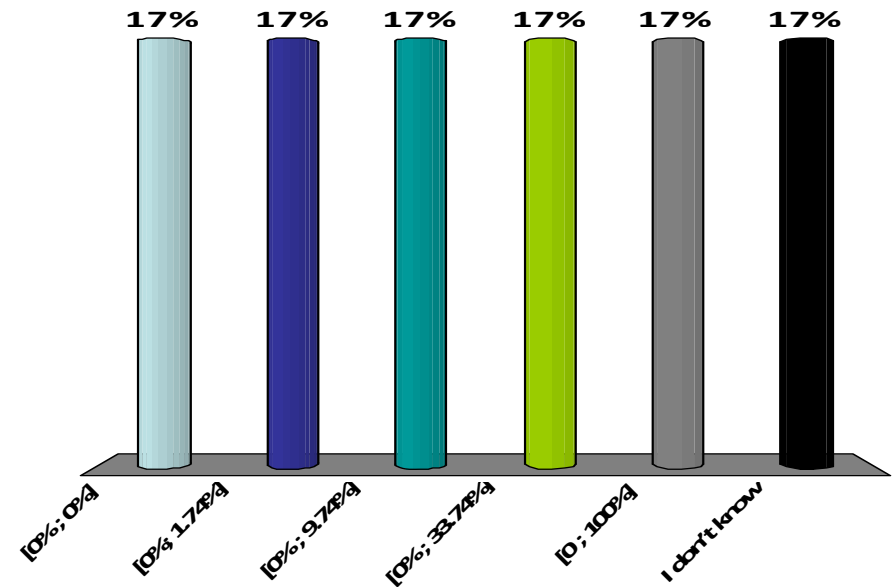
- A. Yes
- B. No
- C. Yes if  $Z_n$  has zero mean
- D. Yes if  $Z_n \sim N(0, \sigma^2)$
- E. I don't know



# Is the simulator output $(X_1, X_2, \dots)$ stationary ?

```
 $X_1 \sim N(\mu, \sigma^2)$   
for  $n = 2:n_{\max}$   
     $U \sim \text{Unif}(0,1)$   
    if  $U < p$   
         $X_n = X_{n-1}$   
    else  
         $X_n \sim N(\mu, \sigma^2)$   
end
```

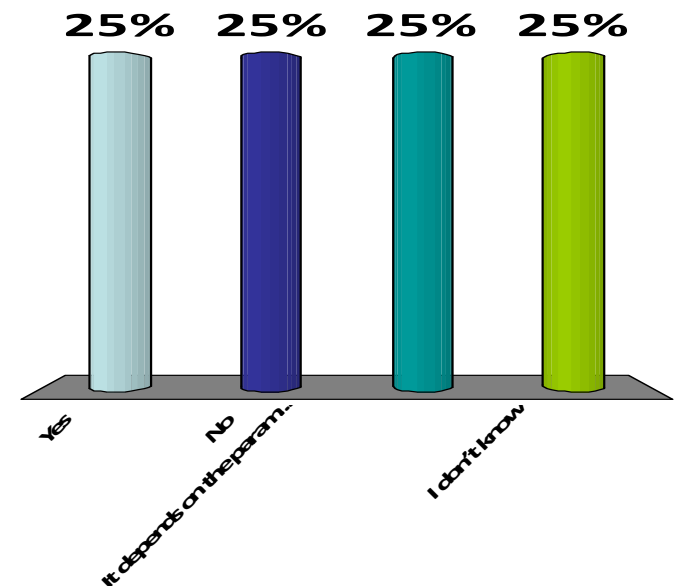
- A. Yes
- B. No
- C. It depends on  $\mu, \sigma$
- D. I don't know



We simulate a random waypoint model with speed pdf  $f_{V_0}$

Does this simulation have a stationary regime?

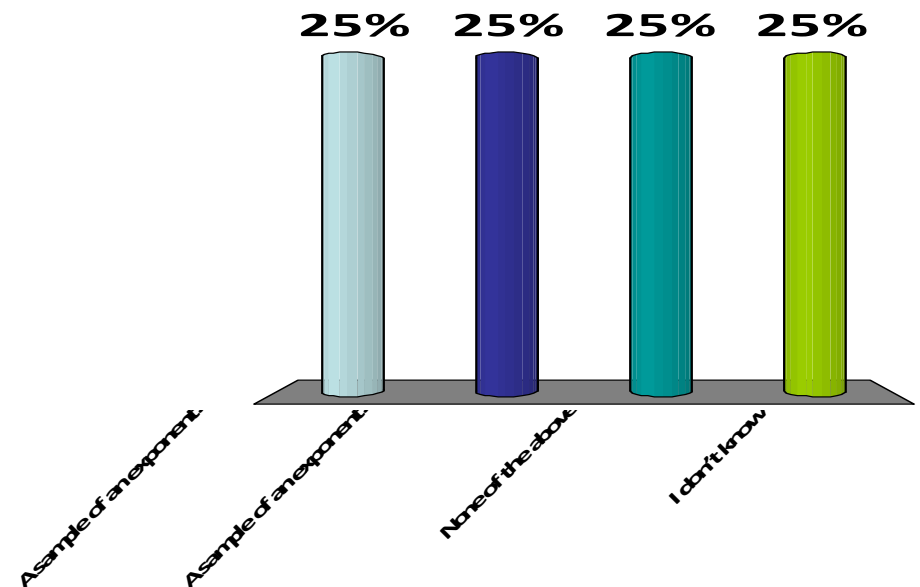
- A. Yes
- B. No
- C. It depends on the parameters of  $f_{V_0}$
- D. I don't know



`myfun(a)`  
=  $a$  `randexp()`  
where `randexp()`  
returns one sample of  
the standard  
exponential  
distribution.

- A. A sample of an exponential distribution with rate  $a$
- B. A sample of an exponential distribution with rate  $1/a$
- C. None of the above
- D. I don't know

What does `myfun(a)`  
return ?



$a > 0$

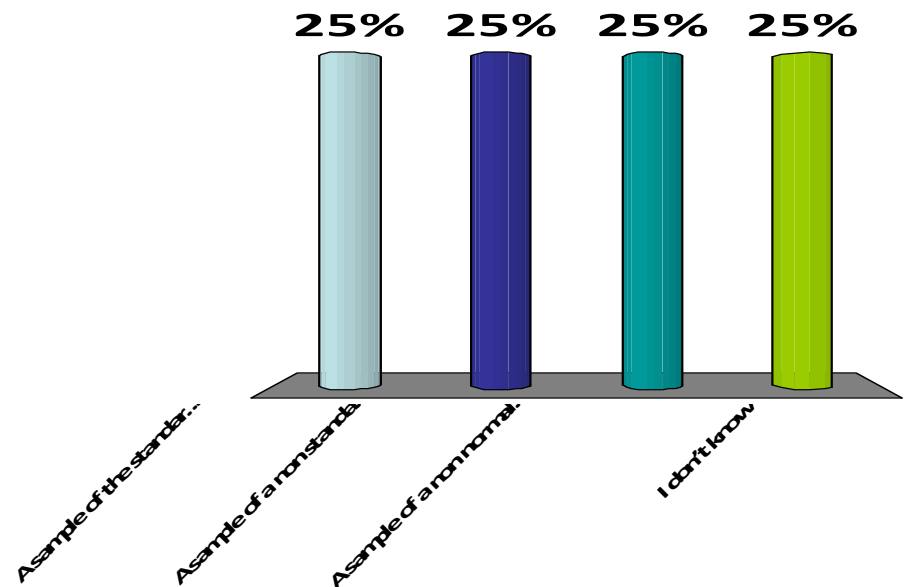
myfun( $a$ ) =  
do

$X = \text{randn}(1,1)$

until  $X > a$

What does myfun( $a$ )  
return ?

- A. A sample of the standard normal distribution  $N(0,1)$
- B. A sample of a non standard normal distribution  $N(\mu, \sigma^2)$
- C. A sample of a non normal distribution
- D. I don't know



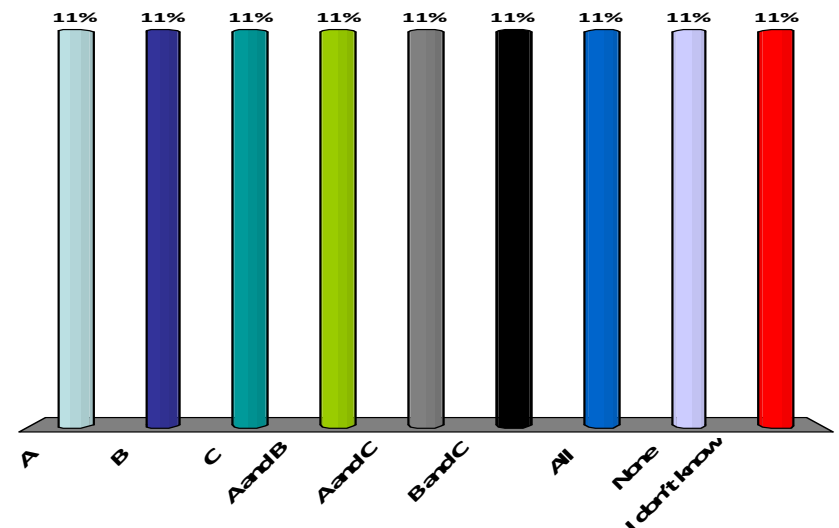
Independent outputs of a simulation are obtained by...

A. executing the runs on parallel threads using the same seed

B. executing the runs on parallel threads using truly random seeds

C. using the last RNG state of one run as seed to the next run

- A. A
- B. B
- C. C
- D. A and B
- E. A and C
- F. B and C
- G. All
- H. None
- I. I don't know

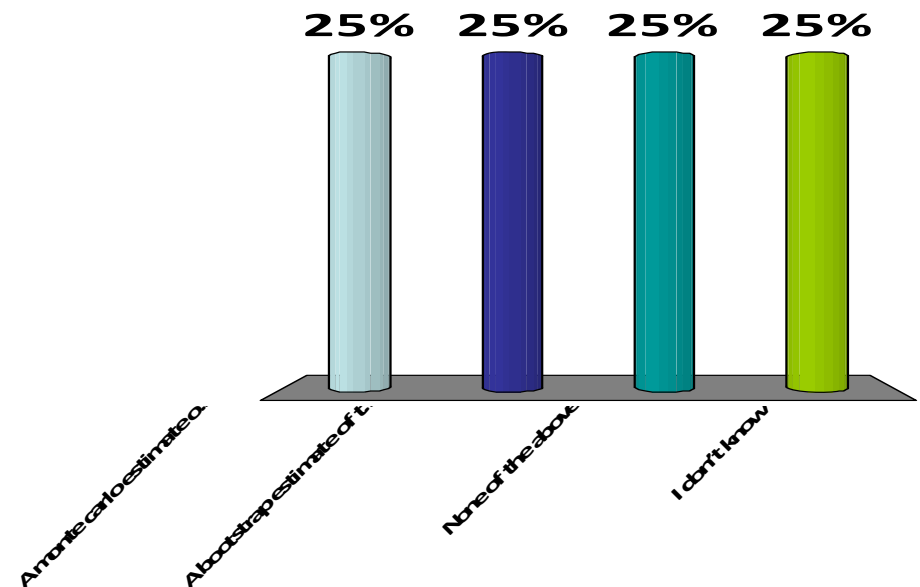


What does this program compute ?

(A is a subset of  $[0, 1]^n$ )

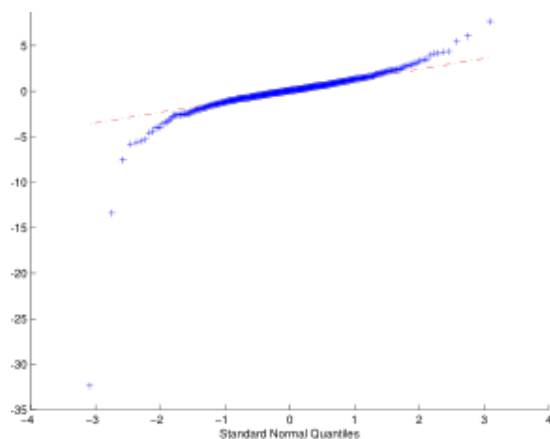
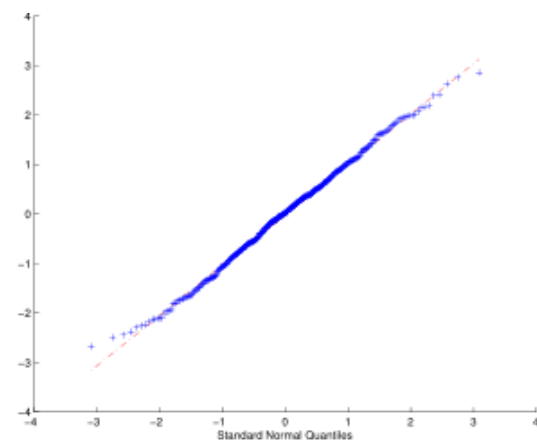
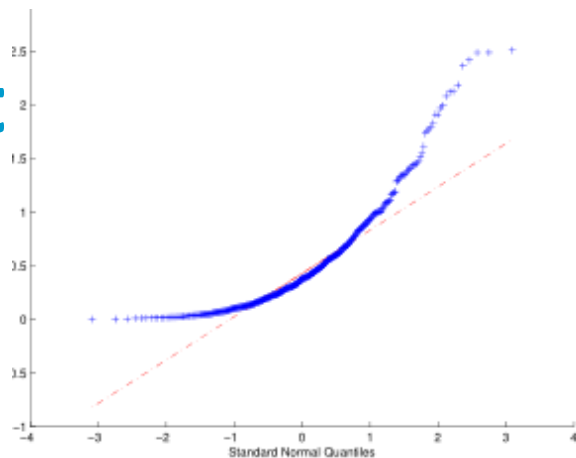
```
N=0
do r=1:R
  if (rand(n,1) ∈ A) N = N + 1
end
return(N/R)
```

- A. A monte carlo estimate of  $\text{vol}(A)$
- B. A bootstrap estimate of the probability that a gaussian random vector is in A
- C. None of the above
- D. I don't know





# Which QQ-plot is for the exponential distribution ?



- A. None
- B. A
- C. B
- D. C
- E. A and B
- F. A and C
- G. B and C
- H. All
- I. I don't know

