

# Impact of random engines and multiple threads

EPISIM

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## Abstract

The goal of this paper is to determine the impact of the random engine and the use of parallelism on the results obtained from the simulator.

We will discuss the results obtained by using following parallelism configurations and random engines.

- No parallelism
- 2 threads
- 4 threads
- 8 threads
- 16 threads
- Lcg-64
- Lcg-64-shift
- Mrg-2
- Mrg-3
- Yarn-2
- Yarn-3

In this paper we will use  $H_0$  = data is normally distributed.

## No parallelism

### Lcg-64

Figures	R	Python
Mean	106682.2	106682
Standard deviation	246	242
Bounds	[105861, 107374]	[96014, 117350]

Shapiro-Wilk	
W	0.99516
p	0.6199
For alpha = 0.05 don't reject $H_0$	

### Lcg-64-shift

Figures	R	Python
Mean	106710.3	106710
Standard deviation	215.951	216
Bounds	[106076, 107650]	[96039, 117381]

Shapiro-Wilk	
W	0.98633
p	0.01729
For alpha = 0.05 reject $H_0$	

**Mrg-2**

Figures	R	Python
Mean	106691.7	106692
Standard deviation	263.63	263
Bounds	[105856, 107417]	[96023, 117361]

Shapiro-Wilk	
W	0.99495
p	0.5809
For alpha = 0.05 don't reject $H_0$	

**Mrg-3**

Figures	R	Python
Mean	106719.2	106719
Standard deviation	258.163	258
Bounds	[106127, 107376]	[96047, 117391]

Shapiro-Wilk	
W	0.99322
p	0.3153
For alpha = 0.05 don't reject $H_0$	

## Yarn-2

Figures	R	Python
Mean	106708.6	106709
Standard deviation	231.7677	231
Bounds	[105993, 107379]	[96038, 117379]

Shapiro-Wilk	
W	0.99796
p	0.9896
For alpha = 0.05 don't reject $H_0$	

## Yarn-3

Figures	R	Python
Mean	106711.6	106712
Standard deviation	252.7461	252
Bounds	[106154, 107266]	[96040, 117383]

Shapiro-Wilk	
W	0.98609
p	0.01569
For alpha = 0.05 reject $H_0$	

## 2 threads

### Lcg-64

Figures	R
Mean	106689.564
Standard deviation	267.6243
Bounds	[105778, 107532]

Shapiro-Wilk	
W	0.9853
p	0.0113

### Lcg-64-shift

Figures	R
Mean	106684.94
Standard deviation	239.4173
Bounds	[106048, 107345]

Shapiro-Wilk	
W	0.9960
p	0.7737

### Mrg-2

Figures	R
Mean	106680.352
Standard deviation	258.0534
Bounds	[106011, 107295]

Shapiro-Wilk	
W	0.9923
P	0.2226

### Mrg-3

Figures	R
Mean	106699.648
Standard deviation	239.7278
Bounds	[105996, 107327]

Shapiro-Wilk	
W	0.9965
P	0.8678

**Yarn-2**

Figures	R
Mean	106686.268
Standard deviation	234.4041
Bounds	[106033, 107267]

Shapiro-Wilk	
W	0.9929
p	0.2784

**Yarn-3**

Figures	R
Mean	106680.636
Standard deviation	231.9703
Bounds	[105913, 107304]

Shapiro-Wilk	
W	0.9951
p	0.6172



## 4 threads

### Lcg-64

Figures	R
Mean	106704.144
Standard deviation	233.356
Bounds	[106128, 107403]

Shapiro-Wilk	
W	0.9957
p	0.7314

### Lcg-64-shift

Figures	R
Mean	106709.648
Standard deviation	247.415
Bounds	[105854, 107327]

Shapiro-Wilk	
W	0.9852
p	0.0111

### Mrg-2

Figures	R
Mean	106710.108
Standard deviation	258.8046
Bounds	[106009, 107393]

Shapiro-Wilk	
W	0.9951
P	0.6240

### Mrg-3

Figures	R
Mean	106689.496
Standard deviation	252.3833
Bounds	[106150, 107608]

Shapiro-Wilk	
W	0.9886
P	0.0462

### Yarn-2

Figures	R
Mean	106704.996
Standard deviation	237.6803
Bounds	[105959, 107219]

Shapiro-Wilk	
W	0.9891
P	0.0565

### Yarn-3

Figures	R
Mean	106685.996
Standard deviation	242.2033
Bounds	[105961, 107381]

Shapiro-Wilk	
W	0.9931
P	0.3094

## 8 threads

### Lcg-64

Figures	R
Mean	106715.56
Standard deviation	229.473
Bounds	[106084, 107228]

Shapiro-Wilk	
W	0.9922
p	0.2132

### Lcg-64-shift

Figures	R
Mean	106699.756
Standard deviation	249.169
Bounds	[105993, 107385]

Shapiro-Wilk	
W	0.9969
p	0.9107

### Mrg-2

Figures	R
Mean	106711.368
Standard deviation	254.272
Bounds	[105989, 107553]

Shapiro-Wilk	
W	0.9963
P	0.8298

### Mrg-3

Figures	R
Mean	106698.24
Standard deviation	231.081
Bounds	[106006, 107273]

Shapiro-Wilk	
W	0.9964
P	0.8537

**Yarn-2**

Figures	R
Mean	106684.828
Standard deviation	235.055
Bounds	[106025, 107249]

Shapiro-Wilk	
W	0.9897
P	0.0739

**Yarn-3**

Figures	R
Mean	106683.38
Standard deviation	237.320
Bounds	[105993, 107439]

Shapiro-Wilk	
W	0.9961
P	0.8035

## 16 threads

### Lcg-64

Figures	R
Mean	106729.98
Standard deviation	258.593
Bounds	[106041, 107342]

Shapiro-Wilk	
W	0.9899
p	0.0822

### Lcg-64-shift

Figures	R
Mean	106719.288
Standard deviation	261.733
Bounds	[105928, 107436]

Shapiro-Wilk	
W	0.9945
p	0.5124

### Mrg-2

Figures	R
Mean	106694.324
Standard deviation	243.6061
Bounds	[106048, 107446]

Shapiro-Wilk	
W	0.9969
P	0.9113

### Mrg-3

Figures	R
Mean	106692.976
Standard deviation	236.677
Bounds	[106037, 107384]

Shapiro-Wilk	
W	0.9913
P	0.1469



### Yarn-2

Figures	R
Mean	106700.332
Standard deviation	248.143
Bounds	[105859, 107409]

Shapiro-Wilk	
W	0.9969
P	0.9195

### Yarn-3

Figures	R
Mean	106707.008
Standard deviation	247.562
Bounds	[105986, 107400]

Shapiro-Wilk	
W	0.9945
P	0.5113