

# Statistical inference project

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## Simulated and theoretical exponential distribution

We are going to compare the theoretical exponential distribution and a simulation.

### 1. Show the sample mean and compare it to the theoretical mean of the distribution.

The simulated exponential distribution centers around the sample mean, about 5, which correctly matches the center of the theoretical mean,  $1/\lambda$ , which in this case is  $\text{mean} = 1/\lambda = 1/(0.2) = 5$ .

```
set.seed(2804)
nosim <- 1000
noexpo <- 40
vectmean <- rep(0, nosim)
for (i in 1:nosim) {
  q <- mean(rexp(noexpo, .2))
  vectmean[i] <- q
}
mean(vectmean) ## simulated mean
```

```
## [1] 4.978644
```

```
mt <- 1/.2; mt ## theoretical mean
```

```
## [1] 5
```

### 2. Show how variable the sample is (via variance) and compare it to the theoretical variance of the distribution.

The simulated sample has variance of about 0.65 while the theoretical distribution has a variance of .625.

```
var(vectmean) ## simulated variance
```

```
## [1] 0.6079212
```

```
msd <- ((1/.2)/(sqrt(noexpo)))^2;msd ## theoretical variance
```

```
## [1] 0.625
```

**3. Show that the distribution is approximately normal.**

As it is apparent in the graph, the distribution is approximately normal:

