MAST30027 Modern Applied, Statistics Assignment3

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Tutorial time: Tue 2.15pm

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```
# Load the dataset
(d = 1+2)
```

```
## [1] 3
```

Q1.(a)

```
# Load the dataset
library(MASS)
data(quine)

r = 1.5
k_hat = mean(quine[,'Days'])

#MLE
(p_hat_mle = k_hat/(r+k_hat))
```

```
## [1] 0.916476
```

Q1.(b)

```
(alpha = 0.5+sum(quine[,'Days']))
```

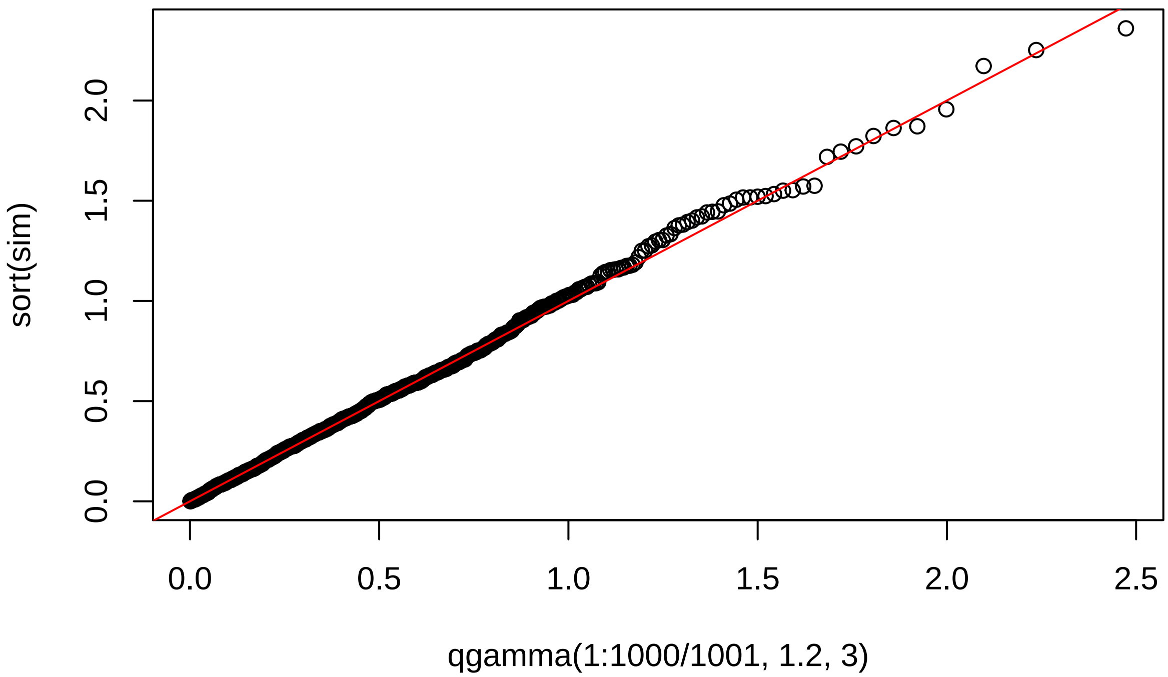
```
## [1] 2403.5
```

```
(beta = 0.5+1.5*length(quine[,'Days']))
```

```
## [1] 219.5
```

Q2.(d)

```r
#The mygamma function take n alpha lambda and return n simulations
mygamma = function(n,alpha,lambda){

  #calculate c and d
  d = alpha -1/3
  c = 1/sqrt(9*d)

  #simulation for n times
  result = rep(0,n)
  for(i in 1:n) {
    result[i] = ((d * (1 + c*simulation(c,d))^3) / lambda)
  }
  return(result)
}

#The simulation function take c, d and return one silulation of exp(g(x))
simulation<- function(c,d) {
  x = rnorm(1)
  y = runif(1,0,dnorm(x))

  #when the x less than -1/c or y is higher than the pdf of exp(g(x)), simulate again
  while (x < -(1/c)||y > f(x,c,d)) {
    x = rnorm(1)
    y = runif(1,0,dnorm(x))
  }
  return(x)
}

#f(x) = exp(g(x))
f <- function(x,c,d){
  return(exp(g(x,c,d)))
}

#g(x),as described in the hint
g <- function(x,c,d){
  return(d*log((1+c*x)^3) - d*(1+c*x)^3+d)
}


#set the seed
set.seed(666)

#generate the simulation
sim = mygamma(1000,1.2,3)

#plot the qq plot of simulation
plot(qgamma(1:1000/1001,1.2,3),sort(sim))
abline(0,1,col="red")
```


sort(sim)
0.0
0.5
1.0
1.5
2.0
0.0
0.5
1.0
1.5
2.0
2.5
qgamma(1:1000/1001, 1.2, 3)