Université Paris-Dauphine Année 2020-2021
L3 - Statistical modelling

QCM 11 oct 2020

Dans cet exercice il vous est demandé de donner l'unique bonne réponse.

Question 1 If `x` is a continuous sample of size `n=12` and bootstrap is used to study the variability of the mean of the sample, what is the number of values taken by the bootstrapped realisations

- [ ] `8.9161e+12`
- [ ] `1`
- [x] `1352078`
- [ ] `12`
- [ ] `479001600`

Question 2 When given a sample x of size n from F and considering the median $\text{med}(X)$ as the quantity of interest, a bootstrap approximation of a 95% interval of variability of the emmpirical median is given by

- [ ] `quantile(median(matrix(sample(x,n*m,rep=TRUE),m)),c(.025,.975))`
- [ ] `median(apply(matrix(sample(x,n*m,rep=TRUE),m),1,sum),prob=.95)`
- [x] `quantile(apply(matrix(sample(x,n*m,rep=TRUE),m),1,median),c(.02,.97))`
- [ ] `quantile(matrix(sample(median(x),n*m,rep=TRUE),m)),c(.035,.985))`

Question 3
We want to compute the variance of the empirical quantile of order p, we proceed by bootstraping, which of the following returns this estimation, for `x` a vector of size 200, a sample of observations.

- [x] `var(sapply(1:100,function(y)quantile(sample(x,length(x),replace=T),p)))`
- [ ] `quantile(sapply(1:100,function(y)var(sample(x,length(x)),replace=T)),p)`
- [ ] `var(sapply(1:100,function(x)quantile(sample(x,length(x)),p)))`

Question 4 For a sample `x` of size n the standard deviation of the sample median can be estimated by bootstrap as

- [ ] `sd(matrix(sample(quantile(x,prob=.5),n*m,rep=TRUE),m))`
- [ ] `median(apply(matrix(sample(sd(x),n*m,rep=TRUE),m),1,mean))`
- [x] `sd(apply(matrix(sample(x,n*m,rep=TRUE),m),1,median))`
- [ ] `median(apply(matrix(sample(x,n*m,rep=TRUE),m),1,sd))`

Question 5
We observe the realisation of a discrete random variable with values in $1,\ldots,n$, from the Y_i, iid realisations, we create the dataset `x` as a vector of size n defined by $x_j = \sum_i \mathbf{1}_{Y_i=j}$, that is the number of times the value j has been drawn. We want to estimate the bias of the estimator $\hat{p} = x_1(\sum x_i)^{-1}$ of the $P(Y=1)$. The bias of this estimator :

- [x] is 0.
- [ ] can be estimated by bootstrap with `mean(sapply(1:100,function(y){x[1]/length(x)}) - x[1]/length(x))`.
- [ ] can be estimated by bootstrap with `mean(sapply(1:100,function(y){z=sample(x,replace=T); return(sum(z==1)/sum(z))})) - x[1]/length(x)`.

Question 6 If `x` is a continuous sample of size `n=13` and bootstrap is used to study the variability of the median of the sample, what is the number of values taken by the bootstrapped realisations

- [ ] `3.028751e+14`
- [ ] `5200300`
- [ ] `1`
- [ ] `6227020800`
- [x] `13`

Question 7
We want to compute the variance of the empirical quantile of order p, we proceed by bootstraping, which of the following returns this estimation, for `x` a vector of size 200, a sample of observations.

- [ ] `var(sapply(1:100,function(x)quantile(sample(x,length(x)),p)))`
- [ ] `quantile(sapply(1:100,function(y)var(sample(x,length(x)),replace=T)),p)`
- [x] `var(sapply(1:100,function(y)quantile(sample(x,length(x),replace=T),p)))`

Question 8 When given a sample x of size n from F and considering the median $\text{med}(X)$ as the quantity of interest, a bootstrap approximation of a 95% interval of variability of the emmpirical median is given by

- [ ] `median(apply(matrix(sample(x,n*m,rep=TRUE),m),1,sum),prob=.95)`
- [ ] `quantile(median(matrix(sample(x,n*m,rep=TRUE),m)),c(.025,.975))`
- [x] `quantile(apply(matrix(sample(x,n*m,rep=TRUE),m),1,median),c(.02,.97))`
- [ ] `quantile(matrix(sample(median(x),n*m,rep=TRUE),m)),c(.035,.985))`

Question 9 If `x` is a continuous sample of size `n=13` and bootstrap is used to study the variability of the median of the sample, what is the number of values taken by the bootstrapped realisations

- [ ] `5200300`
- [x] `13`
- [ ] `6227020800`
- [ ] `3.028751e+14`
- [ ] `1`

Question 10
We observe the realisation of a discrete random variable with values in $1, \ldots, n$, from the Y_i, iid realisations, we create the dataset `x` as a vector of size n defined by $x_j = \sum_i \mathbf{1}_{Y_i=j}$, that is the number of times the value j has been drawn. We want to estimate the bias of the estimator $\hat{p} = x_1(\sum x_i)^{-1}$ of the $P(Y = 1)$. The bias of this estimator :

- [x] is 0.
- [ ] can be estimated by bootstrap with `mean(sapply(1:100,function(y){x[1]/length(x)}) - x[1]/length(x))`.
- [ ] can be estimated by bootstrap with `mean(sapply(1:100,function(y){z=sample(x,replace=T); return(sum(z==1)/sum(z))})) - x[1]/length(x)`.

Question 11 If `x` is a continuous sample of size `n=12` and bootstrap is used to study the variability of the mean of the sample, what is the number of values taken by the bootstrapped realisations

- [ ] `1`
- [ ] `479001600`
- [ ] `12`
- [ ] `8.9161e+12`
- [x] `1352078`

Question 12 For a sample `x` of size n the standard deviation of the sample median can be estimated by bootstrap as

- [ ] `median(apply(matrix(sample(sd(x),n*m,rep=TRUE),m),1,mean))`
- [x] `sd(apply(matrix(sample(x,n*m,rep=TRUE),m),1,median))`
- [ ] `median(apply(matrix(sample(x,n*m,rep=TRUE),m),1,sd))`
- [ ] `sd(matrix(sample(quantile(x,prob=.5),n*m,rep=TRUE),m))`