

Random sampling

Given population

```
pop := ( 12.32 )
        | 11.26 |
        | 3.563 |
        | 4.778 |
        | 14.56 |
        | 13.07 |
        | 8.364 |
        | 10.58 |
        | 15.75 |
        ( 5.753 )
```

ORIGIN := 1

properties of population

 $N := \text{length}(\text{pop})$ $N = 10$ $\mu := \text{mean}(\text{pop})$ $\mu = 9.9998$ $\sigma := \text{stdev}(\text{pop})$ $\sigma = 4.0001$

Sampling from population

Sample size

$n := 5$

Select seed number

seed := 1

choose random number

$i := 1..n$ $random_i := \text{ceil}(\text{rnd}(N))$

random =

	1
1	1
2	2
3	6
4	4
5	9

Change random number to element of population

$sample_i := \text{pop}_{(random_i)}$

sample =

	1
1	12.32
2	11.26
3	13.07
4	4.778
5	15.75

samplemean := mean(sample) **samplemean = 11.4356**

Flowchart population

random number

sample

pop =

	1
1	12.32
2	11.26
3	3.563
4	4.778
5	14.56
6	13.07
7	8.364
8	10.58
9	15.75
10	5.753

random =

	1
1	1
2	2
3	6
4	4
5	9

sample =

	1
1	12.32
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Random sampling

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properties of population

 $N := \text{length}(\text{pop})$ $N = 10$ $\mu := \text{mean}(\text{pop})$ $\mu = 9.9998$ $\sigma := \text{stdev}(\text{pop})$ $\sigma = 4.0001$

Sampling from population

Sample size

$n := 5$

Number of trial

$m := 10$

Select seed number

seed := 1

choose random number

$i := 1..n$

$j := 1..m$

$\text{random}(i, j) := \text{ceil}(\text{rnd}(N))$

random =

	1	2	3	4	5	6	7	8	9	10
1	1	2	6	4	9	2	8	4	1	2
2	10	2	1	6	7	2	5	1	8	6
3	9	10	6	5	9	8	10	7	3	9
4	4	7	1	3	6	9	5	8	5	8
5	6	8	6	2	5	6	8	2	5	7

Change random number to element of population

$\text{sample}(i, j) := \text{POP}[\text{random}(i, j)]$

sample =

	1	2	3	4	5	6	7	8	9	10
1	12.32	11.26	13.07	4.778	15.75	11.26	10.58	4.778	12.32	11.26
2	5.753	11.26	12.32	13.07	8.364	11.26	14.56	12.32	10.58	13.07
3	15.75	5.753	13.07	14.56	15.75	10.58	5.753	8.364	3.563	15.75
4	4.778	8.364	12.32	3.563	13.07	15.75	14.56	10.58	14.56	10.58
5	13.07	10.58	13.07	11.26	14.56	13.07	10.58	11.26	14.56	8.364

$\text{samplemean}_j := \text{mean}(\text{sample}^{\langle j \rangle})$

samplemean^T =

	1	2	3	4	5	6	7	8	9
1	10.3342	9.4434	12.77	9.4462	13.4988	12.384	11.2066	9.4604	11.1166

$\text{mean}(\text{samplemean}) = 11.1465$

$\mu = 9.9998$

Flowchart population	random number	sample
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pop =

	1
1	12.32
2	11.26
3	3.563
4	4.778
5	14.56
6	13.07
7	8.364
8	10.58
9	15.75
10	5.753

random =

	1	2	3	4	5	6	7	8	9	10
1	1	2	6	4	9	2	8	4	1	2
2	10	2	1	6	7	2	5	1	8	6
3	9	10	6	5	9	8	10	7	3	9
4	4	7	1	3	6	9	5	8	5	8
5	6	8	6	2	5	6	8	2	5	7

sample =

	1	2	3	4	5	6	7	8	9	10
1	12.32	11.26	13.07	4.778	15.75	11.26	10.58	4.778	12.32	11.26
2	5.753	11.26	12.32	13.07	8.364	11.26	14.56	12.32	10.58	13.07
3	15.75	5.753	13.07	14.56	15.75	10.58	5.753	8.364	3.563	15.75
4	4.778	8.364	12.32	3.563	13.07	15.75	14.56	10.58	14.56	10.58
5	13.07	10.58	13.07	11.26	14.56	13.07	10.58	11.26	14.56	8.364

Given population

pop := READPRN("POP10.PRN")

ORIGIN := 1

properties of population

N := length(pop)

N = 10

μ := mean(pop)

μ = 9.9998

σ := stdev(pop)

σ = 4.0001

Sampling from population

Sample size

n := 5

Number of trial

m := 1000

Select seed number

seed := 1

choose random number

i := 1..n

j := 1..m

random(i, j) := ceil(rnd(N))

Change random number to element of population

sample(i, j) := POP[random(i, j)]

samplemean_j := mean(sample^(j))

μ = 9.9998

mean(samplemean) = 10.0586

Distribution of sample mean

Population

`mean(pop) = 9.9998`

`var(pop) = 16.0005`

Sample

`mean(samplemean) = 10.0586`

`min(samplemean) = 4.292`

`Var(samplemean) = 3.103`

`max(samplemean) = 14.826`

`m := length(samplemean)`

`m = 1000`

`lower := floor(min(samplemean))`

`lower = 4`

`upper := ceil(max(samplemean))`

`upper = 15`

Class interval

`n_cl := 30`

`j := 1..n_cl`

Width of class interval

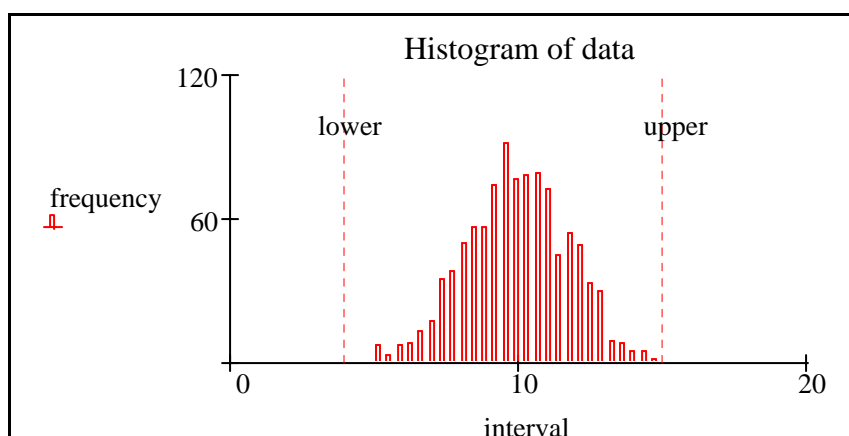
`width := $\frac{\text{upper} - \text{lower}}{\text{n_cl}}$`

Frequency

`intervalj := lower + width·j`

`frequency := hist(interval, samplemean)`

Histogram



`WRITEPRN("x.prn") := pop`