

How do you calculate a bootstrap standard error in R?

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The process of calculating a bootstrap standard error in R involves using the bootstrap method to estimate the variability of a statistic or parameter by generating multiple random samples with replacement from the original data set. These samples are used to compute the statistic of interest, and the standard deviation of these statistics is then calculated. This value represents the bootstrap standard error, which can be used to estimate the precision and accuracy of the original statistic. This method is useful when the underlying distribution of the data is unknown or non-normal, making traditional methods of standard error calculation unreliable. R provides various functions and packages, such as "boot" and "boot.ci", to facilitate the calculation of bootstrap standard error.

Calculate a Bootstrap Standard Error in R

Bootstrapping is a method that can be used to estimate the standard error of a mean.

The basic process for calculating a bootstrapped standard error is as follows:

Take k repeated samples from a given dataset. For each sample, calculate the standard error: s/\sqrt{n} . This results in k different estimates for the standard error. To find the bootstrapped standard error, take the mean of the k standard errors.

The following examples explain two different methods that can be used to calculate a bootstrapped standard error in R.

Method 1: Use the Boot Package

One way to calculate a bootstrap standard error in R is to use the `boot()` function from the `boot` library.

The following code shows how to calculate a bootstrap standard error for a given dataset in R:

```
#make this example reproducible
```

```
set.seed(10)
```

```
#load boot library
```

```
library(boot)
```

```
#define dataset
```

```
x <- c(12, 14, 14, 15, 18, 21, 25, 29, 32, 35)
```

```
#define function to calculate mean
```

```
meanFunc <- function(x,i){mean(x)}
```

```
#calculate standard error using 100 bootstrapped samples
```

```
boot(x, meanFunc, 100)
```

Bootstrap Statistics :

original bias std. error

```
t1* 21.5 0.254 2.379263
```

The "original" value of 21.5 shows the mean of the original dataset. The "std. error" value of 2.379263 shows the bootstrap standard error of the mean.

Note that we used 100 bootstrapped samples to estimate the standard error of the mean in this example, but we could have used 1,000 or 10,000 or any number of bootstrapped samples we'd like.

Method 2: Write Your Own Formula

Another way to calculate a bootstrapped standard error is to write our own function.

The following code shows how to do so:

```
#make this example reproducible
```

```
set.seed(10)
```

```
#load boot library
```

```
library(boot)
```

```
#define dataset
```

```
x <- c(12, 14, 14, 15, 18, 21, 25, 29, 32, 35)
```

```
mean(replicate(100, sd(sample(x, replace=T))/sqrt(length(x))))
```

2.497414

The bootstrapped standard error turns out to be 2.497414.

Notice that this standard error is quite similar to the one calculated in the previous example.

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