

Statistical Inference Theory - Lab 6

Code ▾

CB.SC.I5DAS20032

Problem 1

Suppose the manufacturer claims that the mean lifetime of a light is more than 10000 hours. In a sample of 30 light bulbs, it was found that they only last 9900 hours on average. Assume the population standard deviation is 120 hours. At 0.05 significance level, can we reject the claim by manufacturer?

Solution

Hide

```
xbar = 9900
n=30
m0= 10000
sigma = 120
z = (xbar-m0)/(sigma/sqrt(n))

z
```

```
[1] -4.564355
```

Hide

```
a = 0.05
z.a = qnorm(1 - a)

-z.a
```

```
[1] -1.644854
```

-1.644854 > -4.564355 We **reject** the null hypothesis.

Problem 2

Suppose the food label on a cookie bag states that there is at most 2 grams of saturated fat in a single cookie. In a sample of 35 cookies, it is found that the mean amount of saturated fat per cookie is 2.1 grams. Assume that the population standard deviation is 0.25 grams. At 0.05 significance level, we can reject the claim on the food label.

Solution

Hide

```
n = 35
xbar = 2.1
m0 = 2
sigma = 0.25
z = (xbar-m0)/(sigma/sqrt(n))

z
```

```
[1] 2.366432
```

[Hide](#)

```
a = 0.05
z.a = qnorm(1 - a)

z.a
```

```
[1] 1.644854
```

2.366432 > 1.644854 We **reject** the null hypothesis.

Problem 3

Suppose the mean weight of King Penguins found in an Antarctic colony last year was 15.4kg. In a sample of 35 penguins at the same time this year in the same colony, the mean penguin weight is 14.6kg. Assume the population standard deviation is 2.5kg. At 0.05 significance level, can we reject the null hypothesis that the mean penguin weight does not differ from last year?

Solution

[Hide](#)

```
xbar = 14.6
m0 = 15.4
sigma = 2.5
n = 35
z = (xbar-m0)/(sigma/sqrt(n))

z
```

```
[1] -1.893146
```

[Hide](#)

```
a = 0.05
z.a = qnorm(1 - a)

c(-z.a, z.a)
```

```
[1] -1.644854  1.644854
```

-1.644854 <= -1.893146 <= 1.644854 We **do not reject** the null hypothesis.

Problem 4

Suppose the manufacturer claims that the mean lifetime of a light is more than 10000 hours. In a sample of 30 light bulbs, it was found that they only last 9900 hours on average. Assume the sample population standard deviation is 125 hours. At 0.05 significance level, can we reject the claim by manufacturer?

Solution

[Hide](#)

```
xbar = 9900
n = 30
m0 = 10000
s = 125
t = (xbar - m0)/(s/sqrt(n))

t
```

```
[1] -4.38178
```

[Hide](#)

```
a = .05
t.a = qt(1 - a, df = n-1)

-t.a
```

```
[1] -1.699127
```

-4.38178 < -1.699127 We **reject** the null hypothesis.

Problem 5

Suppose the food label on a cookie bag states that there is at most 2 grams of saturated fat in a single cookie. In a sample of 25 cookies, it is found that the mean amount of saturated fat per cookie is 2.1 grams. Assume that the sample population standard deviation is 0. grams. At 0.05 significance level, we can reject the claim on the food label.

Solution

[Hide](#)

```
n = 25
xbar = 2.1
m0 = 2
s = 0.3
t = (xbar - m0)/(s/sqrt(n))

t
```

```
[1] 1.666667
```

[Hide](#)

```
a = .05
t.a = qt(1 - a, df = n - 1)

-t.a
```

```
[1] -1.710882
```

We **do not reject** the null hypothesis.