

两组数值变量比较的假设检验

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学习目的

1. **掌握**统计学方法的基本概念、基本原理和适用条件
2. **熟记**重要的统计学方法的公式
3. **熟练**使用R/SPSS软件完成统计分析，并整理统计结果

R语言

1. 单样本的t检验

示例（1）

```
> x<-c(1,2,3)
> t.test(x,mu=0)

      One Sample t-test

data:  x
t = 3.4641, df = 2, p-value = 0.07418
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 -0.4841377  4.4841377
sample estimates:
mean of x
      2
```

示例 (2)

```
> x<-read.csv("c://t1.csv",header=T)$x
> x
[1] 110 100 120 115 130 120 140 110 125 100 115 125 95 115 110 125 110 115 115 105
> t.test(x,mu=124.7)
```

One Sample t-test

```
data: x
t = -3.9863, df = 19, p-value = 0.0007905
alternative hypothesis: true mean is not equal to 124.7
95 percent confidence interval:
 109.907 120.093
sample estimates:
mean of x
 115
```

2. 两个独立样本的t检验

示例 (1)

```
x<-c(1, 2, 3, 2.5, 4.2, 5.6)
```

```
g<-c(1, 1, 1, 2, 2, 2)
```

```
var.test(x~g)
```

```
t.test(x~g, var.equal=F) (默认)
```

```
> x<-c(1,2,3,2.5,4.2,5.6)
> g<-c(1,1,1,2,2,2)
> var.test(x~g)
```

F test to compare two variances

```
data: x by g
F = 0.41494, num df = 2, denom df = 2, p-value = 0.5865
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.01063943 16.18257261
sample estimates:
ratio of variances
      0.4149378
```

```
> t.test(x~g,var.equal=T)
```

Two Sample t-test

```
data: x by g
t = -1.9697, df = 4, p-value = 0.1202
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -5.060095  0.860095
sample estimates:
mean in group 1 mean in group 2
           2.0             4.1
```

示例 (2)

```
> g<-read.csv("c://t2.csv",header=T)$g
> g
[1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
> x<-read.csv("c://t2.csv",header=T)$x
> x
[1] 120 135 125 145 140 160 100 120 145 115 130 100 105 110 140 120 90 120 110 125 110 125 125 95 140 145 120 105 90 115
> var.test(x~g)
```

F test to compare two variances

```
data: x by g
F = 1.2482, num df = 14, denom df = 14, p-value = 0.684
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.419056 3.717858
sample estimates:
ratio of variances
 1.248195
```

```
> t.test(x~g,var.equal=T)
```

Two Sample t-test

```
data: x by g
t = 1.6433, df = 28, p-value = 0.1115
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -2.547171 23.213838
sample estimates:
mean in group 1 mean in group 2
 126.0000      115.6667
```

3. 配对设计的t检验

示例 (1)

`x<-c(1, 2, 3)`

`y<-c(3.1, 4.2, 5)`

`t.test(x, y, paired=T)`

```
> x<-c(1,2,3)
> y<-c(3.1,4.2,5)
> t.test(x,y,paired=T)

      Paired t-test

data:  x and y
t = -36.373, df = 2, p-value = 0.000755
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -2.348414 -1.851586
sample estimates:
mean of the differences
          -2.1
```


示例 (2)

```
> x1<-read.csv("c://t3.csv",header=T)$x1
> x2<-read.csv("c://t3.csv",header=T)$x2
> x1
[1] 83 74 67 64 70 67 81 64
> x2
[1] 78 74 63 66 68 63 77 65
> t.test(x1,x2,paired=T)

      Paired t-test

data:  x1 and x2
t = 2.1166, df = 7, p-value = 0.07208
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.2343599  4.2343599
sample estimates:
mean of the differences
```