112-2 生物統計學一

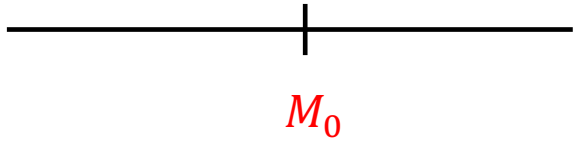
(補充) 無母數分析

2024/05/21

助教: 廖振博

Signed Test

- 適用情境：檢定單一樣本的母體中位數是否等於某定值
  (台大學生每週通勤時數的中位數是否為 5 小時?)



H_0為真下，檢定統計量服從Bin(n, p)

其中 $p = P(X > M_0) = \frac{1}{2}$

資料裡大於5小時的個數

```
> binom.test(29, 50, p = 0.5)

        Exact binomial test

data:  29 and 50
number of successes = 29, number of trials = 50, p-value = 0.3222
alternative hypothesis: true probability of success is not equal to 0.5
95 percent confidence interval:
 0.4320604 0.7181178
sample estimates:
probability of success
                  0.58
```

Signed Test

- 適用情境：檢定單一樣本的母體中位數是否等於某定值
  (台大學生每週通勤時數的中位數是否為 5 小時?)

```
> install.packages("BSDA") (使用非R內建函數需要另外下載套件)
> library("BSDA") (使用前須先將下載套件匯入)
> SIGN.test(studata1$Hours_Commute, md = 5)

        One-sample Sign-Test

data:  studata1$Hours_Commute
s = 29, p-value = 0.3222
alternative hypothesis: true median is not equal to 5
95 percent confidence interval:
 3 9
sample estimates:
median of x
         6
```

Wilcoxon Signed Rank Test

- 適用情境：檢定配對樣本的母體中位數是否等於某定值
  (台大學生本學期 (credit_current) 與上學期 (credit_last) 的修課學分數是否相同？)

```
> wilcox.test(studata1$Credit_Last, studata1$Credit_Current, paired = TRUE)

        Wilcoxon signed rank test with continuity correction

data:  studata1$Credit_Last and studata1$Credit_Current
V = 522, p-value = 0.3788
alternative hypothesis: true location shift is not equal to 0

Warning messages:
1: In wilcox.test.default(studata1$Credit_Last, studata1$Credit_Current,  :
  cannot compute exact p-value with ties
2: In wilcox.test.default(studata1$Credit_Last, studata1$Credit_Current,  :
  cannot compute exact p-value with zeroes
```

Mann–Whitney U test / Wilcoxon rank sum test

- 適用情境：檢定兩獨立樣本的母體中位數是否相等
  (台大公衛系與非公衛系學生 (department)，每周通勤時數的中位數是否相同？)

```
> wilcox.test(studata1$Hours_Commute ~ studata1$Department, paired = F)

        Wilcoxon rank sum test with continuity correction

data:  studata1$Hours_Commute by studata1$Department
W = 137, p-value = 0.7148
alternative hypothesis: true location shift is not equal to 0

Warning message:
In wilcox.test.default(x = DATA[[1L]], y = DATA[[2L]], ...) :
  cannot compute exact p-value with ties
```

Kruskal–Wallis Test

- 適用情境：檢定三組或以上獨立樣本的母體中位數是否相同
  (若以目前居住縣市 (county) 來分組，請問住在不同縣市的同學，每週通勤時數的中位數是否相同？)

```
> kruskal.test(studata1$Hours_Commute ~ studata1$County)

        Kruskal-Wallis rank sum test

data:  studata1$Hours_Commute by studata1$County
Kruskal-Wallis chi-squared = 10.529, df = 3, p-value = 0.01457
```

- 事後檢定

```
> pairwise.wilcox.test(studata1$Hours_Commute, studata1$County, p.adjust.method = "bonf")

        Pairwise comparisons using Wilcoxon rank sum test with continuity correction

data:  studata1$Hours_Commute and studata1$County

  1     2     3
2 0.026 -     -
3 1.000 1.000 -
4 1.000 0.057 1.000
```