Testing Hypotheses about proportions

R-codes:

1. Binomial Test:

   \[ n=215, \ B=39, \ p_0 =0.15 \]
   
   when \( n \) is large, then use

   \[ \text{prop.test (B\_obs, n, p_0)} \]

   1-sample proportions test with continuity correction

   data:  39 out of 215, null probability 0.15
   X-squared = 1.425, df = 1, p-value = 0.2326
   alternative hypothesis: true p is not equal to 0.15
   95 percent confidence interval:
   0.1335937 0.2408799
   sample estimates:
   \( p \)
   0.1813953

If \( n \) is small, then

\[ \text{binom.test(39, 215, 0.15)} \]

   Exact binomial test

   data:  39 and 215
   number of successes = 39, number of trials = 215, p-value = 0.2135
   alternative hypothesis: true probability of success is not equal to 0.15
   95 percent confidence interval:
   0.1322842 0.2395223
   sample estimates:
   probability of success
   0.1813953
2. **Two populations:**
   
   - \( n_1 \) and \( n_2 \) - the sample sizes
   - \( B_1 \) and \( B_2 \) – the number of successes

   Example #2:
   
   \[ b = c(9,4) \]
   \[ n = c(12,13) \]

   **prop.test(b, n)**
   
   2-sample test for equality of proportions with continuity correction
   
   - data: \( b \) out of \( n \)
   - \( X \)-squared = 3.2793, df = 1, p-value = 0.07016
   - alternative hypothesis: two.sided
   - 95 percent confidence interval:
     - 0.01151032 0.87310506
   - sample estimates:
     - prop 1   prop 2
     - 0.7500000 0.3076923

   or one can use Chi-squared test:
   
   \[ m = \text{matrix}(c(9,4,3,9), 2) \]

   **chisq.test(m)**
   
   Pearson's Chi-squared test with Yates' continuity correction
   
   - data: \( m \)
   - \( X \)-squared = 3.2793, df = 1, p-value = 0.07016

3. **Empirical CDF:**
   
   Example #3:
   
   \[ X = c(1.2, 0.5, 3.2, 2.5, 4) \]
   \[ n = \text{length}(X) \]

   **plot(sort(X), (1:n)/n, type="s", ylim=c(0,1))**
   
   **ecdf(X)**
Empirical CDF
Call: ecdf(X)
\( x[1:5] = 0.5, 1.2, 2.5, 3.2, 4 \)
Example #4:

Data:
y=c(2.5, 7.5, 13.5, 19)
b=c(0, 5, 10, 18, 20)
freq.:
```r
v = c(10, 12, 13, 14)
m = rep(y, v)
hist(m, breaks=b)
```
```r
x = seq(0, 5, 0.01)
y = seq(0, 5, 0.01)

plot(x, floor(y), type="l")

or

plot(x, punif(x, 0, 5), type="l")
```
n=20
z=1:n
v=seq(0, 20, 0.01)
plot(z, pbinom(z, 20, 0.30), type='step')
lines(v, pnorm(v, 6, 4.2^(0.5)),type="l")

Here np= 6, np(1-p)=4.2. (both are almost 5)