**Hypothesis Testing**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Test for | Null | Test statistic  Difference(Null) / Standard Error | Distribution | Confidence interval  (  E = M\*Standard Error | Sample size | Use when | Note |
| Population mean |  |  |  |  |  | Normal distribution or n>30; known |  |
| Population mean |  |  |  |  |  | N<30 and /or unknown | is standard deviation of sample |
| Population proportion |  |  |  |  |  | np, n(1-p)>10 [5?] | is an educated guess, it can be replaced with a conservative 1/2 |
| Difference of two means |  |  |  |  |  | Both normal, or n1,n2>=30;  Sigma1,2 known |  |
| Difference of two means :: unpooled |  |  |  |  |  | n1,n2<30 and/or  Sigma1,2 unknown  --  When the assumption of equal variances is not valid, we need to use separate, or unpooled, variances | For exact df refer to:  <https://online.stat.psu.edu/stat500/lesson/7/7.3/7.3.1/7.3.1.2> |
| Difference of two means :: pooled |  | Where |  |  |  | n1,n2<30 and/or  Sigma1,2 unknown  --  When we have good reason to believe that the variance for population 1 is equal to that of population 2 |  |
| Mean difference paired |  |  |  |  |  | N<20 pairs of data and/or sigma\_d unknown |  |
| Difference of two proportion (pooled/unpooled) |  |  |  |  |  |  |  |
| F-test for variance of two populations |  |  |  |  |  |  | samples must come from a normal distribution. The Central Limit Theorem applies to sample means, not to the data. Therefore, if the sample size is large, it does not mean we can assume the data come from a normal distribution. |
| Bonett’s test for variance of two populations |  |  |  |  |  |  |  |
| Levene’s test for variance of two populations |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

From Null to test statistics:

Change of variable

Ref:

[1] <https://www.dummies.com/education/math/statistics/statistics-for-dummies-cheat-sheet/>

[2] <https://online.stat.psu.edu/stat500>