Mann Whitney's U test

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Introduction

- It is equivalent non parametric test for unpaired t test when data are ordinal.
- Situation:
  - Data are ordinal
  - Independent or unpaired outcomes
  - K=2, two set of scores.
  - Different subjects two groups design.

Hypothesis

- H_0: There is no significant difference between the outcomes of two independent variables.
  - vs
- H_1: There is significant difference between the outcomes of two independent samples.

Test statistics

- U = Smaller of U_1 and U_2
- $U_1 = n_1n_2 + n_1(n_1+1)/2 - R_1$
- $U_2 = n_1n_2 + n_2(n_2+1)/2 - R_1$
- Where;
- n_1: No. of subjects in 1st group
- n_2: No. of subjects in 2nd group
- R_1: Sum of rank of 1st group.
- R_2: Sum of the ranks of 2nd group.

Steps to compute ranks

- List all the score of the two groups together.
- Rank the scores
- Take the sum of ranks of each group separately and assign the R_1 and R_2 respectively.
- Compute U_1 and U_2
- Obtain the value of Ucal = smaller or min (U_1 or U_2)

Decision rule

- If Ucal > Un_1n_2 at 0.05, then accept the H_o hypothesis or otherwise reject H_o.

Example.

- Data for two independent groups.
- Do the ratings on PIH differ significantly among literate and illiterate primi-gravida mothers.

Literate	Illiterate
12	8
17	18
9	26
21	15
	23
N=4	N=5

Steps

- List all the scores of the two groups together.
- Rank the scores.

Scores	Rank
8	1
9	2
12	3
15	4
17	5
18	6
21	7
23	8
26	9

- Take the sum of ranks separately. Assign the R_1 and R_2 separately.

Literates	Ranks	Illiterates	Ranks
12	3	8	1
17	5	18	6
9	2	26	9
21	7	15	4
		23	8
	$\sum R_1 = 17$		$\sum R_2 = 28$
	Mean of R1=4.25		Mean of R2 =5.6.

Calculate U1 and U2

- U1= n1n2+n1(n1+1)/2 – R1
  = 4x5 + 4(4+1)/2 - 17
  = 20 + 10-17
  =30-17
  = 13.

U2 = n1n2+n2(n2+1)/2 – R2
  =4x5 + 5(5+1)/2 – 28
  =20+15-28
  = 35-28
  = 7.

Decision

- Smaller of U1 , U2
- Ucal =7 (is the smaller)
- At 0.05 level, is 1,
- Hence the H_0 is accepted.