Testul W

June 8, 2005

Exercitiu 1 *Folosind testul W si pentru* $\alpha = 0.05$ *sa se verifice ipoteza* $H_0 : m_e = 50; H_1 : m_e > 50$ *cu ajutorul datelor: 57, 45.5, 46, 52.5, 53, 58, 48, 71, 52, 57.5, 58, 44, 35.5, 54, 65.5.*

Demostratie Deoarece folosim testul W vom face tabelul:

i	x_i	$x_i - 50$	$\|x_i - 50\|$	R_i	R_i^s
1	57	7	7	9	9
2	45.5	-4.5	4.5	7	-7
3	46	-4	4	5.5	-5.5
4	52.5	2.5	2.5	3	3
5	53	3	3	4	4
6	58	8	8	11.5	11.5
7	48	-2	2	1.5	-1.5
8	71	21	21	15	15
9	52	2	2	1.5	1.5
10	57.5	7.5	7.5	10	10
11	58	8	8	11.5	11.5
12	44	-6	6	8	-8
13	35.5	-14.5	14.5	13	-13
14	54	4	4	5.5	5.5
15	65.5	15.5	15.5	14	14

Calculez

$$w = \sum_{i=1}^{n} R_i^s = 50$$

Calculam

$$Z_{calc} = \frac{w}{\sqrt{\frac{(n+1)(n+2)(2n+1)}{6}}} = \frac{50}{\sqrt{16 \cdot 17 \cdot 31/6}} = \frac{50}{37.48} = 1.33$$

Din tabel luam $Z_{1-\alpha} = Z_{0.95} = 1.65$.
Deoarece $Z_{calc} = 1.33 < Z_{1-\alpha} = 1.65$ vom accepta ipoteza H_0. ■

Exercitiu 2 *Folosind testul W si pentru* $\alpha = 0.05$ *sa se verifice ipoteaza* $H_0 : m_e = 1.14; H_1 : m_e > 1.14$ *utilizind urmatorul set de date: 1.2, 1.18, 1.25, 1.29, 1.12 , 1.11, 1.19, 1.23, 1.31, 1.20, 1.13, 1.23, 1.06, 1.17.*

Demostratie Deorece folosim testul W vom face urmatorul tabel:

i	x_i	$x_i - 1.14$	$\lvert x_i - 1.14\rvert$	R_i	R_i^s
1	1.2	0.06	0.06	7.5	7.5
2	1.18	0.04	0.04	5	5
3	1.25	0.11	0.11	12	12
4	1.29	0.15	0.15	13	13
5	1.12	-0.02	0.02	2	-2
6	1.11	-0.03	0.03	3.5	-3.5
7	1.19	0.05	0.05	6	6
8	1.23	0.09	0.09	10.5	10.5
9	1.31	0.17	0.17	14	14
10	1.2	0.06	0.06	7.5	7.5
11	1.13	-0.01	0.01	1	-1
12	1.23	0.09	0.09	10.5	10.5
13	1.06	-0.08	0.08	9	-9
14	1.17	0.03	0.03	3.5	3.5

Calculam

$$w = \sum_{i=1}^{n} R_i^s = 74$$

Acum calculam

$$Z_{calc} = \frac{w}{\sqrt{\frac{(n+1)(n+2)(2n+1)}{6}}} = \frac{74}{\sqrt{\frac{15 \cdot 16 \cdot 29}{6}}} = 2.17$$

Din tabel avem $Z_{1-\alpha} = Z_{1-0.05} = Z_{0.95} = 1.65$.
Deoarece $Z_{calc} = 2.17 > Z_{1-\alpha} = 1.65$ vom respinge ipoteza H_0. ■

Exercitiu 3 *Folosind testul W si pentru $\alpha = 0.05$ sa se verifice ipotezele $H_0 : m_e = 22; H_1 : m_e > 22$ pentru urmatorul set de date: 21.5, 18.95, 19.4, 18.55, 19.15, 22.35, 22.9, 22.2, 23.1.*

Demostratie Deoarece vom folosi testul W vom face urmatorul tabel

i	x_i	$x_i - 22$	$\lvert x_i - 22\rvert$	R_i	R_i^s
1	21.5	-0.5	0.5	3	-3
2	18.95	-3.05	3.05	8	-8
3	19.4	-2.6	2.6	6	-6
4	18.55	-3.45	3.45	9	-9
5	19.15	-2.85	2.85	7	-7
6	22.35	0.35	0.35	2	2
7	22.9	0.9	0.9	4	4
8	22.2	0.2	0.2	1	1
9	23.1	1.1	1.1	5	5

Calculam

$$w = \sum_{i=1}^{n} R_i^s = -21$$

Calculam

$$Z_{calc} = \frac{w}{\sqrt{\frac{(n+1)(n+2)(2n+1)}{6}}} = \frac{-21}{\sqrt{10 \cdot 11 \cdot 21/6}} = -1.07$$

Din tabel avem $Z_{1-\alpha} = Z_{1-0.05} = Z_{0.95} = 1.65$.
Deoarece $Z_{calc} = -1.07 < Z_{1-\alpha} = 1.65$ vom accepta ipoteza H_0. ■

Exercitiu 4 *Folosind testul W pentru* $\alpha = 0.05$ *sa se verifice ipotezele* $H_0 : m_e = 7.20; H_1 : m_e > 7.20$ *pentru urmatorul set de date: 8.25, 9.16, 9.55, 7, 6.55, 8.72, 6.7, 7.05, 7.2, 6.94, 7.16, 9.55, 5.98, 6.18, 7.82, 8.36.*

Demostratie Deorece utilizam testul W vom face urmatorul tabel

i	x_i	$x_i - 7.2$	$\|x_i - 7.2\|$	R_i	R_i^s
1	8.25	1.05	1.05	9	9
2	9.16	1.96	1.96	13	13
3	9.55	2.35	2.35	14.5	14.5
4	7	-0.2	0.2	3	-3
5	6.55	-0.65	0.65	7	-7
6	8.72	1.52	1.52	12	12
7	6.7	-0.5	0.5	5	-5
8	7.05	-0.15	0.15	2	-2
9	7.2	0	0	0	0
10	6.94	-0.26	0.26	4	-4
11	7.16	-0.04	0.04	1	-1
12	9.55	2.35	2.35	14.5	14.5
13	5.98	-1.22	1.22	11	-11
14	6.18	-1.02	1.02	8	-8
15	7.82	0.62	0.62	6	6
16	8.36	1.16	1.16	10	10

Calculam

$$w = \sum_{i=1}^{n} R_i^s = 38$$

Calculam de asemenea

$$Z_{calc} = \frac{w}{\sqrt{\frac{(n+1)(n+2)(2n+1)}{6}}} = \frac{38}{\sqrt{17 \cdot 18 \cdot 33/6}} = 0.93$$

Din tabel avem avem $Z_{1-\alpha} = Z_{1-0.05} = Z_{0.95} = 1.65$.
Deoarece $Z_{calc} = 0.93 < Z_{1-\alpha} = 1.65$ vom accepta ipoteza H_0. ■

Exercitiu 5 *Fie* m_e *mediana diferentei (x-y) si vom verifica su ajutorul testului w ipotezele in cazul* $\alpha = 0.05$ $H_0 : m_e = 0; H_1 : m_e > 0$ *pentur urmatorul set de date: (17.1,19.6), (14.6,12.3), (17.3,19.4), (18.5,14.3), (13.5,18.6), (13.7,14.7), (15.4,15.4), (18.4,16.3), (16.6,16.2), (9.1,12.5), (11.5,8.1), (7.5,8.4), (19.6,17.5), (6.4,9.1), (16.5,18.6), (19.8,17.7), (14.3,13.2).*

Demostratie Deoarece utilizam testul W vom face urmatorul tabel

i	x_i	y_i	$x_i - y_i$	$\lvert x_i - y_i - 0\rvert$	R_i	R_i^s
1	17.1	19.6	-2.5	2.5	11	-11
2	14.6	12.3	2.3	2.3	10	10
3	17.3	19.4	-2.1	2.1	7	-7
4	18.5	14.3	4.2	4.2	15	15
5	13.5	18.6	-5.1	5.1	16	16
6	13.7	14.7	-1	1	3	-3
7	15.4	15.4	0	0	0	0
8	18.4	16.3	2.1	2.1	7	7
9	16.6	16.2	0.4	0.4	1	1
10	9.1	12.5	-3.4	3.4	13.5	-13.5
11	11.5	8.1	3.4	3.4	13.5	13.5
12	7.5	8.4	-0.9	0.9	2	-2
13	19.6	17.5	2.1	2.1	7	7
14	6.4	9.1	-2.7	2.7	12	-12
15	16.5	18.6	-2.1	2.1	7	-7
16	19.8	17.7	2.1	2.1	7	7
17	14.3	13.2	1.1	1.1	4	4

Calculam

$$w = \sum_{i=1}^{n} R_i^s = 25$$

Calculam de asemenea

$$Z_{calc} = \frac{w}{\sqrt{\frac{(n+1)(n+2)(2n+1)}{6}}} = \frac{25}{\sqrt{18 \cdot 19 \cdot 35/6}} = 0.56$$

Din tabel avem $Z_{1-\alpha} = Z_{1-0.05} = Z_{0.95} = 1.65$.
Deoarece $Z_{calc} = 0.56 < Z_{1-\alpha} = 1.65$ vom accepta ipoteza H_0. ■

Exercitiu 6 *Fie m_e mediatoarea diferentei x-y sa se verifice utilizind testul W la pragul $\alpha = 0.05$ ipotezele $H_0 : m_e = 0; H_1 : m_e > 0$ pentru urmatorul set de date: (8.32,7.80), (6.45,7), (5.95,6.2), (7.36,8.14), (7.83,8.33), (7.30,8.15), (5.4,5.55), (6.9,8.1), (7,4.8), (8.17,7.77), (6.68,7.18), (6.95,8.45), (7.26,8.56), (15.43,7.28), (8.14,6.44).*

Demostratie Deoarece folosim testul vem vom realiza tabelul

i	x_i	y_i	$x_i - y_i$	$\lvert x_i - y_i - 0 \rvert$	R_i	R_i^s
1	8.32	7.8	0.52	0.52	6	6
2	6.45	7	-0.55	0.55	7	-7
3	5.95	6.2	-0.25	0.25	2	-2
4	7.36	8.14	-0.78	0.78	8	-8
5	7.83	8.33	-0.5	0.5	4.5	-4.5
6	7.3	8.15	-0.85	0.85	9	-9
7	5.4	5.55	-0.15	0.15	1	-1
8	6.9	8.1	-1.2	1.2	10	-10
9	7	4.8	2.2	2.2	14	14
10	8.17	7.77	0.4	0.4	3	3
11	6.68	7.18	-0.5	0.5	4.5	-4.5
12	6.95	8.45	-1.5	1.5	12	-12
13	7.26	8.56	-1.3	1.3	11	-11
14	15.43	7.28	8.15	8.15	15	15
15	8.14	6.44	1.7	1.7	13	13

Calculam

$$w = \sum_{i=1}^{n} R_i^s = -18$$

Calculam de asemenea

$$Z_{calc} = \frac{w}{\sqrt{\frac{(n+1)(n+2)(2n+1)}{6}}} = \frac{-18}{\sqrt{16 \cdot 17 \cdot 31/6}} = -0.48$$

Din tabel avem $Z_{1-\alpha} = Z_{1-0.05} = Z_{0.95} = 1.65$.
Deoarece $Z_{calc} = -0.48 < Z_{1-\alpha} = 1.65$ vom accepta ipoteza H_0. ■