

$$T_n(Z) = -\frac{1}{n^2} \sum_{i,j=1}^n \ln(1 + (X_i - Y_j)^2) + \frac{1}{n(n-1)} \sum_{i < j}^n \ln(1 + (X_i - X_j)^2) + \frac{1}{n(n-1)} \sum_{i < j}^n \ln(1 + (Y_i - Y_j)^2),$$

critical value of T_n simulation criterion calculated by 1'000'000 iterations

Cauchy Mean

$$formulae = P(z > z_{1-\alpha/2} - \frac{h}{\sqrt{6 \ln 3}}) + P(z < -z_{1-\alpha/2} - \frac{h}{\sqrt{6 \ln 3}}), \quad z \sim N(0, 1), \quad 1/\sqrt{6 \ln 3} \approx 0.389$$

Table 1: Power of tests for the Cauchy distribution,
 $X \sim C(0, 1)$, $Y \sim C(h/\sqrt{n}, 1)$,
samples size 100, 1000 iterations, 800 permutations in $T_{n, perm}$

h	$T_{n, perm}$	$T_{n, sim}$	formulae	<i>wilcox.test</i>	<i>ks.test</i>
1	6.4	6.3	6.8	6.6	6.3
2	10.1	10.6	12.2	11.9	11.1
3	19.6	20.3	21.5	20.5	20.2
5	50.9	50.5	49.5	48.5	53.1
7	82	82.3	77.8	77.2	83.6
9	96.7	96.8	93.9	91.5	96.5

Table 2: Power of tests for the Cauchy distribution,
 $X \sim C(0, 1)$, $Y \sim C(h/\sqrt{n}, 1)$,
samples size 500, 1000 iterations, 800 permutations in $T_{n, perm}$

h	$T_{n, perm}$	$T_{n, sim}$	formula	<i>wilcox.test</i>	<i>ks.test</i>
1	5.8	6.1	6.8	6.4	6.4
2	11.6	11.6	12.2	12.6	13.9
3	21	21.8	21.5	22.2	24.3
5	50.9	51	49.5	48	57.9
7	82.2	82.4	77.8	75.6	85.9
9	96.2	96.5	93.9	93.2	97.2

Table 3: Power of tests for the Cauchy distribution,
 $X \sim C(0, 1)$, $Y \sim C(h/\sqrt{n}, 1)$,
samples size 1000, 1000 iterations, 800 permutations in $T_{n, perm}$

h	$T_{n, perm}$	$T_{n, sim}$	formula	<i>wilcox.test</i>	<i>ks.test</i>
1	6.3	6	6.8	6.8	8.1
2	11.4	11.9	12.2	12.9	13.4
3	21	20.9	21.5	22.8	26.2
5	53.6	53.6	49.5	50.8	59.6
7	84	84.5	77.8	79.5	87.6
9	96.6	96.6	93.9	93.2	98.3

Cauchy Var

Table 4: Power of tests for the Cauchy distribution,
 $X \sim C(0, 1)$, $Y \sim C(0, 1 + h/\sqrt{n})$,
samples size 100, 1000 iterations, 800 permutations in $T_{n,perm}$

h	$T_{n,perm}$	$T_{n,sim}$	$wilcox.test$	$ks.test$
2	10.6	11.9	5.4	5.4
4	27.6	29.8	5.5	8.7
6	49.4	53.6	5.5	15.9
8	68.8	73.5	5.5	25
10	84.2	87.1	5.2	36.4

Table 5: Power of tests for the Cauchy distribution,
 $X \sim C(0, 1)$, $Y \sim C(0, 1 + h/\sqrt{n})$,
samples size 500, 1000 iterations, 800 permutations in $T_{n,perm}$

h	$T_{n,perm}$	$T_{n,sim}$	$wilcox.test$	$ks.test$
2	9.4	10	4.5	6.3
4	28.5	30.6	4.8	14
6	54.5	56.5	5	26.1
8	79.5	80.5	5.2	43.3
10	93	94	5.2	62.2

Table 6: Power of tests for the Cauchy distribution,
 $X \sim C(0, 1)$, $Y \sim C(0, 1 + h/\sqrt{n})$,
samples size 1000, 1000 iterations, 800 permutations in $T_{n,perm}$

h	$T_{n,perm}$	$T_{n,sim}$	$wilcox.test$	$ks.test$
2	10.2	10.5	5	7.6
4	32.4	33.8	5.2	13.8
6	61.1	62.8	5.2	27.9
8	84.8	85.6	5.2	47.4
10	96.1	97.1	5.4	67.9

Norm Mean

Table 7: Power of tests for the Normal distribution,
 $X \sim N(0, 1)$, $Y \sim N(h/\sqrt{n}, 1)$,
samples size 100, 1000 iterations, 800 permutations in $T_{n,perm}$

h	$T_{n,perm}$	$T_{n,sim}$	$wilcox.test$	$ks.test$
1	11.1	11.3	12.5	9.5
2	29.3	29	31.1	20.5
3	52.4	53.4	55.8	42
4	77.5	77.5	80.6	64.9
5	91.9	92.5	93.1	84.7

Norm Var

Table 8: Power of tests for the Normal distribution,
 $X \sim N(0, 1)$, $Y \sim N(0, 1 + h/\sqrt{n})$,
 samples size 100, 1000 iterations, 800 permutations in $T_{n,perm}$

h	$T_{n,perm}$	$T_{n,sim}$	$wilcox.test$	$ks.test$
1	8.1	8.7	6.4	5.3
2	15	17.4	6.3	7.2
3	30.5	34.2	6.6	10.7
4	50.6	57.1	6.7	16.7
5	70.8	76.7	6.5	24.8