



# ConsoleApp\_DistributionFunctions

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Console applications for distribution functions implemented in FunktionWin (see Schrausser, 2011, 2023a, res.). Theta applications generating distributions and estimators for several parameters  $\theta$  within different designs via *bootstrap* method, with given number of resamples  $B$ , where bootstrap estimator

$$\hat{\theta}_B = B^{-1} \cdot \sum_{i=1}^B \theta_i^*.$$

Implemented in ThetaWin (see Schrausser, 2009, 2023b, res.).

## Binomial

$$f(X \leq k|n) = \sum_{i=0}^k \frac{n!}{i!(n-i)!} \cdot p^i \cdot q^{(n-i)}.$$

Usage:

```
Binomial [p] [k] [n] [[1]]
[p] ..... probability of event A
[k] ..... n of events A
[n] ..... n of trials
[1] ..... (1) full output
```

## Binomial\_T

$$f(X \leq b|b,c) = p = \sum_{i=0}^b \frac{(b+c)!}{i!(b+c-i)!} \cdot 2^{-i} \cdot 2^{-(b+c-i)}.$$

Usage:

```
Binomial_T [b] [c] [[1]]
[b] ..... cell count b
[c] ..... cell count c
[1] ..... (1) full output
```

## epsilon

$$\varepsilon = \frac{\mu_1 - \mu_0}{\hat{\sigma}}.$$

Usage:

```
epsilon [mode] [Q0] [s] [n] [e|Q1] [p] [df] [[x]]  
[mode] ..... (1)Effect-size (2)Theta.1  
[Q0] ..... Theta.0  
[s] ..... Standard deviation  
[n] ..... n of cases  
[e|Q1] ..... Epsilon | Theta.1  
[p] ..... Percent-level (0.00)  
[df] ..... Degrees of freedom n -(.)  
[x] ..... Test value
```

## F\_Function

$$F(F, df_1, df_2) = 1 - p^{\alpha_2} = \int_0^F \frac{\Gamma(\frac{df_1+df_2}{2})}{\Gamma(\frac{df_1}{2}) \cdot \Gamma(\frac{df_2}{2})} \cdot \left(\frac{df_1}{df_2}\right)^{\frac{df_1}{2}} \cdot F^{\frac{df_1}{2}-1} \cdot \left(1 + \frac{df_1}{df_2} \cdot F\right)^{-\frac{df_1+df_2}{2}} dF.$$

Usage:

```
F_Function [mode] [x] [n1] [n2]  
[mode] ..... (1)Fx=p->F (2)Fy=F->p  
[x] ..... p-Wert/F-Wert  
[n1] ..... n1  
[n2] ..... n2
```

## Fisher\_Exact

$$f(X = a|a, b, c, d) = P0 = \frac{(a+b)! \cdot (c+d)! \cdot (a+c)! \cdot (b+d)!}{(a+b+c+d)! \cdot a! \cdot b! \cdot c! \cdot d!},$$

$$f(X \leq n|a, b, c, d) = p^{exact2} = \sum_{i=0}^n P_i; P_i \leq P0.$$

Usage:

```
Fisher_Exact [a] [b] [c] [d] [[1]]  
[a][b][c][d] ... cell counts a,b,c,d  
[1] ..... (1) full output
```

## Fisher\_Z

$$Z = \frac{1}{2} \cdot \log_e \left( \frac{1+r}{1-r} \right),$$

$$r = \frac{e^{2 \cdot Z} - 1}{e^{2 \cdot Z} + 1}.$$

Usage:

```
Fisher_Z [mode] [x]
[mode] .... (1)r->Z (2)Z->r
[x] ..... r-value/Z-value
```

## GAMMA\_Function

$$f(x, t) = \Gamma = \int_0^{\infty} t^{x-1} \cdot e^{-t} dt + c.$$

Usage:

```
GAMMA_Function [mode] [value]
[mode] .... (1)F(x)->[ (2)F'([])->x
[value] ..... x / [
```

## GAMMA

Usage:

```
GAMMA [n] [input] [output]
[n] ..... n of cases
[input] ..... input file
[output] ..... output file
```

## Geometric

$$f(X \leq r|p) = \sum_{i=0}^r p \cdot q^i.$$

Usage:

```
Geometric [p] [r+1] [[1]]
[p] ..... probability of event A
[r+1] ..... n of trials
[1] ..... (1) full output
```

## Hypergeometric

$$f(X \leq k|n, K, N) = \sum_{i=0}^k \frac{\binom{K}{i} \cdot \binom{N-K}{n-i}}{\binom{N}{n}}.$$

Usage:

```
Hypergeometric [k] [n] [N] [K] [[1]]
[k] ..... n of events A in Sub-Population
[n] ..... size of Sub-Population
[N] ..... size of Population
[K] ..... n of events A in Population
[1] ..... (1) full output
```

## Poisson

$$f(X \leq k | n, p) = \sum_{i=0}^k \frac{(n \cdot p)^i}{e^{n \cdot p} \cdot i!}$$

Usage:

```
Poisson [p] [k] [n] [[1]]
[p] ..... probability of event A
[k] ..... n of events A
[n] ..... n of trials
[1] ..... (1) full output
```

## t\_Function

$$F(t, df) = p = \int_{-\infty}^t \frac{\Gamma(\frac{df-1}{2})}{\Gamma(\frac{df}{2})} \cdot (df \cdot \pi)^{-\frac{1}{2}} \cdot \left(1 + \frac{t^2}{df}\right)^{-\frac{df-1}{2}} dt.$$

Usage:

```
t_Function [mode] [x] [n]
[mode] ..... (1)Fx=p->t (2)Fy=t->p
[x] ..... p-value/t-value
[n] ..... n of cases
```

## x2\_Function

$$F(\chi^2, df) = 1 - p^{\alpha_2} = \int_0^{\chi^2} \frac{1}{2^{\frac{df}{2}} \cdot \Gamma(\frac{df}{2})} \cdot (\chi^2)^{\frac{df}{2}-1} \cdot e^{-\frac{\chi^2}{2}} d\chi^2.$$

Usage:

```
x2_Function [mode] [x] [n]
[mode] ..... (1)Fx=p->x^2 (2)Fy=x^2->p
[x] ..... p-value/x^2-value
[n] ..... n of cases
```

## z\_Dichte

$$f(z) = \vartheta = \frac{1}{\sqrt{2 \cdot \pi}} \cdot e^{-\frac{z^2}{2}},$$

$$f^{-1}(z) = f(\vartheta) = z = \sqrt{\ln\left(\frac{\vartheta}{\sqrt{(2 \cdot \pi)^{-1}}}\right)^{-2}},$$

$$F(z) = p = \int_{-\infty}^z \vartheta \ dz.$$

Usage:

```
z_Dichte [modus] [wert] [[f]]
[modus] .... (1)fx=z->d (2)fy=d->z (3) fx=z->p
           (4) f'p->z (5) f'p->d (6) fy=d->p
[wert] ..... z-Wert/z-Dichte/Prozentrang p
[f] ..... (1)z-Dichte Funktionsgraph
```

## z\_Function

Usage:

```
z_Function [mode] [x]
[mode] .... (1)Fx=p->z (2)Fy=z->p
[x] ..... p-value/z-value
```

## Theta

Usage:

```
Theta [sd] [min] [max] [qq] [q] [v] [s] [[x]] [[g]]
[sd] ..... Seed: |0| Zeitwert
[min] ..... R Minimalwert
[max] ..... R Maximalwert
[qq] ..... Theta-Theta/
[q] ..... Theta:
          |0| Harmonisches Mittel (HM)
          |1| Arithmetisches Mittel (AM)
          |2| Summe (SUM)
          |3| Standardabweichung (SD)
          |4| Populationsvarianzschaetzung (VAR)
          |5| Produktsumme(PSM)
          |6| Geometrisches Mittel(GM)
          |7| Schrausser's d (D)
          |8| Dvar0 (DV)
[v] ..... n zu Theta (v)
[s] ..... n Subpopulationen (s)
[x] ..... Vergleichswert x
[g] ..... |1| Wertebereich ganzzahlig
```

## Theta Q

Usage:

```
Theta_Q [sd][min][max][qq][qp][qs1][qs2][qQ][v][m][n][s] [[x]] [[g]]
[sd] ..... Seed: |0| Zeitwert
[min] ..... R Minimalwert
[max] ..... R Maximalwert
[qq] ..... Theta-Theta/
[qp] ..... Theta P/
[qs1] [qs2] ..... Theta S1, S2:
|0| Harmonisches Mittel (HM)
|1| Arithmetisches Mittel (AM)
|2| Summe (SUM)
|3| Standardabweichung (SD)
|4| Populationsvarianzschaetzung (VAR)
|5| Produktsumme(PSM)
|6| Geometrisches Mittel(GM)
|7| Schrausser's d (D)
|8| Dvar0 (DV)
[qQ] ..... Theta Q:
|1| Differenz
|2| Quotient
|3| Summe
|4| Produkt
[v] ..... n zu Theta P (v)
[m] ..... n zu Theta S1 (m)
[n] ..... n zu Theta S2 (n)
[s] ..... n Subpopulationen (s)
[x] ..... Vergleichswert x
[g] ..... |1| Wertebereich ganzzahlig
```

## Theta Qv

Usage:

```
Theta_Qv [sd][min][max][qq][qp][qs1][qs2][qQ][QQ][v][n][s] [[x]] [[g]]
[sd] ..... Seed: |0| Zeitwert
[min] ..... R Minimalwert
[max] ..... R Maximalwert
[qq] ..... Theta-Theta/
[qp] ..... Theta P/
[qs1][qs2]..... Theta S1, S2/
[qQ] ..... Theta Q:
|0| Harmonisches Mittel (HM)
|1| Arithmetisches Mittel (AM)
|2| Summe (SUM)
|3| Standardabweichung (SD)
|4| Populationsvarianzschaetzung (VAR)
|5| Produktsumme(PSM)
|6| Geometrisches Mittel(GM)
```

	7  Schrausser's d (D)
	8  DvarO (DV)
[QQ] .....	Theta Theta Q:   1  Differenz   2  Quotient   3  Summe   4  Produkt   5  Korrelation   6  Kovarianz   7  Determinationskoeffizient   8  Redundanz
[v] .....	n zu Theta P (v)
[n] .....	n zu Theta S1,S2 (n)
[s] .....	n Subpopulationen (s)
[x] .....	Vergleichswert x
[g] .....	1  Wertebereich ganzzahlig

## Theta rQ

Usage:

```
Theta_rQ [sd][min][max][qq][qp][q11][q12][q21][q22][qr1][qr2][qQ][v][m][n][s]
] [[x]] [[g]]
[sd] ..... Seed: |0| Zeitwert
[min] ..... R Minimalwert
[max] ..... R Maximalwert
[qq] ..... Theta-Theta/
[qp] ..... Theta P/
[q11][q12] ..... Theta S11, S12/
[q21][q22] ..... Theta S21, S22:
| 0| Harmonisches Mittel (HM)
| 1| Arithmetisches Mittel (AM)
| 2| Summe (SUM)
| 3| Standardabweichung (SD)
| 4| Populationsvarianzschaetzung (VAR)
| 5| Produktsumme(PSM)
| 6| Geometrisches Mittel(GM)
| 7| Schrausser's d (D)
| 8| DvarO (DV)
[qr1][qr2] ..... Theta Regressionen 1,2/
| 1| Korrelation (kor)
| 2| Kovarianz (cov)
| 3| Determinatinskoeffizient (det)
| 4| Redundanz (red)
[qQ] ..... Theta Q:
| 1| Differenz (Diff)
| 2| Quotient (Quot)
| 3| Summe (Summ)
| 4| Produkt (Prod)
[v] ..... n zu Theta P (v)
[m] ..... n zu Theta S11,S12 (m)
```

```

[n] ..... n zu Theta S21,S22 (n)
[s] ..... n Subpopulationen (s)
[x] ..... Vergleichswert x
[g] ..... |1| Wertebereich ganzzahlig

```

## Theta S

Usage:

```

Theta_S [sd] [min] [max] [qq] [qp] [qs] [v] [m] [s] [[x]] [[g]]
[sd] ..... Seed: |0| Zeitwert
[min] ..... R Minimalwert
[max] ..... R Maximalwert
[qq] ..... Theta-Theta:
[qp] ..... Theta P/
[qs] ..... Theta S/
    |0| Harmonisches Mittel (HM)
    |1| Arithmetisches Mittel (AM)
    |2| Summe (SUM)
    |3| Standardabweichung (SD)
    |4| Populationsvarianzschaetzung (VAR)
    |5| Produktsumme(PSM)
    |6| Geometrisches Mittel(GM)
    |7| Schrausser's d (D)
    |8| Dvar0 (DV)
[v] ..... n zu Theta P (v)
[m] ..... n zu Theta S (m)
[s] ..... n Subpopulationen (s)
[x] ..... Vergleichswert x
[g] ..... |1| Wertebereich ganzzahlig

```

## Verteilungsform

Usage:

```

Verteilungsform [min] [max] [n] [s]
[min] ..... Minimalwert
[max] ..... Maximalwert
[n] ..... n zu Kennwert Theta=sum(x)
[s] ..... n Subpopulationen

```

## Verteilungsform\_2u

Usage:

```

Verteilungsform_2u [min] [max] [q] [n1] [n2] [s] [xd] [g]
[min] ..... Minimalwert
[max] ..... Maximalwert
[q] ..... Theta:
    |0|..... Harmonisches Mittel
    |1|..... Arithmetisches Mittel
    |2|..... Summe

```

```

| 3| ..... Standardabweichung
| 4| ..... Populationsvarianzschätzung
| 5| ..... Produktsumme
| 6| ..... Geometrisches Mittel
| 7| ..... Schrausser's d
| 8| ..... Dvar0

[n] ..... n1 zu Theta
[n] ..... n2 zu Theta
[s] ..... n Subpopulationen
[xd] ..... Vergleichsdifferenzwert
[g] ..... |1| Wertebereich ganzzahlig

```

## Verteilungsform\_kor

Usage:

```

Verteilungsform_kor [min] [max] [q] [n] [s] [x]
[min] ..... Minimalwert
[max] ..... Maximalwert
[q] ..... Theta:
           |1| ..... Produktmoment Korrelation
           |2| ..... Kovarianz
           |3| ..... Determinationskoeffizient
           |4| ..... Redundanz
           |5| ..... Regressionskoeffizient ayx
           |6| ..... Regressionskoeffizient byx
           |7| ..... Regressionskoeffizient axy
           |8| ..... Regressionskoeffizient bxy
[n] ..... n zu Theta
[s] ..... n Subpopulationen

```

## References

- Schrausser, D. G. (2009). *ThetaWin: Overview*. <https://www.academia.edu/81800920>
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