Package: WRestimates (via r-universe)

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Type Package

Title Sample Size, Power and CI for the Win Ratio

Version 0.1.0

Description Calculates non-parametric estimates of the sample size, power and confidence intervals for the win-ratio. For more detail on the theory behind the methodologies implemented see Yu, R. X. and Ganju, J. (2022) <doi:10.1002/sim.9297>.

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Contents

wr.ci *Confidence Interval (CI) for Win Ratio*

Description

Calculate the confidence interval for a win ratio.

$$CI = exp((ln(WR) + / - Z\sqrt{var})$$

Where;

$ln(WR)$ = Natural log of the true or assumed win ratio.

Z = Z-score from normal distribution.

$\sqrt{var}$ = Standard deviation of the natural log of the win ratio.

Usage

```
wr.ci(WR = 1, Z = 1.96, var.ln.WR, N, sigma.sqr, k, p.tie)
```

Arguments

WR	Win ratio; Default: WR = 1 for an assumed true win ratio where H₀ is assumed true.
Z	Z-score from normal distribution; Default: Z = 1.96 for a 95% CI.
var.ln.WR	Variance of the natural log (ln) of the win ratio.
N	Sample size.
sigma.sqr	Population variance of the natural log (ln) of the win ratio.
k	The proportion of subjects allocated to one group i.e. the proportion of patients allocated to treatment.
p.tie	The proportion of ties.

Value

wr.ci returns an object of class "list" containing the following components:

ci	The confidence interval of a win ratio.
WR	The win ratio.
Z	Z-score from normal distribution.
var.ln.WR	Variance of the natural log (ln) of the win ratio.
N	Sample size.
sigma.sqr	Population variance of the natural log (ln) of the win ratio.
k	The proportion of subjects allocated to one group.
p.tie	The proportion of ties.

Author(s)

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References

Yu, R. X. and Ganju, J. (2022). Sample size formula for a win ratio endpoint. *Statistics in medicine*, *41*(6), 950-963. doi:10.1002/sim.9297.

See Also

wr.sigma.sqr; wr.var

Examples

```
## N = 100 patients, 1:1 allocation, one-sided alpha = 2.5%, power = 90%
## (beta = 10%), a small proportion of ties p.tie = 0.1, and 50% more wins
## on treatment than control.

### Calculation 95% CI
wr.ci(N = 100, WR = 1.5, k = 0.5, p.tie = 0.1)
```

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wr.power *Power of a Win Ratio*

Description

Calculate the power of a win ratio.

$$Power = 1 - \Phi(Z[\alpha] - ln(WR[true])(\sqrt{N}/\sigma))$$

Usage

```
wr.power(N, alpha = 0.025, WR.true = 1, sigma.sqr, k, p.tie)
```

Arguments

N	Sample size.
alpha	Level of significance (Type I error rate); Default: α = 0.025.
WR.true	True or assumed win ratio; Default: WR.true = 1 where H₀ is assumed true.
sigma.sqr	Population variance of the natural log (ln) of the win ratio.
k	The proportion of subjects allocated to one group i.e. the proportion of patients allocated to treatment.
p.tie	The proportion of ties.

Value

`wr.power` returns an object of class "`list`" containing the following components:

`power`	Power of the win ratio.
`N`	Sample size.
`alpha`	Level of significance.
`WR.true`	True or assumed win ratio.
`sigma.sqr`	Population variance of the natural log (ln) of the win ratio.
`k`	The proportion of subjects allocated to one group.
`p.tie`	The proportion of ties.

Author(s)

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References

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See Also

`wr.sigma.sqr`

Examples

```
## N = 100 patients, 1:1 allocation, one-sided alpha = 2.5%, small
## proportion of ties p.tie = 0.1, and 50% more wins on treatment
## than control.

### Calculate the Power
wr.power(N = 100, WR.true = 1.5, k = 0.5, p.tie = 0.1)
```

`wr.sigma.sqr` *Assumed Population Variance of a Win Ratio*

Description

Calculate the assumed population variance of a win ratio.

$$\sigma^2 = (4 * (1 + p[tie]))/(3 * k * (1 - k) * (1 - p[tie])$$

Where;

$$p[tie] = The proportion of ties.$$

$$k = The proportion of subjects allocated to one group.$$

Usage

```
wr.sigma.sqr(k, p.tie)
```

Arguments

k	The proportion of subjects allocated to one group i.e. the proportion of patients allocated to treatment.
p.tie	The proportion of ties.

Value

`wr.sigma.sqr` returns an object of class "`list`" containing the following components:

sigma.sqr	Population variance of the natural log (ln) of the win ratio.
k	The proportion of subjects allocated to one group.
p.tie	The proportion of ties.

Author(s)

Autumn O'Donnell <autumn.research@gmail.com>

References

Yu, R. X. and Ganju, J. (2022). Sample size formula for a win ratio endpoint. *Statistics in medicine*, *41*(6), 950-963. doi: 10.1002/sim.9297.

See Also

`wr.var`

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wr.ss *Approximate Sample Size of a Win Ratio*

Description

Calculates the approximate required sample size of a win ratio.

$$N \ \ (\sigma^2 * (Z[1-\alpha] + Z[1-\beta])^2)/(ln^2(WR[true]))$$

Usage

```
wr.ss(alpha = 0.025, beta = 0.1, WR.true = 1, k, p.tie, sigma.sqr)
```

Arguments

alpha	Level of significance (Type I error rate); Default: $\alpha = 0.025$.
beta	Type II error rate; Default: $\beta = 0.1$.
WR.true	True or assumed win ratio; Default: WR.true = 1 where H₀ is assumed true.
k	The proportion of subjects allocated to one group i.e. the proportion of patients allocated to treatment.
p.tie	The proportion of ties.
sigma.sqr	Population variance of the natural log (ln) of the win ratio.

Value

wr.ss returns an object of class "list" containing the following components:

N	Sample size.
alpha	Level of significance (Type I error rate).
beta	Type II error rate.
WR.true	True or assumed win ratio.
k	The proportion of subjects allocated to one group.
p.tie	The proportion of ties.
sigma.sqr	Population variance of the natural log (ln) of the win ratio.

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See Also

wr.sigma.sqr

Examples

```
## 1:1 allocation, one-sided alpha = 2.5%, power = 90% (beta = 10%),
## a small proportion of ties p.tie = 0.1, and 50% more wins on treatment
## than control

### Calculate Sample Size
wr.ss(WR.true = 1.5, k = 0.5, p.tie = 0.1)
```

`wr.var` *Approximate Variance of the Natural Log (ln) of the Win Ratio.*

Description

Calculating the approximate variance of the natural log (ln) a win ratio.

$$Var(ln(WR)) \;\; \sigma^2/N$$

Where;

$$\sigma^2 = (4 * (1 + p[tie]))/(3 * k * (1 - k) * (1 - p[tie])$$

Usage

```
wr.var(N, sigma.sqr, k, p.tie)
```

Arguments

`N`	Sample size.
`sigma.sqr`	Population variance of the natural log (ln) of the win ratio.
`k`	The proportion of subjects allocated to one group i.e. the proportion of patients allocated to treatment.
`p.tie`	The proportion of ties.

Value

`wr.var` returns an object of class "`list`" containing the following components:

`var.ln.WR`	Approximate variance of the natural log (ln) a win ratio.
`N`	Sample size.
`sigma.sqr`	Population variance of the natural log (ln) of the win ratio.
`k`	The proportion of subjects allocated to one group.
`p.tie`	The proportion of ties.

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References

Yu, R. X. and Ganju, J. (2022). Sample size formula for a win ratio endpoint. *Statistics in medicine*, *41*(6), 950-963. doi: 10.1002/sim.9297.

See Also

`wr.sigma.sqr`

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