# Package ‘WRestimates’

## December 6, 2023

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**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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Description

Calculate the confidence interval for a win ratio.

\[ CI = \exp\left(\frac{\ln(WR)}{Z} - Z \sqrt{\text{var}}\right) \]

Where;
- \( \ln(WR) \) = Natural log of the true or assumed win ratio.
- \( Z \) = Z-score from normal distribution.
- \( \sqrt{\text{var}} \) = 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 \( H_{0} \) 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.
wr.power

Author(s)

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References


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: \(\alpha = 0.025\).
- **WR.true**: True or assumed win ratio; Default: \(WR.true = 1\) where \(H_{<sub>0</sub>}\) 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.

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References


See Also

wr.sigma.sqr

Examples

```r
## 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)
```

Description

Calculate the assumed population variance of a win ratio.

\[
\sigma^2 = \frac{(4 + (1 + p[tie]))}{(3 \times k \times (1 - k) \times (1 - p[tie]))}
\]

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.

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References


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.

\[
N \frac{\sigma^2 \times (Z[1 - \alpha] + Z[1 - \beta])^2}{(\ln^2(WR[true]))}
\]

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 \( H_0 \) 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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References


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)
Approximate Variance of the Natural Log (ln) of the Win Ratio.

Description

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

\[ \text{Var}(\ln(WR)) = \frac{\sigma^2}{N} \]

Where;

\[ \sigma^2 = \frac{(4 \ast (1 + p[tie]))/(3 \ast k \ast (1 - k) \ast (1 - p[tie]))}{N} \]

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


See Also

wr.sigma.sqr
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