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Type Package

Title Power and Sample Size Analysis for One-way and Two-way ANOVA Models

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Description User friendly functions for power and sample size analysis at one-way and two-way ANOVA settings take either effect size or delta and sigma as arguments. They are designed for both one-way and two-way ANOVA settings. In addition, a function for plotting power curves is available for power comparison, which can be easily visualized by statisticians and clinical researchers.

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pwr2-package *Power and Sample Size Analysis for One-way and Two-way ANOVA Models*

Description

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Details

Package:	SPA
Type:	Package
Version:	1.0
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License:	GPL-2

There are major five functions in the package. The pwr.1way and pwr.2way functions provide the power analysis for one-way and two-way ANOVA models. The ss.1way and ss.2way functions provide the sample size calculation for one-way and two-way ANOVA models. The pwr.plot function illustrates drawing power curves for different parameter settings.

Author(s)

Pengcheng Lu, Junhao Liu, and Devin Koestler.

Maintainer:Pengcheng Lu <plu2@kumc.edu>

References

[1] Angela Dean & Daniel Voss (1999). Design and Analysis of Experiments. Springer.

Examples

```
## Example 1
pwr.2way(a=3, b=3, alpha=0.05, size.A=4, size.B=5, f.A=0.8, f.B=0.4)
pwr.2way(a=3, b=3, alpha=0.05, size.A=4, size.B=5, delta.A=4, delta.B=2, sigma.A=2, sigma.B=2)

## Example 2
ss.2way(a=3, b=3, alpha=0.05, beta=0.1, delta.A=1, delta.B=2, sigma.A=2, sigma.B=2, B=100)

## Example 3
n <- seq(2, 30, by=4)
f <- seq(0.1, 1.0, length.out=10)
pwr.plot(n=n, k=5, f=f, alpha=0.05)
```

pwr.1way *Power calculation for balanced one-way ANOVA models*

Description

Calculate power for one-way ANOVA models.

Usage

```
pwr.1way(k=k, n=n, alpha=alpha, f=NULL, delta=delta, sigma=sigma)
```

Arguments

k	Number of groups
n	Sample size per group
f	Effect size
alpha	Significant level (Type I error probability)
delta	The smallest difference among k groups
sigma	Standard deviation, i.e. square root of variance

Details

If effect size f is known, plug it in to the function; If delta and sigma are known instead of effect size, put NULL to f.

Value

Object of class "power.htest", a list of the arguments (including the computed one) augmented with "method" and "note" elements.

Author(s)

Pengcheng Lu, Junhao Liu, and Devin Koestler.

References

Angela Dean & Daniel Voss (1999). Design and Analysis of Experiments. Springer.

Examples

```
## Example 1
pwr.1way(k=5, n=15, alpha=0.05, delta=1.5, sigma=1)
pwr.1way(k=5, n=15, f=NULL, alpha=0.05, delta=1.5, sigma=1)

## Example 2
pwr.1way(k=5, n=15, f=0.4, alpha=0.05)
```

pwr.2way *Power calculation for balanced two-way ANOVA models*

Description

Calculate power for two-way ANOVA models.

Usage

```
pwr.2way(a=a, b=b, alpha=alpha, size.A=size.A, size.B=size.B, f.A=NULL, f.B=NULL,
delta.A=NULL, delta.B=NULL, sigma.A=NULL, sigma.B=NULL)
```

Arguments

a	Number of groups in Factor A
b	Number of groups in Factor B
alpha	Significant level (Type I error probability)
size.A	Sample size per group in Factor A
size.B	Sample size per group in Factor B
f.A	Effect size of Factor A
f.B	Effect size of Factor B
delta.A	The smallest difference among a groups in Factor A
delta.B	The smallest difference among b groups in Factor B
sigma.A	Standard deviation, i.e. square root of variance in Factor A
sigma.B	Standard deviation, i.e. square root of variance in Factor B

Details

If effect sizes f.A and f.B are known, plug them in to the function; If delta.A and sigma.A are known instead of f.A, put NULL to f.A. Similarly as delta.B and sigma.B.

Value

Object of class "power.htest", a list of the arguments (including the computed one) augmented with "method" and "note" elements.

Author(s)

Pengcheng Lu, Junhao Liu, and Devin Koestler.

References

Angela Dean & Daniel Voss (1999). Design and Analysis of Experiments. Springer.

Examples

```
## Example 1
pwr.2way(a=3, b=3, alpha=0.05, size.A=4, size.B=5, f.A=0.8, f.B=0.4)

## Example 2
pwr.2way(a=3, b=3, alpha=0.05, size.A=4, size.B=5, delta.A=4, delta.B=2, sigma.A=2, sigma.B=2)
pwr.2way(a=3, b=3, alpha=0.05, size.A=4, size.B=5, f.A=NULL, f.B=NULL,
delta.A=4, delta.B=2, sigma.A=2, sigma.B=2)
```

`pwr.plot` *Power curves for different parameter settings (sample size and effect size) in balanced one-way ANOVA models*

Description

Draw power curves for different parameter settings in balanced one-way ANOVA models.

Usage

```
pwr.plot(n=n, k=k, f=f, alpha=alpha)
```

Arguments

`n`	Sample size per group
`k`	Number of groups
`f`	Effect size
`alpha`	Significant level (Type I error probability)

Details

This function demonstrates drawing power curves for different sample size and effect size settings. N and f can be either a single value or a sequence of values, but they cannot be single values simultaneously. The combination of them could be (a sequence of n, a sequence of f), (a sequence of n, a single f), or (a single n, a sequence of f).

Author(s)

Pengcheng Lu, Junhao Liu, and Devin Koestler.

References

Angela Dean & Daniel Voss (1999). Design and Analysis of Experiments. Springer.

Examples

```
## Example 1
n <- seq(2, 30, by=4)
f <- 0.5
pwr.plot(n=n, k=5, f=f, alpha=0.05)

## Example 2
n <- 20
f <- seq(0.1, 1.0, length.out=10)
pwr.plot(n=n, k=5, f=f, alpha=0.05)

## Example 3
n <- seq(2, 30, by=4)
f <- seq(0.1, 1.0, length.out=10)
pwr.plot(n=n, k=5, f=f, alpha=0.05)
```

---

ss.1way *Sample size calculation for balanced one-way ANOVA models*

Description

Calculate sample size for one-way ANOVA models.

Usage

```
ss.1way(k=k, alpha=alpha, beta=beta, f=NULL, delta=delta, sigma=sigma, B=B)
```

Arguments

k	Number of groups
alpha	Significant level (Type I error probability)
beta	Type II error probability (Power=1-beta)
f	Effect size
delta	The smallest difference among k group
sigma	Standard deviation, i.e. square root of variance
B	Iteration times, default number is 100

Details

Beta is the type II error probability which equals 1-power. For example, if the target power is 85% (=0.85), the corresponding beta equals 0.15. If effect size f is known, plug it in to the function; If delta and sigma are known instead of effect size, put NULL to f, or just miss f argument.

Value

Object of class "power.htest", a list of the arguments (including the computed one) augmented with "method" and "note" elements.

Author(s)

Pengcheng Lu, Junhao Liu, and Devin Koestler.

References

Angela Dean & Daniel Voss (1999). Design and Analysis of Experiments. Springer.

Examples

```
## Example 1
ss.1way(k=5, alpha=0.05, beta=0.1, f=1.5, B=100)

## Example 2
ss.1way(k=5, alpha=0.05, beta=0.1, delta=1.5, sigma=1, B=100)
ss.1way(k=5, alpha=0.05, beta=0.1, f=NULL, delta=1.5, sigma=1, B=100)
```

`ss.2way` *Sample size calculation for balanced two-way ANOVA models*

Description

Calculate sample size for two-way ANOVA models.

Usage

```
ss.2way(a=a, b=b, alpha=alpha, beta=beta, f.A=NULL, f.B=NULL,
delta.A=NULL, delta.B=NULL, sigma.A=NULL, sigma.B=NULL, B=B)
```

Arguments

`a`	Number of groups in Factor A
`b`	Number of groups in Factor B
`alpha`	Significant level (Type I error probability)
`beta`	Type II error probability (Power=1-beta)
`f.A`	Effect size of Factor A
`f.B`	Effect size of Factor B
`delta.A`	The smallest difference among a groups in Factor A
`delta.B`	The smallest difference among b groups in Factor B
`sigma.A`	Standard deviation, i.e. square root of variance in Factor A
`sigma.B`	Standard deviation, i.e. square root of variance in Factor B
`B`	Iteration times, default number is 100

Details

Beta is the type II error probability which equals 1-power. For example, if the target power is 85% (=0.85), the corresponding beta equals 0.15. If effect size f is known, plug it in to the function; If delta and sigma are known instead of effect size, put NULL to f.

Value

Object of class "power.htest", a list of the arguments (including the computed one) augmented with "method" and "note" elements.

Author(s)

Pengcheng Lu, Junhao Liu, and Devin Koestler.

References

Angela Dean & Daniel Voss (1999). Design and Analysis of Experiments. Springer.

Examples

```
## Example 1
ss.2way(a=3, b=3, alpha=0.05, beta=0.1, f.A=0.4, f.B=0.2, B=100)
ss.2way(a=3, b=3, alpha=0.05, beta=0.1, f.A=0.4, f.B=0.2,
delta.A=NULL, delta.B=NULL, sigma.A=NULL, sigma.B=NULL, B=100)

## Example 2
ss.2way(a=3, b=3, alpha=0.05, beta=0.1, delta.A=1, delta.B=2, sigma.A=2, sigma.B=2, B=100)
```

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