Package 'qcapower'

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Type Package

Title Estimate Power and Required Sample Size in QCA

Version 0.1.0

Imports ggplot2, ggforce, devtools, stats

Depends R (>= 2.10)

Description Researchers working with Qualitative Comparative Analysis (QCA) can use the package to estimate power of a sufficient term using permutation tests. A term can be anything: A condition, conjunction or disjunction of any combination of these. The package further allows users to plot the estimation results and to estimate the number of cases required to achieve a certain level of power, given a prespecified null and alternative hypothesis. Reference for the article introducing power estimation for QCA is: Rohlfing, Ingo (2018) <doi:10.1017/pan.2017.30> (ungated version: <doi:10.17605/OSF.IO/PC4DF>).

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Encoding UTF-8

LazyData true

RoxygenNote 7.0.2

Suggests knitr, rmarkdown

VignetteBuilder knitr

URL https://github.com/ingorohlfing/qcapower

BugReports https://github.com/ingorohlfing/qcapower

NeedsCompilation no

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Repository CRAN

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Contents

`qcapower` *qcapower returns a power estimate with regard to the consistency of a term, given information about the required parameters*

Description

`qcapower` allows you to estimate power for a term. Probability is the probability of rejecting the null hypothesis that no set relation is in plaace when it is in place, in fact. A term can be a single condition, a conjunction, or a disjunction of any combination of the two.

Usage

```
qcapower(
  cases,
  null_hypo,
  alt_hypo,
  sims = 1000,
  perms = 10000,
  alpha = 0.05,
  cons_threshold = 0.01,
  set_seed = 135
)
```

Arguments

`cases`	Number of cases. In fuzzy-set QCA, equal to total number of cases in the analysis
`null_hypo`	Null hypothesis (*H0*). Consistency value separating consistent from inconsistent terms. It is the highest possible consistency value that would let you conclude that no set relation is given.
`alt_hypo`	Alternative hypothesis (*H1*). Expected, actual consistency value of term.
`sims`	Number of simulations for calculating power
`perms`	Number of permutations of hypothetical dataset per simulation run
`alpha`	Level of alpha at which statistical significance of H0 is tested

cons_threshold	Degree of tolerance in generating hypothetical data with consistency equaling alt_hypo (see vignette)
set_seed	Parameter for achieving reproducibility of estimate

Value

A dataframe with rows equaling the number of sims. power is the power estimate and is identical for each rows. powercum is the running power estimate up to this row. quant is the 5%-quantile of the permuted distributions. See the vignette for more information.

See Also

qp_quant_plot and qp_run_plot

Examples

```
power_data <- qcapower(cases = 20, null_hypo = 0.8, alt_hypo = 0.95, sims = 10, perms = 1000)
head(power_data)
```

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qp_cases *Calculte the number of cases for a particular case target based on simulated data*

Description

qp_cases calculates the number of cases needed for a particular power level. It is based on the presimulated data using qcapower. See the vignette for more details.

Usage

```
qp_cases(power_target, null_hypo, alt_hypo)
```

Arguments

power_target	Desired level of power
null_hypo	Null hypothesis (*H0*). Consistency value separating consistent from inconsistent terms.
alt_hypo	Alternative hypothesis (*H1*). Expected, actual consistency value of term.

Value

An integer showing how many cases are needed to achieve the target level of power.

See Also

qp_cases_brute

Examples

```
qp_cases(0.1, null_hypo = 0.8, alt_hypo = 1)
```

`qp_cases_brute` *Calculate the number of cases for a particular case target with iterative simulations (brute force)*

Description

`qp_cases_brute` calculates the number of cases needed for a particular power level. The function starts with the number of cases given by `start_value` and iteratively simulates power and adjusts the number of cases until the `power_target` is met or the `max_value` has been reached. Running the function can take a lot of time. Use `qp_cases` to

Usage

```
qp_cases_brute(
  power_target,
  start_value = 2,
  max_value = 100,
  progress = TRUE,
  ...
)
```

Arguments

`power_target`	Power level target
`start_value`	Default number of cases for initial search
`max_value`	Default maximum number of cases for search
`progress`	Show progress of calculation (default `TRUE`)
`...`	`qcapower` parameters – see `qcapower`

Value

An integer showing how many cases are needed to achieve the target level of power.

See Also

`qp_cases_brute`

Examples

```
## Not run:
qp_cases_brute(power_target = 0.9, null_hypo = 0.80, alt_hypo = 1)

qp_cases_brute(power_target = 0.9, null_hypo = 0.80, alt_hypo = 1, start_value = 20,
               max_value = 50, perms = 500)

## End(Not run)
```

`qp_quant_plot` *Sina plot of 5 distributions*

Description

Depending on the number of cases, the permuted distributions of consistency values can differ narrowly or widely in terms of their location on the spectrum and their shape.

Usage

```
qp_quant_plot(power_est, title = FALSE)
```

Arguments

`power_est`	Dataframe containing simulation results (see `qcapower`)
`title`	Option for adding title to plot (default `FALSE`)

Details

Creates a sina plot with `ggforce`

Value

A sina plot using the cases to visualize the density distribution (‘gg‘ object).

Examples

```
sim_data <- qp_sina_data
qp_quant_plot(sim_data)
```

qp_run_plot *Plot of power estimate against the number of simulations*

Description

qp_run_plot allows you to plot the running power estimate to determine whether sims is sufficiently large to derive a reliable estimate

Usage

```
qp_run_plot(power_est, title = FALSE)
```

Arguments

power_est	Dataframe containing the simulation results (see qcapower)
title	Option for adding title to plot (default FALSE)

Details

Creates a plot with ggplot2

Value

A line plot ('gg' object).

Examples

```
power_data <- qcapower(cases = 20, null_hypo = 0.8, alt_hypo = 0.95, sims = 10, perms = 1000)
qp_run_plot(power_data)

# Using data with 10000 estimates
data(qp_sina_data)
qp_run_plot(qp_sina_data)
```

qp_sim_power *Data simulated power estimates*

Description

A dataset containing power simulations for different number of cases and different values for null- and alternative hypothesis

Usage

```
qp_sim_power
```

Format

A dataframe with simulation parameters and calculated power

Details

cases number of cases

null_hypo null hypothesis (H0)

alt_hypo alternative hypothesis

sims number of simulations

perms number of permutations

perms calculate power

---

qp_sina_data *Data simulated power estimates for plotting of 5%-quantiles*

Description

A dataset containing the estimated 5%-quantiles from a power simulation with 1000 simulations each with 10000 permutations. The value for the alternative hypothesis was set to 1.

Usage

```
qp_sina_data
```

Format

A dataframe with 1000 rows and 6 variables:

Details

power power estimate over 1000 simulations

powercum running power estimate for ith simulation

null_hypo null hypothesis (H0), set to 0.8 (irrelevant here)

alt_hypo alternative hypothesis (H1), set to 1

cases number of cases, set to 10

quant estimated 5%-quantiles per simulations

Index