Package ‘ump’

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Title Uniformly Most Powerful Tests
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Depends R (>= 3.0.2)
Imports stats, graphics
Description Does uniformly most powerful (UMP) and uniformly most powerful unbiased (UMPU) tests. At present only distribution implemented is binomial distribution. Also does fuzzy tests and confidence intervals (following Geyer and Meeden, 2005, <doi:10.1214/088342305000000340>) for the binomial distribution (one-tailed procedures based on UMP test and two-tailed procedures based on UMPU test).
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**Description**

Calculate the abstract randomized P-value for the UMPU two-tailed test for the binomial distribution.

**Usage**

```r
arpv.binom(x, n, p, plot = TRUE, ...)
```

**Arguments**

- `x`: binomial observations.
- `n`: number of observations.
- `p`: the success probability under the null hypothesis.
- `plot`: if TRUE make a plot.
- `...`: additional arguments passed to `arpv.plot`.

**Details**

The first three arguments must be scalar. Evaluates the distribution function of the abstract randomized P-value for the UMPU two-tailed test for the binomial distribution, which is a continuous, piecewise linear function. Gives the knots.

**Value**

A list containing two components:

- `alpha`: significance level values at the knots.
- `phi`: distribution function values at the knots.

**Examples**

```r
library(ump)
print(arpv.binom(10, 10, 0.7, plot = FALSE))
arpv.binom(10, 10, 0.7)
arpv.binom(10, 10, 0.7, df = FALSE)
```
arpv.plot

Plot Abstract Randomized P-value

Description

Plot either the distribution function or the probability density function of an abstract randomized P-value

Usage

arpv.plot(alpha, phi, df = TRUE, verticals = TRUE)

Arguments

alpha  significance levels at which the density is discontinuous ("knots").
phi values of the distribution function at these knots.
df if TRUE plot the distribution function, otherwise the density.
verticals if TRUE plot vertical lines at the jumps of the density. Ignored if df == TRUE.

Value

none.

Examples

out <- arpv.binom(10, 10, 0.7)
arpv.plot(out$alpha, out$phi)
arpv.plot(out$alpha, out$phi, df = FALSE)

fci.binom

Abstract Randomized P-value for the Binomial Distribution

Description

Calculate the abstract randomized P-value for the UMPU two-tailed test for the binomial distribution.

Usage

fci.binom(x, n, alpha = 0.05, p = seq(0, 1, length = 10001), flat = 1 / 4)
Arguments

- **x**: binomial observation.
- **n**: number of observations.
- **alpha**: the significance level, one minus the coverage probability.
- **p**: the vector of parameter values at which (the membership function of) the fuzzy confidence interval is evaluated.
- **flat**: the amount of flat parts of the membership function shown, expressed as a fraction of the curved parts.

Details

prints the core and support of the fuzzy confidence interval and makes one or two plots (as appropriate) showing the edges of the fuzzy interval.

Value

none

Examples

```
library(ump)
fci.binom(4, 10)
fci.binom(0, 10)
fci.binom(9, 10)
```

Description

Calculate the uniformly most powerful unbiased (UMPU) two-tailed test for the binomial distribution.

Usage

```
umpu.binom(x, n, p, alpha, maxiter = 10, tol = 1e-9)
```

Arguments

- **x**: binomial observations.
- **n**: number of observations.
- **p**: the success probability under the null hypothesis.
- **alpha**: the significance level.
- **maxiter**: the maximum number of iterations allowed.
- **tol**: tolerance used in testing floating point numbers.
Details
At most one of \( x \), \( p \), and \( \alpha \) is allowed to be a vector. Evaluates the critical function for the UMPU two-tailed test for the binomial distribution, which satisfies the following

\[
\begin{align*}
x & \leftarrow \text{seq}(0, n) \\
\text{phix} & \leftarrow \text{umpu.binom}(x, n, p, \alpha) \\
\text{px} & \leftarrow \text{dbinom}(x, n, p) \\
\text{sum(phix * px)} & == \alpha \\
\text{sum(x * phix * px)} & == n * p * \alpha
\end{align*}
\]

when \( p \) is strictly between zero and one.

Value
a vector of values of the critical function.

Examples

library(ump)
umpu.binom(0:10, 10, 0.6, 0.1)
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