Package ‘miscor’

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Type Package

Title Miscellaneous Functions for the Correlation Coefficient

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Description Statistical test for the product-moment correlation coefficient based on H0: rho = rho0 including sample size computation, statistical test for comparing the product-moment correlation coefficient in independent ad dependent samples, sequential triangular test for the product-moment correlation coefficient, partial and semipartial correlation, simulation of bivariate normal and non-normal distribution with a specified correlation.

License GPL-3

LazyLoad yes

LazyData true

Imports methods

Depends R (>= 3.0)

RoxygenNote 6.0.1

NeedsCompilation no

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R topics documented:

`comptest.cor` *Comparision of product-moment correlation coefficients*

Description

This function statistically compares product-moment correlation coefficients in independent and dependent samples.

Usage

```
comptest.cor(x = NULL, y = NULL, z = NULL, group = NULL,
             r.xy = NULL, r.xz = NULL, r.yz = NULL, n = NULL,
             r.1 = NULL, r.2 = NULL, n.1 = NULL, n.2 = NULL,
             alternative = c("two.sided", "less", "greater"),
             conf.level = 0.95, digits = 3, output = TRUE)
```

Arguments

`x`	a numeric vector.
`y`	a numeric vector.
`z`	a numeric vector.
`group`	a numeric vector indiating the group membership.
`r.xy`	alternative specification, product-moment correlation coefficient between `x` and `y`.
`r.xz`	alternative specification, product-moment correlation coefficient between `x` and `z`.
`r.yz`	alternative specification, product-moment correlation coefficient between `y` and `z`.
`n`	alternative specification, number of observations.
`r.1`	alternative specification, product-moment correlation coefficient in group 1.
`r.2`	alternative specification, product-moment correlation coefficient in group 2.

`n.1`	alternative specification, number of observations in group 1.
`n.2`	alternative specification, number of observations in group 2.
`alternative`	a character string describing the alternative hypothesis, must be one of `"two.sided"` (default), `"greater"` or `"less"`.
`conf.level`	confidence level of the interval.
`digits`	integer indicating the number of decimal places to be displayed.
`output`	logical: if `TRUE`, output is shown.

Details

In dependent samples, the function tests the two-sided null hypothesis H0: $\rho.xy = \rho.xz$ or the one-sided null hypothesis H0: $\rho.xy >= \rho.xz$ or $\rho.xy <= \rho.xz$. Function parameters are specified using either (`x`, `y`, `z`) or (`r.xy`, `r.xz`, `r.yz`, `n`). In independent samples, the function tests the two-sided null hypothesis H0: $\rho.1 = \rho.2$ or the one-sided null hypothesis H0: $\rho.1 >= \rho.2$ or $\rho.1 <= \rho.2$. Function parameters are specified using either (`x`, `y`, `group`) or (`r.1`, `r.2`, `n.1`, `n.2`).

Value

Returns an object of class `comptest.cor` with following entries:

`call`	function call
`dat`	data.frame with x, y and z (if available)
`spec`	specification of function arguments
`res`	list with results depending on the analysis (independent of dependent samples), i.e., z (test statistic), pval (significance

Author(s)

Takuya Yanagida `<takuya.yanagida@univie.ac.at>`,

References

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

Zou, G. Y. (2007). Toward using confidence intervals to compare correlation. *Psychological Methods, 12*, 399-413.

See Also

`test.cor`, `seqtest.cor`

Examples

```
# Dependent samples: Generate random data
x <- c(3, 2, 2, 3, 7, 8, 5, 9)
y <- c(2, 4, 1, 5, 7, 3, 6, 7)
z <- c(1, 4, 3, 3, 1, 4, 2, 5)
```

```
#----------------------------------------
# Dependent samples
# H0: rho.xy == rho.xz,  H1: rho.xy != rho.xz

comptest.cor(x, y, z)

#----------------------------------------
# Dependent samples
# H0: rho.xy <= rho.xz,  H1: rho.xy > rho.xz
# r.xy = 0.44, r.xz = 0.21. r.yz = 0.20, n = 120

comptest.cor(r.xy = 0.44, r.xz = 0.21, r.yz = 0.20, n = 120,
             alternative = "greater")

###

# Independent samples: Generate random data
dat <- data.frame(group = rep(1:2, each = 200),
                  rbind(sim.cor(200, rho = 0.3),
                        sim.cor(200, rho = 0.5)))

#----------------------------------------
# Independent samples
# H0: rho.1 == rho.2, H1: rho.1 != rho.2

comptest.cor(x = dat$x, y = dat$y, group = dat$group)

#----------------------------------------
# Independent samples
# H0: rho.1 >= rho.2, H1: rho.1 ! < rho.2
# Group 1: r = 0.32, n = 108
# Group 2: r = 0.56, n = 113

comptest.cor(r.1 = 0.32, n.1 = 108, r.2 = 0.56, n.2 = 113,
             alternative = "less")
```

---

conf.cor *Product-moment correlation coefficient with confidence interval*

Description

This function computes the product-moment correlation coefficient with two-sided or one-sided confidence interval using Fisher's z tranformation.

Usage

```
conf.cor(x = NULL, y = NULL, r = NULL, n = NULL,
         alternative = c("two.sided", "less", "greater"),
         conf.level = 0.95, digits = 3, output = TRUE)
```

Arguments

x	a numeric vector.
y	a numeric vector.
r	alternative specification, product-moment correlation coefficient.
n	alternative specification, number of observations.
alternative	a character string describing the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
conf.level	confidence level of the interval.
digits	integer indicating the number of decimal places to be displayed.
output	logical; if TRUE, output is shown.

Value

Returns an object of class conf.cor with following entries:

call	function call
dat	data.frame with x and y (if available)
spec	specification of function arguments
res	list with results, i.e., r (correlation coefficient), n, lower (lower limit of CI), upper (upper limit of CI)

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>,

References

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

Kubinger, K. D., Rasch, D., & Simeckova, M. (2007). Testing a correlation coefficient's significance: Using H0: $0 < \rho \leq \lambda$ is preferable to H0: ρ =0. *Psychology Science, 49*, 74-87.

See Also

test.cor, seqtest.cor, comptest.cor

Examples

```
#--------------------------------------
# Two-sided 95% Confidence Interval
# r = 0.55, n = 120

conf.cor(r = 0.55, n = 120)

#--------------------------------------
# One-sided 99% Confidence Interval
```

```
# Generate random data
dat <- sim.cor(100, rho = 0.4)

conf.cor(dat$x, dat$y, conf.level = 0.99, alternative = "less")
```

---

par.cor *Partial and semipartial correlation*

Description

This function computes the partial or semipartial correlation coefficient between two vaiables. In addition, this function can test the partial or semipartial correlation coefficient for H0: $\rho.p = \rho 0$, so that any value for $\rho 0$ can be specified.

Usage

```
par.cor(x = NULL, y = NULL, p.xy = NULL, p.x = NULL, p.y = NULL,
        sig = FALSE, rho0 = 0, alternative = c("two.sided", "less", "greater"),
        reduced = FALSE, conf.level = 0.95, digits = 3, output = TRUE)
```

Arguments

x	a numeric vector.
y	a numeric vector.
p.xy	a numeric vector or data.frame, varialbe(s) residualized from x and y.
p.x	a numeric vector or data.frame, varialbe(s) residualized only from x.
p.y	a numeric vector or data.frame, varialbe(s) residualized only from y.
sig	logical: if TRUE, statistical significance test is conducted.
rho0	a number indicating $\rho 0$, the value under the null hypothesis.
alternative	a character string describing the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
reduced	logical: if TRUE, compuatation is based on the reduced formula.
conf.level	confidence level of the interval.
digits	integer indicating the number of decimal places to be displayed.
output	logical: if TRUE, output is shown.

Details

Partial correlation is the correlation of x and y while statistically controlling for third variables specified in the argument p.xy. These variables are residualized from x and y using (multiple) regression models. Semipartial correlation is the correlation of x and y while statistically controlling for third variables only for x (specified in the argument p.x) or y (specified in the argument p.y). These variables are residualized from x or y using a (multiple) regression model.

Value

Returns an object of class par.cor with following entries:

call	function call
dat	list with data for x.resid (x residualized), y.resid (y residualized), x, y, p.xy, p.y, and p.x
spec	specification of function argument method
res	list with results, i.e., t or z (test statistic), df (degree of freedom) pval (significance value), r.p (partial or semipartial co

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>,

References

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

See Also

test.cor, conf.cor, comptest.cor, seqtest.cor

Examples

```
dat <- data.frame(x = c(4, 6, 8, 8, 9, 4),
                  y = c(3, 7, 9, 8, 9, 3),
                  z = c(1, 3, 4, 4, 5, 2))

#-------------------------------------
# Partial correlation

par.cor(dat$x, dat$y, p.xy = dat$z)

#-------------------------------------
# Semipartial correlation
# remove z from x

par.cor(dat$x, dat$y, p.x = dat$z)

#-------------------------------------
# Semipartial correlation
# remove z from y

par.cor(dat$x, dat$y, p.y = dat$y)

#-------------------------------------
# Partial correlation: Two-sided test
# H0: rho.p == 0, H1: rho.p != 0

par.cor(dat$x, dat$y, p.xy = dat$z, sig = TRUE)

#-------------------------------------
# Partial correlation: One-sided test
# H0: rho.p <= 0.2, H1: rho.p > 0.2
```

```
par.cor(dat$x, dat$y, p.xy = dat$z, sig = TRUE,
        rho0 = 0.4, alternative = "less")
```

---

plot.seqtest *Plot seqtest*

Description

This function plots the seqtest object

Usage

```
## S3 method for class 'seqtest'
plot(x, ...)
```

Arguments

x	seqtest object
...	further arguments passed to or from other methods

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>

References

Rasch, D., Pilz, J., Verdooren, L. R., & Gebhardt, G. (2011). *Optimal experimental design with R*. Boca Raton: Chapman & Hall/CRC.

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

Schneider, B., Rasch, D., Kubinger, K. D., & Yanagida, T. (2015). A Sequential triangular test of a correlation coefficient's null-hypothesis: $0 < \rho \leq \rho 0$. *Statistical Papers, 56*, 689-699.

See Also

seqtest.cor, print.seqtest

Examples

```
#--------------------------------------
# Sequential triangular test for the product-moment correlation coefficient

seq.obj <- seqtest.cor(0.46, k = 14, rho = 0.3, delta = 0.2,
                       alpha = 0.05, beta = 0.2)

plot(seq.obj)
```

plot.sim.seqtest.cor *Plot sim.seqtest*

Description

This function plots the `sim.seqtest.cor` object

Usage

```
## S3 method for class 'sim.seqtest.cor'
plot(x, plot.lines = TRUE, plot.nom = TRUE,
                         ylim = NULL, type = "b", pch = 19, lty = 1, lwd = 1, ...)
```

Arguments

`x`	`sim.seqtest.cor` object.
`plot.lines`	plot lines connecting points withe the x- and y-axis.
`plot.nom`	plot line at the nominal alpha.
`ylim`	the y limits of the plot.
`type`	what type of plot should be drawn (`"p"` for points, `"l"` for lines and `"b"` for both).
`pch`	plotting character.
`lty`	line type.
`lwd`	line width.
`...`	further arguments passed to or from other methods.

Author(s)

Takuya Yanagida `<takuya.yanagida@univie.ac.at>`

References

Schneider, B., Rasch, D., Kubinger, K. D., & Yanagida, T. (2015). A Sequential triangular test of a correlation coefficient's null-hypothesis: $0 < \rho \le \rho 0$. *Statistical Papers, 56*, 689-699.

See Also

`sim.seqtest.cor`, `seqtest.cor`

Examples

```
## Not run:

#-----------------------------------------------
# Determine optimal k and nominal type-II-risk
# H0: rho <= 0.3, H1: rho > 0.3
# alpha = 0.01, beta = 0.05, delta = 0.25

# Step 1: Determine the optimal size of subsamples (k)

sim.obj.1 <- sim.seqtest.cor(rho.sim = 0.3, k = seq(4, 16, by = 1), rho = 0.3,
                             alternative = "greater",
                             delta = 0.25, alpha = 0.05, beta = 0.05,
                             runs = 10000)

plot(sim.obj.1)

# Step 2: Determine the optimal nominal type-II-risk based on
#         the optimal size of subsamples (k) from step 1

sim.obj.2 <- sim.seqtest.cor(rho.sim = 0.55, k = 16, rho = 0.3,
                             alternative = "greater",
                           delta = 0.25, alpha = 0.05, beta = seq(0.05, 0.15, by = 0.01),
                             runs = 10000)

plot(sim.obj.2)

## End(Not run)
```

`print.comptest.cor` *Print comptest.cor*

Description

This function prints the `comptest.cor` object

Usage

```
## S3 method for class 'comptest.cor'
print(x, ...)
```

Arguments

`x`	`comptest.cor` object.
`...`	further arguments passed to or from other methods.

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>

References

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

Zou, G. Y. (2007). Toward using confidence intervals to compare correlation. *Psychological Methods, 12*, 399-413.

See Also

comptest.cor

Examples

```
#--------------------------------------
# Dependent samples

# Generate random data
x <- c(3, 2, 2, 3, 7, 8, 5, 9)
y <- c(2, 4, 1, 5, 7, 3, 6, 7)
z <- c(1, 4, 3, 3, 1, 4, 2, 5)

#.........................................
# H0: rho.xy == rho.xz,  H1: rho.xy != rho.xz

obj <- comptest.cor(x, y, z, output = FALSE)
print(obj)

#........................................
# H0: rho.xy <= rho.xz,  H1: rho.xy > rho.xz
# r.xy = 0.44, r.xz = 0.21. r.yz = 0.20, n = 120

obj <- comptest.cor(r.xy = 0.44, r.xz = 0.21, r.yz = 0.20, n = 120,
                    alternative = "greater", output = FALSE)
print(obj)

#--------------------------------------
# Independent samples

# Generate random data
dat <- data.frame(group = rep(1:2, each = 200),
                  rbind(sim.cor(200, rho = 0.3),
                        sim.cor(200, rho = 0.5)))

#....................................
# H0: rho.1 == rho.2, H1: rho.1 != rho.2

obj <- comptest.cor(x = dat$x, y = dat$y, group = dat$group,
                    output = FALSE)
print(obj)

#.....................................
# H0: rho.1 >= rho.2, H1: rho.1 ! < rho.2
```

```
# Group 1: r = 0.32, n = 108
# Group 2: r = 0.56, n = 113

obj <- comptest.cor(r.1 = 0.32, n.1 = 108, r.2 = 0.56, n.2 = 113,
                    alternative = "less", output = FALSE)
print(obj)
```

`print.conf.cor` *Print cor.conf*

Description

This function prints the `cor.conf` object

Usage

```
## S3 method for class 'conf.cor'
print(x, ...)
```

Arguments

`x`	`cor.conf` object.
`...`	further arguments passed to or from other methods.

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>

References

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

Kubinger, K. D., Rasch, D., & Simeckova, M. (2007). Testing a correlation coefficient's significance: Using H0: $0 < \rho \le \lambda$ is preferable to H0: $\rho = 0$. *Psychology Science, 49*, 74-87.

See Also

conf.cor

Examples

```
#--------------------------------------
# Two-sided 95% Confidence Interval
# r = 0.55, n = 120

obj <- conf.cor(r = 0.55, n = 120, output = FALSE)
print(obj)
```

```
#----------------------------------------
# One-sided 99% Confidence Interval

# Generate random data
dat <- sim.cor(100, rho = 0.4)

obj <- conf.cor(dat$x, dat$y, conf.level = 0.99, alternative = "less",
               output = FALSE)
print(obj)
```

`print.par.cor` *Print par.cor*

Description

This function prints the `par.cor` object

Usage

```
## S3 method for class 'par.cor'
print(x, ...)
```

Arguments

`x`	`par.cor` object.
`...`	further arguments passed to or from other methods.

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>

References

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

See Also

`par.cor`

Examples

```
dat <- data.frame(x = c(4, 6, 8, 8, 9, 4),
                  y = c(3, 7, 9, 8, 9, 3),
                  z = c(1, 3, 4, 4, 5, 2))

#----------------------------------------
# Partial correlation
```

```
obj <- par.cor(dat$x, dat$y, p.xy = dat$z, output = FALSE)
print(obj)

#-------------------------------------
# Semipartial correlation
# remove z from x

obj <- par.cor(dat$x, dat$y, p.x = dat$z, output = FALSE)
print(obj)

#-------------------------------------
# Semipartial correlation
# remove z from y

obj <- par.cor(dat$x, dat$y, p.y = dat$y, output = FALSE)
print(obj)

#-------------------------------------
# Partial correlation: Two-sided test
# H0: rho.p == 0, H1: rho.p != 0

obj <- par.cor(dat$x, dat$y, p.xy = dat$z, sig = TRUE,
               output = FALSE)
print(obj)

#-------------------------------------
# Partial correlation: One-sided test
# H0: rho.p <= 0.2, H1: rho.p > 0.2

obj <- par.cor(dat$x, dat$y, p.xy = dat$z, sig = TRUE,
               rho0 = 0.4, alternative = "less", output = FALSE)
print(obj)
```

---

print.seqtest *Print seqtest*

Description

This function prints the `seqtest` object

Usage

```
## S3 method for class 'seqtest'
print(x, ...)
```

Arguments

`x`	`seqtest` object.
`...`	further arguments passed to or from other methods.

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>

References

Rasch, D., Pilz, J., Verdooren, L. R., & Gebhardt, G. (2011). *Optimal experimental design with R*. Boca Raton: Chapman & Hall/CRC.

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

Schneider, B., Rasch, D., Kubinger, K. D., & Yanagida, T. (2015). A Sequential triangular test of a correlation coefficient's null-hypothesis: $0 < \rho \leq \rho 0$. *Statistical Papers, 56*, 689-699.

See Also

seqtest.cor, plot.seqtest

Examples

```
#--------------------------------------
# Sequential triangular test for product-moment correlation coefficient

seq.obj <- seqtest.cor(0.46, k = 14, rho = 0.3, delta = 0.2,
                       alpha = 0.05, beta = 0.2, output = FALSE)

print(seq.obj)
```

---

print.sim.seqtest.cor *Print sim.seqtest*

Description

This function prints the sim.seqtest.cor object

Usage

```
## S3 method for class 'sim.seqtest.cor'
print(x, ...)
```

Arguments

x	sim.seqtest.cor object.
...	further arguments passed to or from other methods.

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>

References

Schneider, B., Rasch, D., Kubinger, K. D., & Yanagida, T. (2015). A Sequential triangular test of a correlation coefficient's null-hypothesis: $0 < \rho \leq \rho 0$. *Statistical Papers, 56*, 689-699.

See Also

`sim.seqtest.cor`, `plot.sim.seqtest.cor`

Examples

```
## Not run:

#----------------------------------------------
# Determine optimal k and nominal type-II-risk
# H0: rho <= 0.3, H1: rho > 0.3
# alpha = 0.01, beta = 0.05, delta = 0.25

# Step 1: Determine the optimal size of subsamples (k)

sim.obj <- sim.seqtest.cor(rho.sim = 0.3, k = seq(4, 16, by = 1), rho = 0.3,
                           alternative = "greater",
                           delta = 0.25, alpha = 0.05, beta = 0.05,
                           runs = 10000, output = FALSE)

print(sim.obj)

# Step 2: Determine the optimal nominal type-II-risk based on
#         the optimal size of subsamples (k) from step 1

sim.obj <- sim.seqtest.cor(rho.sim = 0.55, k = 16, rho = 0.3,
                           alternative = "greater",
                          delta = 0.25, alpha = 0.05, beta = seq(0.05, 0.15, by = 0.01),
                           runs = 10000, output = FALSE)

print(sim.obj)

## End(Not run)
```

---

print.size *Print size*

Description

This function prints the `size` object

Usage

```
## S3 method for class 'size'
print(x, ...)
```

Arguments

x	size object.
...	further arguments passed to or from other methods.

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>

References

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

See Also

size.cor

Examples

```
#--------------------------------------
# H0: rho = 0.3, H1: rho != 0.3
# alpha = 0.05, beta = 0.2, delta = 0.2

n <- size.cor(delta = 0.2, rho = 0.3, alpha = 0.05, beta = 0.2,
              output = FALSE)

print(n)
```

---

print.test.cor *Print cor.rhotest*

Description

This function prints the test.cor object

Usage

```
## S3 method for class 'test.cor'
print(x, ...)
```

Arguments

x	test.cor object.
...	further arguments passed to or from other methods.

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>

References

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

Kubinger, K. D., Rasch, D., & Simeckova, M. (2007). Testing a correlation coefficient's significance: Using H0: $0 < \rho \leq \lambda$ is preferable to H0: $\rho = 0$. *Psychology Science, 49*, 74-87.

See Also

test.cor

Examples

```
#--------------------------------------
# Two-sided test
# H0: rho == 0, H1: rho != 0
# r = 0.23, n = 60

obj <- test.cor(r = 0.23, n = 120, output = FALSE)
print(obj)

#--------------------------------------
# Two-sided test
# H0: rho == 0.4, H1: rho != 0.4
# r = 0.55, n = 120

obj <- test.cor(r = 0.55, n = 120, rho0 = 0.4,
                output = FALSE)
print(obj)

#--------------------------------------
# One-sided test
# H0: rho <= 0.4, H1: rho > 0.4

# Generate random data
dat <- sim.cor(100, rho = 0.4)

obj <- test.cor(dat$x, dat$y, rho0 = 0.4, output = FALSE)
print(obj)
```

---

scatterplot *Scatterplot Matrices*

Description

This function produces a scatterplot matrix for integer data

Usage

```
scatterplot(dat, type = c("jitter", "size", "count", "sun", "identity"),
             barplot = TRUE, curves = TRUE)
```

Arguments

`dat`	a dat frame
`type`	type of plot, i.e., 'jitter', 'size', 'count', 'sun', and 'identity'
`barplot`	logical: if `TRUE` barplots are shown in the diagonals.
`curves`	logical: if `TRUE` lowess smoothing curves are added in the upper diagonal.

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>

References

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

See Also

`test.cor`, `seqtest.cor`

Examples

```
dat <- round(sim.cor(200, rho = 0.7))

# Scatterplot matrix: jitter
scatterplot(dat)

# Scatterplot matrix: size
scatterplot(dat, type = "size")

# Scatterplot matrix: count
scatterplot(dat, type = "count")

# Scatterplot matrix: sun
scatterplot(dat, type = "sun")
```

---

seqtest.cor — *Sequential triangular test for the product-moment correlation coefficient*

Description

This function performs the sequential triangular test for the product-moment correlation coefficient

Usage

```
seqtest.cor(x, k, rho,
            alternative = c("two.sided", "less", "greater"),
            delta, alpha = 0.05, beta = 0.1,
            output = TRUE, plot = FALSE)
```

Arguments

x	initial data, i.e., product-moment correlation coefficient in a sub-sample of k observations.
k	number of observations in each sub-sample.
rho	a number indicating the correlation under the null hypothesis, $\rho 0$.
alternative	a character string specifying the alternative hypothesis,
delta	minimum difference to be detected, δ.
alpha	type-I-risk, α.
beta	type-II-risk, β.
output	logical: if TRUE, output is shown.
plot	logical: if TRUE, an initial plot is generated.

Details

Null and alternative hypothesis is specified using arguments rho and delta. Note that the argument k (i.e., number of observations in each sub-sample) has to be specified. At least k = 4 is needed. The optimal value of k should be determined based on statistical simulation using sim.seqtest.cor function.

In order to specify a one-sided test, argument alternative has to be used (i.e., two-sided tests are conducted by default). That is, alternative = "less" specifies the null hypothesis, H0: ρ >= $\rho 0$ and the alternative hypothesis, H1: ρ < $\rho 0$; alternative = "greater" specifies the null hypothesis, H0: ρ <= $\rho 0$ and the alternative hypothesis, H1: ρ > $\rho 0$.

The main characteristic of the sequential triangular test is that there is no fixed sample size given in advance. That is, for the most recent sampling point, one has to decide whether sampling has to be continued or either the null- or the alternative hypothesis can be accepted given specified precision requirements (i.e. type-I-risk, type-II-risk and an effect size). The sequence of data pairs must we split into sub-samples of length k >= 4 each. The (cumulative) test statistic Z.m on a Cartesian coordinate system produces a "sequential path" on a continuation area as a triangle. As long as the statistic remains within that triangle, additional data have to be sampled. If the path touches or exceeds the borderlines of the triangle, sampling is completed. Depending on the particular borderline, the null-hypothesis is either accepted or rejected.

Value

Returns an object of class seqtest, to be used for later update steps. The object has following entries:

call	function call
type	type of the test (i.e., correlation coefficient)
spec	specification of function arguments
tri	specification of triangular
dat	data
res	list with results

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>,

References

Schneider, B., Rasch, D., Kubinger, K. D., & Yanagida, T. (2015). A Sequential triangular test of a correlation coefficient's null-hypothesis: $0 < \rho \leq \rho 0$. *Statistical Papers, 56*, 689-699.

See Also

update.seqtest, sim.seqtest.cor

Examples

```
#--------------------------------------
# H0: rho = 0.3, H1: rho != 0.3
# alpha = 0.05, beta = 0.2, delta = 0.2

seq.obj <- seqtest.cor(0.46, k = 14, rho = 0.3, delta = 0.2,
                       alpha = 0.05, beta = 0.2, plot = TRUE)

seq.obj <- update(seq.obj, c(0.56, 0.76, 0.56, 0.52))

#--------------------------------------
# H0: rho <= 0.3, H1: rho > 0.3
# alpha = 0.05, beta = 0.2, delta = 0.2

seq.obj <- seqtest.cor(0.46, k = 14, rho = 0.3,
                       alternative = "greater", delta = 0.2,
                       alpha = 0.05, beta = 0.2, plot = TRUE)

seq.obj <- update(seq.obj, c(0.56, 0.76, 0.66))
```

---

sim.cor *Simulate bivariate distribution with a specified correlation*

Description

This function simulates bivariate distribution with correaltion equal to rho, mean equal to mean, standard deviation equal to sd, skewness equal to skewness, and kurtosis equal to kurtosis by Fleishman polynomials. Note that that the specified skewness and kurtosis parameters have to be in line with $kurtosis$ >= ($skewnewss$^2 - 2)

Usage

```
sim.cor(n, rho, mean = c(0, 0), sd = c(1, 1),
        skewness = c(0, 0), kurtosis = c(0, 0))
```

Arguments

n	number of observations.
rho	correlation.
mean	mean vector.
sd	standard deviation vector.
skewness	skewness vector.
kurtosis	kurtosis vector.

Value

Returns a data.frame with variables x and y.

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>,

References

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

See Also

test.cor, seqtest.cor, comptest.cor,

Examples

```
#------------------------------------------------
# Bivariate  distribution with rho = 0.3, n = 200
# x: skewness = 0, kurtosis = 0
# y: skewness = 0, kurtosis = 0

sim.cor(200, rho = 0.3)

#-----------------------------------------------
# Bivariate distribution with rho = 0.4, n = 500
# x: skewness = 0, kurtosis = 1.5
# y: skewness = 2, kurtosis = 7

sim.cor(500, rho = 0.4, skewness = c(0, 1.5), kurtosis = c(2, 7))
```

sim.seqtest.cor *Simulation of the sequential triangular test for the product-moment correlation coefficient*

Description

This function performs a statistical simulation for the sequential triangular test for the product-moment correlation coefficient

Usage

```
sim.seqtest.cor(rho.sim, k, rho,
                alternative = c("two.sided", "less", "greater"),
                delta, alpha = 0.05, beta = 0.1, runs = 1000,
                m.x = 0,  sd.x = 1, m.y = 0, sd.y = 1,
                digits = 3, output = TRUE, plot = FALSE)
```

Arguments

`rho.sim`	simulated population correlation coefficient, ρ.
`k`	an integer or a numerical vector indicating the number of observations in each sub-sample.
`rho`	a number indicating the correlation under the null hypothesis, $\rho 0$.
`alternative`	a character string specifying the alternative hypothesis,
`delta`	minimum difference to be detected, δ.
`alpha`	type-I-risk, α.
`beta`	an integer or a numerical vector indicating the type-II-risk, β.
`runs`	numer of simulation runs.
`m.x`	population mean of simulated vector x.
`sd.x`	population standard deviation of simulated vector x.
`m.y`	population mean of simulated vector y.
`sd.y`	population standard deviation of simulated vector y.
`digits`	integer indicating the number of decimal places to be displayed.
`output`	logical: if `TRUE`, output is shown.
`plot`	logical: if `TRUE`, plot is shown.

Details

In order to determine the optimal k, simulation is conducted under the H0 condition, i.e., `rho.sim = rho`. Simulation is carried out for a sequence of k values to seek for the optimal k where the empirical alpha is as close as possible to the nominal alpha. In order to determine optimal beta (with fixed k), simulation is conudcted under the H1 condition, i.e., `rho.sim = rho + delta` or rho.sim = rho - delta. Simulation is carried out for a sequencen of beta values to seek for the optimal beta where the empirical beta is as close as possible to the nominal beta.

In order to specify a one-sided test, argument alternative has to be used (i.e., two-sided tests are conducted by default). Specifying argument alternative = "less" conducts the simulation for the null hypothesis, H0: ρ >= ρ.0 with the alternative hypothesis, H1: ρ < ρ.0; specifying argument alternative = "greater" conducts the simluation for the null hypothesis, H0: ρ <= ρ.0 with the alternative hypothesis, H1: ρ > ρ.0.

Value

Returns an object of class sim.seqtest.cor with following entries:

call	function call
spec	specification of function arguments
simres	list with results (for each k or beta) for each run
res	data.frame with results, i.e., k, alpha.nom (nominal alpha), alpha.emp (estimated empirical alpha), beta.nom (nomin

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>,

References

Schneider, B., Rasch, D., Kubinger, K. D., & Yanagida, T. (2015). A Sequential triangular test of a correlation coefficient's null-hypothesis: $0 < \rho \leq \rho 0$. *Statistical Papers, 56*, 689-699.

See Also

seqtest.cor, plot.sim.seqtest.cor, print.sim.seqtest.cor

Examples

```
## Not run:
#----------------------------------------------
# Determine optimal k and nominal type-II-risk
# H0: rho <= 0.3, H1: rho > 0.3
# alpha = 0.01, beta = 0.05, delta = 0.25

# Step 1: Determine the optimal size of subsamples (k)

sim.seqtest.cor(rho.sim = 0.3, k = seq(4, 16, by = 1), rho = 0.3,
                alternative = "greater",
                delta = 0.25, alpha = 0.05, beta = 0.05,
                runs = 10000, plot = TRUE)

# Step 2: Determine the optimal nominal type-II-risk based on
#         the optimal size of subsamples (k) from step 1

sim.seqtest.cor(rho.sim = 0.55, k = 16, rho = 0.3,
                alternative = "greater",
```

```
                delta = 0.25, alpha = 0.05, beta = seq(0.05, 0.15, by = 0.01),
                runs = 10000, plot = TRUE)

## End(Not run)
```

size.cor *Sample size determination for testing the product-moment correlation coefficient*

Description

This function performs sample size computation for testing the product-moment correlation coefficient for H0: $\rho = \rho 0$ based on precision requirements (i.e., type-I-risk, type-II-risk and an effect size).

Usage

```
size.cor(rho = NULL, delta, alternative = c("two.sided", "less", "greater"),
         alpha = 0.05, beta = 0.1, output = TRUE)
```

Arguments

rho	a number indicating the correlation coefficient under the null hypothesis, $\rho 0$.
delta	minimum difference to be detected, δ.
alternative	a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
alpha	type-I-risk, α.
beta	type-II-risk, β.
output	logical: if TRUE, output is shown.

Value

Returns an object of class size with following entries:

call	function call
type	type of the test (i.e., correlation coefficient)
spec	specification of function arguments
res	list with the result, i.e., optimal sample size

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>,

References

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

Rasch, D., Pilz, J., Verdooren, L. R., & Gebhardt, G. (2011). *Optimal experimental design with R*. Boca Raton: Chapman & Hall/CRC.

See Also

test.cor, seqtest.cor

Examples

```
#-------------------------------------
# H0: rho = 0.3, H1: rho != 0.3
# alpha = 0.05, beta = 0.2, delta = 0.2

size.cor(rho = 0.3, delta = 0.2, alpha = 0.05, beta = 0.2)

#-------------------------------------
# H0: rho <= 0.3, H1: rho > 0.3
# alpha = 0.05, beta = 0.2, delta = 0.2

size.cor(rho = 0.3, delta = 0.2, alternative = "greater",
         alpha = 0.05, beta = 0.2)
```

---

test.cor — *Test for the product-moment correlation coefficient for H0: $\rho = \rho 0$*

Description

This function tests the product-moment correlation coefficient for H0: $\rho = \rho 0$, so that any value for $\rho 0$ can be specified.

Usage

```
test.cor(x = NULL, y = NULL, r = NULL, n = NULL, rho0 = 0,
         alternative = c("two.sided", "less", "greater"), reduced = FALSE,
         conf.level = 0.95, digits = 3, output = TRUE)
```

Arguments

x	a numeric vector.
y	a numeric vector.
r	alternative specification, product-moment correlation coefficient.
n	alternative specification, number of observations.
rho0	a number indicating $\rho 0$, the value under the null hypothesis.

alternative	a character string describing the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less".
reduced	logical: if TRUE, compuatation is based on the reduced formula.
conf.level	confidence level of the interval.
digits	integer indicating the number of decimal places to be displayed.
output	logical: if TRUE, output is shown.

Details

Computation is based on Fisher's z transformation $\mathbf{z} = 0.5/cdotln(\frac{1+r}{1-r})$. The difference between the full formula (i.e., reduced = FALSE) and the reduced formula (i.e., reduced = TRUE) is that the full formula includes the term $\frac{\rho}{n-1}$ in the formula of the exectation *E*, i.e.,

$$E(\mathbf{z}) = 0.5/cdotln(\frac{1+\rho}{1-\rho}) + \frac{\rho}{n-1}$$

whereas the reduced formula does not include this term, i.e.,

$$E(\mathbf{z}) = 0.5/cdotln(\frac{1+\rho}{1-\rho})$$

It is recommended to always use the full formula, especially in small samples.

Value

Returns an object of class test.cor with following entries:

call	function call
dat	data.frame with x and y (if available)
spec	specification of function arguments
res	list with results, i.e., t or z (test statistic), df (degree of feedom), pval (significance value), r (correlation coefficient), n

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>,

References

Cramer, H. (1946). *Mathematical methods of statistics*. Princeton: Princeton Press.

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

Kubinger, K. D., Rasch, D., & Simeckova, M. (2007). Testing a correlation coefficient's significance: Using H0: $0 < \rho \leq \lambda$ is preferable to H0: ρ =0. *Psychology Science, 49*, 74-87.

See Also

size.cor, comptest.cor, seqtest.cor

Examples

```
#--------------------------------------
# Two-sided test
# H0: rho == 0, H1: rho != 0
# r = 0.23, n = 60

test.cor(r = 0.23, n = 120)

#--------------------------------------
# Two-sided test
# H0: rho == 0.4, H1: rho != 0.4
# r = 0.55, n = 120

test.cor(r = 0.55, n = 120, rho0 = 0.4)

#--------------------------------------
# One-sided test
# H0: rho <= 0.4, H1: rho > 0.4

# Generate random data
dat <- sim.cor(100, rho = 0.4)

test.cor(dat$x, dat$y, rho0 = 0.4)
```

`update.seqtest` *Update seqtest*

Description

This function updates the `seqtest` object

Usage

```
## S3 method for class 'seqtest'
update(object, x = NULL, y = NULL, initial = FALSE,
                            output = TRUE, plot = TRUE, ...)
```

Arguments

`object`	`cor.seqtest` object.
`x`	data for group 1.
`y`	data for group 2.
`initial`	logical, used internally for creating a `seqtest` object
`output`	logical: if `TRUE`, output is shown.
`plot`	logical: if `TRUE`, plot is shown.
`...`	further arguments passed to or from other methods.

Author(s)

Takuya Yanagida <takuya.yanagida@univie.ac.at>

References

Rasch, D., Pilz, J., Verdooren, L. R., & Gebhardt, G. (2011). *Optimal experimental design with R*. Boca Raton: Chapman & Hall/CRC.

Rasch, D., Kubinger, K. D., & Yanagida, T. (2011). *Statistics in psychology - Using R and SPSS*. New York: John Wiley & Sons.

Schneider, B., Rasch, D., Kubinger, K. D., & Yanagida, T. (2015). A Sequential triangular test of a correlation coefficient's null-hypothesis: $0 < \rho \le \rho 0$. *Statistical Papers, 56*, 689-699.

See Also

seqtest.cor,

Examples

```
#-----------------------------------------
# Sequential triangular test for the product-moment correlation coefficient

seq.obj <- seqtest.cor(0.46, k = 14, rho = 0.3, delta = 0.2,
                       alpha = 0.05, beta = 0.2, plot = TRUE)

seq.obj <- update(seq.obj, c(0.56, 0.76, 0.56, 0.52))
```

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