Package ‘psychometric’

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Type Package

Title Applied Psychometric Theory

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Description Contains functions useful for correlation theory,
meta-analysis (validity-generalization), reliability,
item analysis, inter-rater reliability, and classical utility.

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Contents

`psychometric-package` *Applied Psychometric Theory*

Description

Contains functions useful for correlation theory, meta-analysis (validity-generalization), reliability, item analysis, inter-rater reliability, and classical utility

Details

Package:	psychometric
Type:	Package
Version:	2.4
License:	GPL (version 2.0 or later)

This package corresponds to the basic concepts encountered in an introductory course in Psychometric Theory at the Graduate level. It is especially useful for Industrial/Organizational Psychologists, but will be useful for any student or practitioner of psychometric theory. I originally developed this package to correspond with concepts covered illustrated in PSYC 7429 at the University of MO - St. Louis course in Psychometric Theory.

Author(s)

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See Also

multilevel-package ltm-package psy-package polycor-package nlme-package

Examples

```
# Convert Pearson r to Fisher z'
r2z (.51)
# Convert Fisher z' to r
z2r (.563)

# Construct a CI about a True Score
# Observed = 700, Test Ave. = 500, SD = 100, and reliability = .9
CI.tscore (700, 500, 100, .9)

# Compute the classical utility of a test
# Assuming base-rate = .5, selection ratio = .5 and rxy = .5
ClassUtil(rxy=.5, BR=.5, SR=.5)

# Examine test score items
data(TestScores)
item.exam(TestScores[,1:10], y = TestScores[,11], discrim=TRUE)
```

`ABHt32` *Table 3.2 from Arthur et al*

Description

These data are used as an example in ch. 3 of Conducting Meta-Analysis using SAS. The data appear in table 3.1 and 3.2 on pages 66 and 68. The example data are useful in illustrating simple meta-analysis concepts.

Usage

```
data(ABHt32)
```

Format

A data frame with 10 observations on the following 7 variables.

- *study* Study code
- *Rxy* Published Correlation
- *n* Sample Size
- *Rxx* Reliability of Predictor
- *Ryy* Reliability of Criterion
- *u* Range Restriction Ratio
- *moderator* Gender

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Examples

```
data(ABHt32)
str(ABHt32)
rbar(ABHt32)
FunnelPlot(ABHt32)
```

alpha *Cronbach's Coefficient Alpha*

Description

Coefficient alpha is a measure of internal consistency. It is a standard measure of reliability for tests.

Usage

```
alpha(x)
```

Arguments

x Data.frame or matrix object with rows corresponding individuals and columns to items

Details

You can specify any portion of a matrix or data.frame. For instance, if using a data.frame with numerous variables corresponding to items, one can specify subsets of those items. See examples below.
alpha <- $k/(k-1)*(1-SumSxi/Sx)$
where k is the number of items, Sx is the standard deviaton of the total test, and SumSxi is the sum of the standard deviations for each item.

Value

coefficient alpha

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 6,* 297-334.

See Also

alpha.CI

Examples

```
data(attitude)
alpha(attitude)
alpha(attitude[,1:5])
```

alpha.CI — *Confidence Interval for Coefficient Alpha*

Description

Computes a one-tailed (or two-tailed) CI at the desired level for coefficient alpha

Usage

```
alpha.CI(alpha, k, N, level = 0.90, onesided = FALSE)
```

Arguments

`alpha`	coefficient alpha to use for CI construction
`k`	number if items
`N`	sample size
`level`	Significance Level for constructing the CI, default is .90
`onesided`	return a one-sided (one-tailed) test, default is FALSE

Details

By inputting alpha, number of items and sample size, one can make inferences via a confidence interval. This can be used to compare two alpha coefficients (e.g., from two groups), or to compare alpha to some specified value (e.g., > = .7). onesided = FALSE renders a two-sided test (i.e., this is the difference between tails of .025/.975 and .05/.95)

Value

Returns a table with 3 elements

`LCL`	lower confidence limit of CI
`ALPHA`	coefficient alpha
`UCL`	upper confidence limit of CI

Warning

You must first compute alpha and then enter into function. `alpha.CI` will not evaluate a data.frame or matrix object.

Note

Feldt et al., provide a number of procedures for making inferences about alpha (e.g., F test of the null hypothesis). Since the CI is the most versatile, it is the only function created in this package

Author(s)

Thomas D. Fletcher `<t.d.fletcher05@gmail.com>`

References

Feldt, L. S., Woodruff, D. J., & Salih, F. A. (1987). Statistical inferences for coefficient alpha. *Applied Psychological Measurement, 11,* 93-103.

See Also

alpha

Examples

```
# From Feldt et al (1987)
# alpha = .79, #items = 26, #examinees = 41
# a two-tailed test 90% level

alpha.CI(.79, 26, 41)
```

---

artifacts *Artifact Distribtutions Used in Meta-Analysis*

Description

Three artifact distributions are computed with each of these three functions which are then used to correct the observed sample-weighted mean correlation for attenuation. The artifacts are reliability in predictor, reliability in criterion, and range-restriction.

Usage

```
aRxx(x)
bRyy(x)
cRR(x)
```

Arguments

x	A matrix or data.frame with columns Rxx, Ryy, and u: see EnterMeta

Details

- *aRxx* Distribution of measurement error in the predictor: a = sqrt(Rxx)
- *bRyy* Distribution of measurement error in the criterion: b = sqrt(Ryy)
- *cRR* Degree of range restriction indicated by ratio u
  (restricted SD/unrestricted SD): $c = sqrt((1 - u^2) * rb^2 + u^2)$.

These are used in the computation of the compound attentuation factor CAFAA = mean(a)*mean(b)*mean(c).

Value

A list containing:

- `ma` Mean of a (or b or c)
- `va` Variance of a (or b or c)

Note

One usually will not use these functions alone, but rather use functions that make use of these correction factors.

Author(s)

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References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

rhoCA, varAV, varResT, pvaaa

Examples

```
# From Arthur et al
data(ABHt32)
aRxx(ABHt32)
bRyy(ABHt32)
cRR(ABHt32)
rhoCA(ABHt32)

# From Hunter et al
data(HSJt35)
aRxx(HSJt35)
bRyy(HSJt35)
cRR(HSJt35)
rhoCA(HSJt35)
```

CAFAA *Compound Attenuation Factor for Meta-Analytic Artifact Corrections*

Description

The compound attenuation factor is computed as the product of the mean for each artifact distribution (square root of artifact) when correcting for attenuation in a correlation coefficient.

Usage

```
CAFAA(x)
```

Arguments

x A matrix or data.frame with columns Rxx, Ryy, and u: see `EnterMeta`

Details

The compound attenuation factor is computed as the product of mean(a)*mean(b)*mean(c) where
a = sqrt(Rxx) and is computed with the function `aRxx`
b = sqrt(Ryy) and is computed with the function `bRyy`
c = $sqrt((1 - u^2) * rbar^2 + u^2)$ and is computed with the function `cRR`

Value

A numeric value representing the compound attenuation factor

Note

This value is used in the correction for artifacts of a correlation coefficient

Author(s)

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References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

`rhoCA`, `aRxx`, `bRyy`, `cRR`

Examples

```
#From Arthur et al
data(ABHt32)
CAFAA(ABHt32)
rhoCA(ABHt32)

# From Hunter et al
data(HSJt35)
CAFAA(HSJt35)
rhoCA(HSJt35)
```

CI.Rsq *Confidence Interval for R-squared*

Description

Computes the confidence interval for a desired level for the squared-multiple correlation

Usage

```
CI.Rsq(rsq, n, k, level = 0.95)
```

Arguments

rsq	Squared Multiple Correlation
n	Sample Size
k	Number of Predictors in Model
level	Significance Level for constructing the CI, default is .95

Details

CI is constructed based on the approximate SE of Rsq
$sersq < -sqrt((4 * rsq * (1 - rsq)^2 * (n - k - 1)^2)/((n^2 - 1) * (n + 3)))$

Value

Returns a table with 4 elements

Rsq	Squared Multiple Correlation
SErsq	Standard error of Rsq
LCL	Lower Confidence Limit of the CI
UCL	Upper Confidence Limit of the CI

Note

This is an adequate approximation for n > 60

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Olkin, I. & Finn, J. D. (1995). Correlation Redux. *Psychological Bulletin, 118*, 155-164.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.).* Mahwah, NJ: Lawrence Erlbaum.

See Also

CI.Rsqlm

Examples

```
# see section 3.6.2 Cohen et al (2003)
# 95 percent CI
CI.Rsq(.5032, 62, 4, level = .95)
# 80 percent CI
CI.Rsq(.5032, 62, 4, level = .80)
```

`CI.Rsqlm` *Confidence Interval for Rsq - from lm()*

Description

Computes the CI for a desired level based on an object of class lm()

Usage

```
CI.Rsqlm(obj, level = 0.95)
```

Arguments

obj	object of a linear model
level	Significance Level for constructing the CI, default is .95

Details

Extracts the necessary information from the linear model object and uses CI.Rsq

Value

Returns a table with 4 elements

Rsq	Squared Multiple Correlation
SErsq	Standard error of Rsq
LCL	Lower Confidence Limit of the CI
UCL	Upper Confidence Limit of the CI

Note

This is an adequate approximation for n > 60

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Olkin, I. & Finn, J. D. (1995). Correlation Redux. *Psychological Bulletin, 118*, 155-164.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.).* Mahwah, NJ: Lawrence Erlbaum.

See Also

CI.Rsq

Examples

```
# Generate data
x <- rnorm(100)
z <- rnorm(100)
xz <- x*z
y <- .25*x - .25*z + .25*x*z + .25*rnorm(100)
# Create an lm() object
lm1 <- lm(y ~ x*z)
CI.Rsqlm(lm1)
```

CI.tscore *Confidence Intervals for Test Scores*

Description

Computes the CI for a desired level for observed scores and estimated true scores

Usage

```
CI.tscore(obs, mx, s, rxx, level = 0.95)

CI.obs(obs, s, rxx, level = 0.95)
```

Arguments

obs	Observed test score on test x
mx	mean of test x
s	standard deviation of test x
rxx	reliability of test x
level	Significance Level for constructing the CI, default is .95

Details

`CI.tscore` makes use of `Est.true` to correct the observed score for regression to the mean and `SE.Est` for the correct standard error. `CI.tscore` also requires entry of the mean of the test scores for correcting for regression to the mean.
`CI.obs` is much simpler in construction as it only makes use of the observed score without any corrections. `CI.obs` uses `SE.Meas`, the SEM that appears in most test manuals and text books.

Value

Both functions return a table with 4 elements

SE.	Standard Error of the Estimate or SE of Measurement
LCL	lower confidence limit of the CIDescription of 'comp2'
T.Score	(or OBS) Estimate True Score or Observed score
UCL	upper confidence limit of the CI

Warning

Be Cautious in construction and interpretation of CIs
To obtain percent for 1 SEM
1-((1-pnorm(1))*2)
To obtain percent for 2 SEM
1-((1-pnorm(2))*2)

95 percent CI corresponds to 1.96 * SE
1 * SE corresponds to .6827
2 * SE corresponds to 0.9772499
so, for two-sided, 2 * SE corresponds to 0.9544997

Note

It is not in error to report any one of these. The misinterpretation is in taking the observed score and making inferences about the true score without (1) using the correct standard error and (2) correcting for regression toward the mean of the observed scores.

Author(s)

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References

Dudek, F. J. (1979). The continuing misinterpretation of the standard error of measurement. *Psychological Bulletin, 86*, 335-337.

See Also

SE.Meas

Examples

```
# Examples from Dudek (1979)
# Suppose a test has mean = 500, SD = 100 rxx = .9
# If an individual scores 700 on the test
CI.tscore (700, 500, 100, .9, level=.68)
CI.obs(700, 100,.9, level=.68)
```

CIr — *Confidence Interval for a Correlation Coefficient*

Description

Will construct the CI for a desired level given a correlation and sample size

Usage

```
CIr(r, n, level = 0.95)
```

Arguments

`r`	Correlation Coefficient
`n`	Sample Size
`level`	Significance Level for constructing the CI, default is .95

Value

`LCL`	Lower Confidence Limit of the CI
`UCL`	Upper Confidence Limit of the CI

Note

Does not compute r, you must enter it into the function

Author(s)

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References

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.).* Mahwah, NJ: Lawrence Erlbaum.

See Also

r2z, CIz, SEz, z2r

Examples

```
# From ch. 2 in Cohen et al (2003)
CIr (.657, 15)
```

CIrb *Confidence Interval about Sample Weighted Mean Correlation*

Description

Produces a CI for the desired level of the sample weighted mean correlation using the appropriate standard error.

Usage

```
CIrb(x, LEVEL = 0.95, homogenous = TRUE)
```

Arguments

x	A matrix or data.frame with columns Rxy and n: see EnterMeta
LEVEL	Significance Level for constructing the CI, default is .95
homogenous	Whether or not to use homogenous or heterogenous SE

Details

The CI is constructed based on the uncorrected mean correlation. It is corrected for sampling error only. To get the CI for the mean correlation corrected for artifacts, use CredIntRho, but this is a credibility interval rather than a confidence interval. See Hunter & Schmidt (2004) for more details on the interpretation of the differences.

If the CI is computed about a heterogenous mean correlation, one is implying that moderators are present, but that one can't determine what those moderators might be. Otherwise, strive to parse the studies into homogenous subsets and create CI about those means within the subsets.

Value

A list containing:

LCL	Lower Confidence Limit of the CI
UCL	Upper Confidence Limit of the CI

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

SErbar, rbar

Examples

```
#From Arthur et al
data(ABHt32)
rbar(ABHt32)
CIrb(ABHt32)

# From Hunter et al
data(HSJt35)
rbar(HSJt35)
CIrb(HSJt35)
```

CIrdif — *Confidence Interval for the difference in Correlation Coefficients*

Description

Will construct the CI for a difference in two correlations for a desired level

Usage

```
CIrdif(r1, r2, n1, n2, level = 0.95)
```

Arguments

`r1`	Correlation 1
`r2`	Correlation 2
`n1`	Sample size for `r1`
`n2`	Sample size for `r2`
`level`	Significance Level for constructing the CI, default is .95

Details

Constructs a confidence interval based on the standard error of the difference of two correlations $(r1 - r2)$, sed $< -sqrt((1 - r1^2)/n1 + (1 - r2^2)/n2)$

Value

Returns a table with 4 elements

`DifR`	Observed Difference in correlations
`SED`	Standard error of the difference
`LCL`	Lower Confidence Limit of the CI
`UCL`	Upper Confidence Limit of the CI

Author(s)

Thomas D. Fletcher `<t.d.fletcher05@gmail.com>`

References

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.).* Mahwah, NJ: Lawrence Erlbaum.

See Also

`rdif.nul`

Examples

```
# From ch. 2 in Cohen et al (2003)
CIrdif(.657, .430, 62, 143)
```

CIz — *Confidence Interval for Fisher z'*

Description

Constructs a CI for a specified level about z'. This is useful for constructing CI for a correlation

Usage

```
CIz(z, n, level = 0.95)
```

Arguments

`z`	Fishers z'
`n`	Sample Size
`level`	Significance Level for constructing the CI, default is .95

Value

`LCL`	Lower Confidence Limit of the CI
`UCL`	Upper Confidence Limit of the CI

Author(s)

Thomas D. Fletcher `<t.d.fletcher05@gmail.com>`

References

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.).* Mahwah, NJ: Lawrence Erlbaum.

See Also

`r2z`, `CIr`, `SEz`, `z2r`

Examples

```
# From ch. 2 in Cohen et al (2003)
zp <- r2z(.657)
CIz(zp, 15)
```

`ClassUtil` *Classical Utility of a Test*

Description

Calculate the classical utility of a test given a correlation, base-rate and selection ratio.

Usage

```
ClassUtil(rxy = 0, BR = 0.5, SR = 0.5)
```

Arguments

`rxy`	Correlation of Test X with Outcome Y
`BR`	Base Rate or prevalence without use of a test
`SR`	Selection Ratio: Number selected out of those tested

Details

The degree of utility of using a test as a selection instrument over randomly selecting individuals can be reflected in the decision outcomes expected by using the selection instrument. Suppose you have a predictor (selection instrument) and a criterion (job performance). By regressing the criterion on the predictor, and selecting individuals based on some cut-off value, we have 4 possible outcomes. A = True Positives, B = True Negatives, C = False Negatives, and D = False Positives. The classical utility of using the test over current procedures (random selection) is:

[A / (A+D)] - [(A + C) / (A + B + C + D)]

Various manipulations of these relationships can be used to assist in decision making.

Value

Returns a table with the following elements reflecting decision outcomes:

`True Positives`	Probability of correctly selecting a successful candidate
`False Negatives`	Probability of incorrectly not selecting a successful candidate
`False Positives`	Probability of incorrectly selecting an unsuccessful candidate
`True Negatives`	Probability of correctly not selecting an unsuccessful candidate
`Sensitivity`	True Positives / (True Positives + False Negatives)
`Specificity`	True Negatives / (True Negatives + False Positives)
`% of Decisions Correct`	Percentage of correct decisions
`Proportion Selected Succesful`	Proportion of those selected expected to be successful
`% Improvement over BR`	Percentage of improvement using the test over random selection

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Murphy, K. R. & Davidshofer, C. O. (2005). *Psychological testing: Principles and applications (5th ed.).* Saddle River, NJ: Prentice Hall.

See Also

`Utility`

Examples

```
# 50 percent of those randomly selected are expected to be successful
# A company need only select 1/10 applicants
# The correlation between test scores and performance is .35
ClassUtil(.35, .5, .1)
```

CredIntRho   *Credibility Interval for Meta-Analytic Rho*

Description

Computed the credibility interval about the population correlation coefficient at the desired level.

Usage

```
CredIntRho(x, aprox = FALSE, level = 0.95)
```

Arguments

`x`	A matrix or data.frame with columns Rxy, n and artifacts (Rxx, Ryy, u): see `EnterMeta`
`aprox`	Logical test to determine if the approximate or exact var e is used
`level`	Significance Level for constructing the CI, default is .95

Details

The credibility interval is used for the detection of potential moderators. Intervals that large or include zero potentially reflect the presence of moderators. Credibility intervals are constructed about rho, whereas confidence intervals are generally constructed about rbar. See Hunter & Schmidt (2004) for a description of the different uses.

The credibility interval is computed as: rho +/- z[crit] * SD(rho)

where, rho is the corrected correlation, z[crit] is the critcal z value (1.96 for 95%), and SD(rho) is the sqrt(variance in rho).

Value

LCL	Lower Confidence Limit of the CI
UCL	Upper Confidence Limit of the CI

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

rbar, rhoCA, CIrb, varRes

Examples

```
# From Arthur et al
data(ABHt32)
CredIntRho(ABHt32, aprox=TRUE)

# From Hunter et al
data(HSJt35)
CredIntRho(HSJt35)
```

---

cRRr — *Correction for Range Restriction*

Description

Corrects a correlation for Range restriction given population and sample standard deviations

Usage

```
cRRr(rr, sdy, sdyu)
```

Arguments

rr	Observed or restricted correlation
sdy	Standard deviation of a restricted sample
sdyu	Standard deviation of an unrestricted sample

Details

When one of the variables used to measure a correlation has a restricted variance One the correlation will be attenuated. This commonly occurs for instance when using incumbents (those already selected by previous procedures) to based decisions about validity of new selection procedures. Given u (ratio of unrestricted SD of one variable to the restricted SD of that variable), the following formula is used to correct for attenuation in a correlation coefficient:
$rxy < -(rr * (sdyu/sdy))/sqrt(1 + rr^2 * ((sdyu^2/sdy^2) - 1))$

Value

`unrestricted` corrected correlation

Note

Do not confuse this function with the meta-analysis function cRR in this same package!

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.).* Mahwah, NJ: Lawrence Erlbaum.

See Also

cRR

Examples

```
# See section 2.10.3 of Cohen et al (2003)
cRRr(.25, 12, 5)

# Create two correlated variables
x <- rnorm(1000)
y <- 0.71*x +rnorm(1000)
cor(x,y)
# order and select top 1/10
tmp <- cbind(x,y)[order(y,x),][1:100,]
rxyr <- cor(tmp[,"x"],tmp[,"y"]) # restricted rxy
rxyr
# correct for restriction of range
cRRr(rxyr, sd(tmp[,"y"]), sd(y))
```

CVF *Compound Variance Factor for Meta-Analytic Artifact Corrections*

Description

The compound variance factor is computed by summing the individual squared coefficients of variation for each artifact when correcting for attenuation in a correlation coefficient

Usage

```
CVF(x)
```

Arguments

`x`	A matrix or data.frame with columns representing artifacts (Rxx, Ryy, u): see `EnterMeta`

Details

The CVF is equal to scv(a) + scv(b) + scv(c), where scv is the squared coefficient of variation. The letters a, b, c represent artifacts reliability in predictor, reliability in criterion, and restriction of range respectively. The scv is computed as the variance in the artifact divided by the square of the average for the artifact.

Value

a numeric value representing the compound variance factor

Author(s)

Thomas D. Fletcher `<t.d.fletcher05@gmail.com>`

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

`aRxx`, `bRyy`, `cRR`, `varAV`, `CAFAA`

Examples

```
# From Arthur et al
data(ABHt32)
CVF(ABHt32)


# From Hunter et al
data(HSJt35)
CVF(HSJt35)
```

CVratio *Content Validity Ratio*

Description

Computes Lawshe's CVR for determining whether items are essential or not.

Usage

```
CVratio(NTOTAL, NESSENTIAL)
```

Arguments

NTOTAL	Total number of Experts
NESSENTIAL	Number of Experts indicating item 'essential'

Details

To determine content validity (in relation to job performance), a panel of subject matter experts will examine a set of items indicating whether the items are essential, useful, not necessary. The CVR is calculated to indicate whether the item is pertinent to the content validity.

CVR values range +1 to -1. Values closer to +1 indicated experts are in aggreement that the item is essential to content validity.

Value

Content Validity Ratio

Note

CVR = (Ne - N/2)/(N-1)

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Lawshe, C. H. (1975). A quantitative approach to content validity. *Personnel Psychology, 28,* 563-575.

Examples

```
# Using 5 Expert panelists (SMEs)
# The ratings for an item is as follows:
# Rater1 = Essential
# Rater2 = Essential
# Rater3 = Essential
# Rater4 = Useful
# Rater5 = Not necessary
# # essential = 3
CVratio (5, 3)
```

---

discrim *Item Discrimination*

Description

Discrimination of an item is the ability for a specific item to distinguish among upper and lower ability individuals on a test

Usage

```
discrim(x)
```

Arguments

x	matrix or data.frame of items to be examined. Rows represent persons, Columns represent items

Details

The function takes data on individuals and their test scores and computes a total score to separate high and low ordered individuals. The upper and lower groups are defined as the top and bottom 1/3 of the total. Discrimination is then computed and returned for each item using the formula: (number correct in the upper group - number correct in the lower group) / size of each group

Value

Discrimination index for each item in the data.frame or matrix analyzed.

Note

`discrim` is used by `item.exam` `discrim` is especially useful for dichotomously coded items such as correct/incorrect. If items are not dischotomously coded, the interpretation of `discrim` has less meaning.

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Allen, M. J. & Yen, W. M. (1979). *Introduction to measurement theory.* Monterey, CA: Brooks/Cole.

See Also

`item.exam`

Examples

```
# see item.exam
# Scores on a test for 12 individuals
# 1 = correct
item1 <- c(1,1,1,0,1,1,1,1,1,1,0,1)
item2 <- c(1,0,1,1,1,1,1,1,1,1,1,0)
item3 <- c(1,1,1,1,1,1,1,1,1,1,1,1)
item4 <- c(0,1,0,1,0,1,0,1,1,1,1,1)
item5 <- c(0,0,0,0,1,0,0,1,1,1,1,1)
item6 <- c(0,0,0,0,0,0,1,0,0,1,1,1)
item7 <- c(0,0,0,0,0,0,0,0,1,0,0,0)
exam <- cbind(item1, item2, item3, item4, item5, item6, item7)
discrim(exam)
```

`EnterMeta` *Enter Meta-Analysis Data*

Description

This function creates data entry object suitable for creating an object needed in the typical meta-analysis. The object will have the appropriate variable names.

Usage

```
EnterMeta()
```

Details

To create a data object appropriate for the meta-analysis functions in this package: Type
my.Meta.data <- EnterMeta()
Then use the data editor to enter data in the appropriate columns.

Value

Does not return a value, but rather is used for naming columns of a data.frame() The final object (if saved) will contain:

`study`	Enter Study Code or article name
`Rxy`	Correlation coefficient
`n`	Sample size for study
`Rxx`	Reliability of predictor variable X
`Ryy`	Reliability of criterion variable Y
`u`	Degree of range restriction - ratio of restricted to unrestricted standard deviations
`moderator`	moderator variable (if any)

Warning

This function will not automatically save your data object. You must create the object using the assignment operator.

Note

This is the general format required for data objects used for all the meta-analysis functions in this package. If certain variables are empty (e.g., Rxx, u), then the appropriate correction is not made, but the placeholder must be there. Moderator is useful for the user to subset the data and re-run any functions.

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

See Also

As an alternative, consider `read.csv` for importing data prepared elsewhere (e.g., Excel)

Examples

```
# my.data <- EnterMeta()
```

Est.true *Estimation of a True Score*

Description

Given the mean and reliability of a test, this function estimates the true score based on an observed score. The estimation is accounting for regression to the mean

Usage

```
Est.true(obs, mx, rxx)
```

Arguments

`obs`	an observed score on test x
`mx`	mean of test x
`rxx`	reliability of test x

Details

The estimated true score (that) is computed as
that <- mx*(1-rxx)+rxx*obs
When the obs score is much higher than the mean, the that < obs
When the obs score is much lower than the mean, that > obs

Value

Estimated True score

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Dudek, F. J. (1979). The continuing misinterpretation of the standard error of measurement. *Psychological Bulletin, 86*, 335-337.

See Also

CI.tscore, SE.Est

Examples

```
# Examples from Dudek (1979)
# Suppose a test has mean = 500, SD = 100 rxx = .9
# If an individual scores 700 on the test
Est.true(700, 500, .9)

# If an individual scores 400 on the test
Est.true(400, 500, .9)
```

FileDrawer *File Drawer N*

Description

Computes the number of 'lost' studies needed to render the observed meta-analytic correlation to non-significance.

Usage

```
FileDrawer(x, rc = 0.1)
```

Arguments

`x`	A matrix or data.frame with columns Rxy and n: see `EnterMeta`
`rc`	cut-off correlation for which to make a comparison

Details

Use to detect availability bias in published correlations. It is computed as n <- k * (rb/rc - 1), where, n is the file drawer n, k is the number of studies in current meta-analyis, rb is rbar and rc is the cut-off correlation for which you wish to make a comparison. For a test of the null hypothesis, use rc = 0. In many instances, practitioners are interested in reducing correlations to less than 1 percent of the variance accounted for (i.e., rc = .1).

Value

`"# of 'lost' studies needed"`
File drawer N needed to change decision

Author(s)

Thomas D. Fletcher `<t.d.fletcher05@gmail.com>`

References

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Rosenthal, R. (1979). The "file-drawer problem" and tolerance for null results. *Psychological Bulletin, 86,* 638-641.

See Also

FunnelPlot

Examples

```
# From Arthur et al
data(ABHt32)
FileDrawer(ABHt32)

# From Hunter et al
data(HSJt35)
FileDrawer(HSJt35)
```

FunnelPlot *Funnel Plot for Meta-Analysis*

Description

Produces a simple x-y plot corresponding to the correlation and sample size. A vertical line is produced representing the sample weighted correlation.

Usage

```
FunnelPlot(x)
```

Arguments

x	A matrix or data.frame with columns Rxy and n: see EnterMeta

Details

Plot showing 'no evidence' of availabilty bias will resemble funnel getting smaller at the top, and larger at the bottom of the plot. A plot showing evidence of availablity bias will not resemble a funnel.

Value

a plot

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

`FileDrawer`

Examples

```
# From Arthur et al
data(ABHt32)
FunnelPlot(ABHt32)

# From Hunter et al
data(HSJt35)
FunnelPlot(HSJt35)
```

`HSJt35` *Table 3.5 Hunter et al.*

Description

This is a useful and fictious example for conducting Meta-Analysis. It appeared in Hunter et al (1982)

Usage

```
data(HSJt35)
```

Format

A data frame with 8 observations on the following 7 variables.

- *study* Study code
- *Rxy* Published correlation
- *n* Sample size
- *Rxx* Reliability of predictor
- *Ryy* Reliability of criterion
- *u* Range Restriction Ratio
- *moderator* none <na>

Details

This example has been replicated a number of times (e.g., Hunter & Schmidt, 2004). It is useful in illustrating the basic concepts of validity generalization. The data can be used to demonstrate bare-bones MA as well as correction for artifacts. This data format is the format necessary for the R functions in the psychometric package.

References

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

Examples

```
data(HSJt35)
rbar(HSJt35)
FunnelPlot(HSJt35)
CredIntRho(HSJt35)
```

`ICC.CI` *Confidence interval for the Intra-class Correlation*

Description

Computes the CI at the desired level for the ICC1 and ICC2

Usage

```
ICC1.CI(dv, iv, data, level = 0.95)

ICC2.CI(dv, iv, data, level = 0.95)
```

Arguments

`dv`	The dependent variable of interest
`iv`	cluster or grouping variable
`data`	data.frame containing the data
`level`	Significance Level for constructing the CI, default is .95

Details

Computes the ICC from a one-way ANOVA. The CI is then computed at the desired level using formulae provided by McGraw & Wong (1996). They use the terminology ICC(1) and ICC(k) for ICC1 and ICC2 respectively.

Value

A table with 3 elements:

LCL	lower confidence limit if CI
ICC	intra-class correlation
UCL	upper confidence limit if CI

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

McGraw, K. O. & Wong, S. P. (1996). Forming some inferences about some intraclass correlation coefficients. *Psychological Methods, 1,* 30-46.

Bliese, P. (2000). Within-group agreement, non-independence, and reliability: Implications for data aggregation and analysis. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions (pp. 349-381).* San Francisco: Jossey-Bass.

See Also

ICC.lme, ICC1, ICC2

Examples

```
library(multilevel)
data(bh1996)
ICC1.CI(HRS, GRP, bh1996)
ICC2.CI(HRS, GRP, bh1996)
```

ICC.lme — *Intraclass Correlation Coefficient from a Mixed-Effects Model*

Description

ICC1 and ICC2 computed from a lme() model.

Usage

```
ICC1.lme(dv, grp, data)

ICC2.lme(dv, grp, data, weighted = FALSE)
```

Arguments

dv	The dependent variable of interest
grp	cluster or grouping variable
data	data.frame containing the data
weighted	Whether or not a weighted mean is used in calculation of ICC2

Details

First a lme() model is computed from the data. Then ICC1 is computed as $t00/(t00 + siqma^2)$, where t00 is the variance in intercept of the model and $sigma^2$ is the residual variance for the model. The ICC2 is computed by computing the ICC2 for each group $t00/(t00 + sigma^2/nj)$ where nj is the size of group j. The mean across all groups is then taken to be the ICC2. However, one can specify that the mean should be weigted by group size such that larger groups are given more weight. The calculation of the individual group ICC2 is done by Bliese's `gmeanrel` function. An alternate specification not used here, but sometimes seen in the literature for ICC2 is to use the formula above for the total data set, but replace nj with the average group size. This is the method used in Bliese's `mult.icc`.

Value

ICC1 or ICC2

Warning

If data used are attached, you will sometimes receive a warning that can be ignored. The warning states that the following variables ... are masked. This is because the function first attaches the data and then detaches it within the function.

Note

ICC1.lme and ICC2.lme should in principle be equal an ICC computed from a one-way ANOVA only when the data are balanced (equal group sizes for all groups and no missing data). The ICC.lme should be a more accurate measure of ICC in all other instances. The three specifications of ICC2 mentioned above (details) will be similar by not exactly equal because of group variablity.

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Bliese, P. (2000). Within-group agreement, non-independence, and reliability: Implications for data aggregation and analysis. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions (pp. 349-381).* San Francisco: Jossey-Bass.

See Also

`ICC.CI`, `mult.icc`, `gmeanrel`

Examples

```
library(nlme)
library(multilevel)
data(bh1996)
ICC1.lme(HRS, GRP, data=bh1996)
ICC2.lme(HRS, GRP, data=bh1996)
```

`item.exam` *Item Analysis*

Description

Conducts an item level analysis. Provides item-total correlations, Standard deviation in items, difficulty, discrimination, and reliability and validity indices.

Usage

```
item.exam(x, y = NULL, discrim = FALSE)
```

Arguments

`x`	matrix or data.frame of items
`y`	Criterion variable
`discrim`	Whether or not the discrimination of item is to be computed

Details

If someone is interested in examining the items of a dataset contained in data.frame x, and the criterion measure is also in data.frame x, one must parse the matrix or data.frame and specify each part into the function. See example below. Otherwise, one must be sure that x and y are properly merged/matched. If one is not interested in assessing item-criterion relationships, simply leave out that portion of the call. The function does not check whether the items are dichotomously coded, this is user specified. As such, one can specify that items are binary when in fact they are not. This has the effect of computing the discrimination index for continuously coded variables.
The difficulty index (p) is simply the mean of the item. When dichotomously coded, p reflects the proportion endorsing the item. However, when continuously coded, p has a different interpretation.

Value

A table with rows representing each item and columns repsenting :

`Sample.SD`	Standard deviation of the item
`Item.total`	Correlation of the item with the total test score
`Item.Tot.woi`	Correlation of item with total test score (scored without item)
`Difficulty`	Mean of the item (p)
`Discrimination`	Discrimination of the item (u-l)/n

`Item.Criterion`	Correlation of the item with the Criterion (y)
`Item.Reliab`	Item reliability index
`Item.Rel.woi`	Item reliability index (scored without item)
`Item.Validity`	Item validity index

Warning

Be cautious when using data with missing values or small data sets.

Listwise deletion is employed for both X (matrix of items to be analyzed) and Y (criterion). When the datasets are small, such listwise deletion can make a big impact. Further, since the upper and lower groups are defined as the upper and lower 1/3, the stability of this division of examinees is greatly increased with larger N.

Note

Most all text books suggest the point-biserial correlation for the item-total. Since the point-biserial is equivalent to the Pearson r, the `cor` function is used to render the Pearson r for each item-total. However, it might be suggested that the polyserial is more appropriate. For practical purposes, the Pearson is sufficient and is used here.

If discrim = TRUE, then the discrimination index is computed and returned EVEN IF the items are not dichotomously coded. The interpretation of the discrimination index is then suspect. `discrim` computes the number of correct responses in the upper and lower groups by summation of the '1s' (correct responses). When data are continuous, the discrimination index represents the difference in the sum of the scores divided by number in each group (1/3*N).

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Allen, M. J. & Yen, W. M. (1979). *Introduction to measurement theory.* Monterey, CA: Brooks/Cole.

See Also

`alpha`, `discrim`

Examples

```
data(TestScores)
# Look at the data
TestScores
# Examine the items
item.exam(TestScores[,1:10], y = TestScores[,11], discrim=TRUE)
```

MetaTable *Summary function for 'Complete' Meta-Analysis*

Description

Computes and returns the major functions involved in a Meta-Analysis. It is generic in the sense that no options are available to alter defaults.

Usage

```
MetaTable(x)
```

Arguments

x	A matrix or data.frame with columns Rxy, n and artifacts (Rxx, Ryy, u): see `EnterMeta`

Details

For a set of correlations for each study (i), the following calculations are made and returned:

r-bar `rbar`, variance in r-bar `varr`, variance due to sampling error (not approximated) `vare`, percent of variance due to sampling error `pvse`, 95% CI for r-bar (using both the heterogenous and homogenous SE) `CIrb`, rho (corrected r-bar) `rhoCA`, variance in rho `varRCA`, percent of variance attributable to artifacts `pvaaa`, 90% Credibility interval `CredIntRho`

Value

Data.frame with various statistics returned - see details above

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

`rbar`, `rhoCA`

Examples

```
# From Arthur et al
data(ABHt32)
MetaTable(ABHt32)
# From Hunter et al
data(HSJt35)
MetaTable(HSJt35)
```

---

pvaaa *Percent of Variance Accounted for by Artifacts in Rho*

Description

Computes the percentage variance attributed to attenuating artifacts (sampling error, restriction of range, reliability in predictor and criterion.

Usage

```
pvaaa(x, aprox = FALSE)
```

Arguments

x	A matrix or data.frame with columns Rxy, n and artifacts (Rxx, Ryy, u): see EnterMeta
aprox	Logical test to determine if the approximate or exact var e is used

Details

Percent of variance is computed as: (`vare` + `varAV`) / `varr` * 100

Value

A numeric value representing the percent of variance accounted for by artifacts

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

vare, varAV, varr, pvse

Examples

```
# From Arthur et al
data(ABHt32)
pvaaa(ABHt32)

# From Hunter et al
data(HSJt35)
pvaaa(HSJt35)
```

---

pvse *Percent of variance due to sampling error*

Description

Ratio of sampling error variance to weighted variance in correlations for a meta-analysis. This value is compared to 75 (e.g., 75% rule) to determine the presence of moderators.

Usage

```
pvse(x)
```

Arguments

x	A matrix or data.frame with columns Rxy and n: see EnterMeta

Details

pvse <- vare/varr*100

Value

A single numeric value of class matrix representing the % of variance accounted for by sampling error

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

varr, vare

Examples

```
# From Arthur et al
data(ABHt32)
pvse(ABHt32)
# From Hunter et al
data(HSJt35)
pvse(HSJt35)
```

Qrbar *Meta-Analytic Q statistic for r-bar*

Description

Provides a chi-square test for significant variation in sample weighted correlation, rbar

Usage

```
Qrbar(x)
aprox.Qrbar(x)
```

Arguments

x	A matrix or data.frame with columns Rxy and n: see EnterMeta

Details

Q is distributed as chi-square with df equal to the number of studies - 1. Multiple equations exist presumably because of a need to do the calculations 'by hand' in the past. A significant Q statistic implies the presence of one or more moderating variables operating on the observed correlations.

Value

A table containing the following items:

CHISQ	Chi-square value
df	degrees of freedom
p-val	probabilty value

Warning

The test is presented by Hunter et al. 1982, but is NOT recommended nor mentioned by Hunter & Schmidt (2004). The test is sensitive to the number of studies included in the meta-analysis. Large meta-analyses may find significant Q statistics when variation in the population is not present, and small meta-analyses may find lack of significant Q statistics when moderators are present. Hunter & Schmidt (2004) recommend the credibility inteval, `CredIntRho`, or the 75% rule, `pvse`, as determinants of the presence of moderators.

Note

`Qrbar` is computed as: $sum((((n-1)*(r-rb)^2)/(1-rb^2)^2), na.rm = TRUE)$
`aprox.Qrbar` is computed as: $(N/(1-rb^2)^2)*vr$

where n is sample size of study i, N is total sample size across studies, rb is `rbar`, r is the correlation of study i, and vr is `varr`.

Author(s)

Thomas D. Fletcher `<t.d.fletcher05@gmail.com>`

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

`varr`, `vare`, `rbar`, `CredIntRho`, `pvse`

Examples

```
# From Arthur et al
data(ABHt32)
aprox.Qrbar(ABHt32)

# From Hunter et al
```

```
data(HSJt35)
Qrbar(HSJt35)
aprox.Qrbar(HSJt35)
```

Qrho *Meta-Analytic Q statistic for rho*

Description

Provides a chi-square test for significant variation in sample weighted correlation corrected for attenuating artifacts

Usage

```
Qrho(x, aproxe = FALSE)
```

Arguments

x	A matrix or data.frame with columns Rxy, n and artifacts (Rxx, Ryy, u): see EnterMeta
aproxe	Logical test to determine if the approximate or exact var e is used

Details

Q is distributed as chi-square with df equal to the number of studies - 1. A significant Q statistic implies the presence of one or more moderating variables operating on the observed correlations after corrections for artifacts.

Value

A table containing the following items:

CHISQ	Chi-square value
df	degrees of freedom
p-val	probabilty value

Warning

The test is sensitive to the number of studies included in the meta-analysis. Large meta-analyses may find significant Q statistics when variation in the population is not present, and small meta-analyses may find lack of significant Q statistics when moderators are present. Hunter & Schmidt (2004) recommend the credibility inteval, CredIntRho, or the 75% rule, pvse, as determinants of the presence of moderators.

Note

Q is defined as: (k*vr)/(vav+ve)

where, k is the number of studies, vr is `varr`, vav is `varAV`, and ve is `vare`

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS*. Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.)*. Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies*. Beverly Hills: Sage Publications.

See Also

`varr`, `vare`, `rbar`, `CredIntRho`, `pvse`

Examples

```
# From Arthur et al
data(ABHt32)
Qrho(ABHt32)

# From Hunter et al
data(HSJt35)
Qrho(HSJt35)
```

`r.nil` *Nil hypothesis for a correlation*

Description

Performs a two-tailed t-test of the H0 that r = 0

Usage

```
r.nil(r, n)
```

Arguments

`r`	Correlation coefficient
`n`	Sample Size

Value

Returns a table with 4 elements

H0:rNot0 correlation to be tested

t	t value for the H0
df	degrees of freedom
p	p value

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.).* Mahwah, NJ: Lawrence Erlbaum.

See Also

rdif.nul, CIrdif

Examples

```
# From ch. 2 in Cohen et al (2003)
r.nil(.657, 15)
```

---

r2z *Fisher r to z'*

Description

Converts a Pearson correlation coefficient to Fishers z'

Usage

```
r2z(x)
```

Arguments

x	Pearson correlation coefficient

Details

z' = .5 * log((1+r)/(1-r))

Value

Fisher z'

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.).* Mahwah, NJ: Lawrence Erlbaum.

See Also

z2r, CIr,

Examples

```
# From ch. 2 in Cohen et al (2003)
r2z(.657)
```

---

rbar *Sample size weighted mean correlation*

Description

Computes the weighted mean correlation from a data object of the general format found in EnterMeta

Usage

```
rbar(x)
```

Arguments

x	A matrix or data.frame with columns Rxy and n: see EnterMeta

Details

For a set of correlations for each study (i), rbar is computed as: sum(Ni*ri)/sum(Ni) where, Ni is the sample size of study i and ri is the correlation in study i.

Value

Sample Weighted Average Correlation: uncorrected for artifacts other than sampling error

Note

This is the mean correlation across studies corrected for sampling error. It is also known as bare-bones meta-analysis.

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

varr, rhoCA

Examples

```
# From Arthur et al
data(ABHt32)
rbar(ABHt32)
# From Hunter et al
data(HSJt35)
rbar(HSJt35)
```

`rdif.nul` *Null hypothesis for difference in two correlations*

Description

Tests the hypothesis that two correlations are significantly different

Usage

```
rdif.nul(r1, r2, n1, n2)
```

Arguments

r1	Correlation 1
r2	Correlation 2
n1	Sample size for r1
n2	Sample size for r2

Details

First converts r to z' for each correlation. Then constructs a z test for the difference z <- (z1 - z2)/sqrt(1/(n1-3)+1/(n2-3))

Value

Returns a table with 2 elements

`zDIF`	z value for the H0
`p`	p value

Note

Does not test alternate hypotheses (e.g., difference = .1)

Author(s)

Thomas D. Fletcher `<t.d.fletcher05@gmail.com>`

References

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.).* Mahwah, NJ: Lawrence Erlbaum.

See Also

`r.nil`, `CIrdif`

Examples

```
# From ch. 2 in Cohen et al (2003)
rdif.nul(.657, .430, 62, 143)
```

---

rhoCA — *Meta-Analytically Derived Correlation Coefficient Corrected for Artifacts*

Description

This represents the population correlation coefficient free from attenuaton due to artifacts (sampling error, range-restriction, reliability in the predictor and criterion).

Usage

```
rhoCA(x)
```

Arguments

x — A matrix or data.frame with columns Rxy, n and artifacts (Rxx, Ryy, u): see `EnterMeta`

Details

This is the sample weighted correlation coefficient `rbar` divided by the compound attenuation factor, `CAFAA`.

Value

A numeric value represesting the corrected correlation coefficient.

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

`CAFAA`, `rbar`

Examples

```
# From Arthur et al
data(ABHt32)
rhoCA(ABHt32)

# From Hunter et al
data(HSJt35)
rhoCA(HSJt35)
```

SE.Meas *Standard Errors of Measurement (test scores)*

Description

These functions will calculate the three Standard Errors of Measurement as described by Dudek(1979). They are useful in constructing CI about observed scores, true scores and predicting observed scores on parallel measures.

Usage

```
SE.Meas(s, rxx)
SE.Est (s, rxx)
SE.Pred(sy, rxx)
```

Arguments

`s`	Standard Deviation in tests scores on test x
`sy`	Standard Deviation in tests scores on parallel test y = x
`rxx`	Reliability of test x

Details

Dudek (1979) notes that in practice, individuals often misinterpret the SEM. In fact, most textbooks misinterpret these measures. The SE.Meas $(s * sqrt(1 - rxx))$ is useful in the construction of CI about observed scores, but should not be interpreted as indicating the TRUE SCORE is necessarily included in the CI. The SE.Est $(s*sqrt(rxx*(1-rxx)))$ is useful in the construction of CI about the TRUE SCORE. The estimate of a CI for a TRUE SCORE also requires the calculation of a TRUE SCORE (due to regression to the mean) from observed scores. The SE.Pred $(sy * sqrt(1 - rxx^2))$ is useful in predicting the score on a parallel measure (Y) given a score on test X. SE.Pred is usually used to estimate the score of a re-test of an individual.

Value

The returned value is the appropriate standard error

Note

Since strictly parallel tests have the same SD, s and sy are equivalent in these functions. SE.Meas() is used by `CI.obs`. SE.Est() is used by `CI.tscore`. You must use `Est.true` to first compute the estimated true score from an observed score accounting for regression to the mean.

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Dudek, F. J. (1979). The continuing misinterpretation of the standard error of measurement. *Psychological Bulletin, 86*, 335-337.

Lord, F. M. & Novick, M. R. (1968). *Statistical theories of mental test scores.* Reading, MA: Addison-Wesley.

Nunnally, J. C. & Bernstein, I. H. (1994). *Psychometric Theory (3rd ed.).* New York: McGraw-Hill.

See Also

`Est.true`, `CI.obs`, `CI.tscore`

Examples

```
# Examples from Dudek (1979)
# Suppose a test has mean = 500, SD = 100 rxx = .9
# If an individual scores 700 on the test
# The three SE are:
SE.Meas (100, .9)
SE.Est (100, .9)
SE.Pred (100, 9)

# CI about the true score
CI.tscore(700, 500, 100, .9)

# CI about the observed score
CI.obs(700, 100, .9)
```

SErbar — *Standard Error for Sample Size Weighted Mean Correlation*

Description

The standard error of homogenous or heterogenous samples is computed to be used for construction of confidence intervals about the Sample Size Weighted Mean Correlation in meta-analysis. Use `SERHOM` if no moderators are present (population is homogenous), and use `SERHET` if moderators are present (population is heterogenous).

Usage

```
SERHOM(x)
SERHET(x)
```

Arguments

x	A matrix or data.frame with columns Rxy and n: see `EnterMeta`

Details

The formula for each are:
SERHOM <- $(1 - rb^2)/sqrt(N - k)$
SERHET <- $sqrt((1 - rb^2)^2/(N - k) + varRes(x)/k)$

where, rb is rbar, N is the total sample size, k is the number of studies.

Value

A numeric value, the standard error

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

CIrb, rbar

Examples

```
# From Arthur et al
data(ABHt32)
SERHOM(ABHt32)
SERHET(ABHt32)
CIrb(ABHt32)

# From Hunter et al
data(HSJt35)
SERHOM(HSJt35)
SERHET(HSJt35)
CIrb(HSJt35)
```

SEz *Standard Error of Fishers z prime*

Description

Given a sample size, n, will compute the aproximate standard error for z prime This is useful for constructing confidence intervals about a correlation.

Usage

```
SEz(n)
```

Arguments

n	sample size

Details

SEz = 1/sqrt(n-3)

Value

The approximate standard error for Fisher's z prime

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Olkin, I. & Finn, J. D. (1995). Correlation Redux. *Psychological Bulletin, 118*, 155-164.

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.).* Mahwah, NJ: Lawrence Erlbaum.

See Also

r2z, CIr, CIz, z2r

Examples

```
# From ch. 2 in Cohen et al (2003)
zp <- r2z(.657)
zp
SEz(15)
```

SpearmanBrown	*Spearman-Brown Prophecy Formulae*

Description

These two functions are various manipulations of the Spearman-Brown Prophecy Formula. They are useful in determining relibility if test length is changed or length of a new test if reliability were to change.

Usage

```
SBrel(Nlength, rxx)

SBlength(rxxp, rxx)
```

Arguments

`Nlength`	New length of a test in relation to original
`rxx`	reliability of test x
`rxxp`	reliability of desired (parallel) test x

Details

Nlength represents a ratio of new to original. If the new test has 10 items, and the original test has 5 items, Nlength is 2. Likewise, if the original test has 5 items, and the new test has 10 items, Nlength is .5. In general, researchers should aim for reliabilities > .9.

`SBrel` is used to address the question, what if I increased/decreased my test length? What will the new reliability be? This is used when computing split-half reliabilities and when when concerned about reducing test length.
`SBlength` is used to address the question, how long must my test be (in relation to the original test) in order to achieve a desired reliability?
The formulae for each are:
rxxp <- Nlength*rxx/(1+(Nlength-1)*rxx)
N <- rxxp*(1-rxx)/(rxx*(1-rxxp))

Value

`rxxp`	the prophesized reliability
`N`	Ratio of new test length to original test length

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Allen, M. J. & Yen, W. M. (1979). *Introduction to measurement theory.* Monterey, CA: Brooks/Cole.

See Also

alpha

Examples

```
# Given a test with rxx = .7, 10 items
# Desire a test with rxx=.9, how many items are needed?
new.length <- SBlength(.9, .7)
new.length * 10
# 39 items are needed
# what is the reliability of a test 1/2 as long
SBrel(.5, .7)
```

TestScores *Fictitious Test Scores for Illustrative Purposes*

Description

These data were created to correspond to scores for 30 examinees on 10 items of test X plus a score on criterion Y.

Usage

```
data(TestScores)
```

Format

A matrix with 30 observations on the following 11 variables.

- `i1` item1 on test x
- `i2` item2 on test x
- `i3` item3 on test x
- `i4` item4 on test x
- `i5` item5 on test x
- `i6` item6 on test x
- `i7` item7 on test x
- `i8` item8 on test x
- `i9` item9 on test x
- `i10` item10 on test x
- `y` Score on criterion Y

Details

These data are constructed such that items 1 - 10 are coded 0,1 for incorrect/correct responses. The data illustate that some items are better for maintaining internal consistency, whereas others may be more useful for relating to external criteria.

See Also

item.exam

Examples

```
data(TestScores)
str(TestScores)
item.exam(TestScores[,1:10], y = TestScores[,11], discrim=TRUE)
alpha(TestScores[,1:10])
```

Utility *Marginal and Total Utility of a Test*

Description

Computes the marginal or total utility of a test.

Usage

```
MargUtil(Rxy, Sy, MXg, COST, Nselected)

TotUtil(Rxy, Sy, MXg, COST, Nselected)
```

Arguments

Rxy	Correlation of Test X with Criterion Y
Sy	Standard Deviation of Y in monetary units
MXg	Mean of selected group on test X in standard score units
COST	Total cost of testing
Nselected	number of applicants selected

Details

Marginal utility is the gain expected in the outcome (i.e., job performance), in monetary units, for a person from the predictor selected subgroup compared to a person who is randomly selected.

Total utility is the total gain in the outcome (i.e., job performance), in monetary units, expected for those selected using the test.

Value

Marginal or Total Utility of a Test (a numeric value in monetary units)

Note

Computation for marginal and total utility are:

MU <- Rxy*Sy*MXg - COST/Nselected
TU <- Nselected*Rxy*Sy*MXg - COST

The computation of Sy should be done locally (within an organization) and is often difficult.

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Cascio, W. F. & Aguinis, H. (2005). *Applied Psychology in Human Resource Management (6th ed.)* Englewood Cliffs, NJ: Prentice-Hall.

Murphy, K. R. & Davidshofer, C. O. (2005). *Psychological testing: Principles and applications (5th ed.).* Saddle River, NJ: Prentice Hall.

See Also

ClassUtil

Examples

```
# Rxy = .35
# Each year 72 workers are hired
# SD of performance in dollars is $4000
# 1 out of 10 applicants are selected
# cost per test = $5
# average test score for those selected = 1.76
MargUtil(.35, 4000, 1.76, 720*5, 72)
TotUtil (.35, 4000, 1.76, 720*5, 72)
```

---

varAV *Variance Due to Attenuating Artifacts*

Description

Since the presence of artifacts may inflate the observed variance in correlations, one needs to compute the variance attributed to the artifacts.

Usage

```
varAV(x)
```

Arguments

x	A matrix or data.frame with columns Rxy, n and artifacts (Rxx, Ryy, u): see EnterMeta

Details

varAV is computed as $\texttt{rhoCA}^2 * \texttt{CAFAA}^2 * \texttt{CVF}$

varAV is used to compute the residual variance in correlations `varResT`

Value

A numeric value representing the variance due to attenuating artifacts

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS*. Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.)*. Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

`CAFAA`,`rhoCA`, `CVF`

Examples

```
# From Arthur et al
data(ABHt32)
varAV(ABHt32)

# From Hunter et al
data(HSJt35)
varAV(HSJt35)
```

---

vare — *Sampling Error Variance*

Description

Computes sampling error variance in correlations from a data object of the general format found in `EnterMeta`

Usage

```
vare(x)
aprox.vare(x)
vare36(x)
```

Arguments

x   A matrix or data.frame with columns Rxy and n: see EnterMeta

Details

vare is the 'core' equation for estimating the sampling error variance. Presumably because of the history of meta-analysis and lack of desktop computing power, hand-calculatons were needed. Thus, two additional equations were developed. The aprox.vare appears in many textbooks and is used often (Arthur et al.). Another variation is presented by Hunter & Schmidt (2004) as their equation 3.6 vare36.

Value

Sampling error variance (exact, approximate, or alternate aproximate)

Note

The equations for each function are:
vare <- $sum(n*(1-rb^2)^2/(n-1), na.rm = TRUE)/sum(n, na.rm = TRUE)$
aprox.vare <- $(1-rb^2)^2/(mean(n, na.rm = TRUE)-1)$
vare36 <- $((1-rb^2)^2*k)/T$ where k is number of studies and T is total sample size

These are only presented here for completeness. The recommended equation is vare.

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

varr, rbar

Examples

```
# From Arthur et al
data(ABHt32)
vare(ABHt32)
aprox.vare(ABHt32)
vare36(ABHt32)
# From Hunter et al
data(HSJt35)
```

```
vare(HSJt35)
aprox.vare(HSJt35)
vare36(HSJt35)
```

---

varr *Sample Size weighted variance*

Description

Computes the weighted variance in correlations from a data object of the general format found in EnterMeta

Usage

```
varr(x)
```

Arguments

x	A matrix or data.frame with columns Rxy and n: see EnterMeta

Details

For a set of correlations for each study (i), varr is computed as: $sum(Ni*(ri-rbar)^2)/sum(Ni)$ where, Ni is the sample size of study i and ri is the correlation in study i and rbar is the weighted mean correlation.

Value

Sample weighted variance in correlations: uncorrected for artifacts other than sampling error

Note

This is the variance in correlations across studies corrected for sampling error. It is also known as bare-bones meta-analysis.

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

vare, rbar

Examples

```
# From Arthur et al
data(ABHt32)
varr(ABHt32)
# From Hunter et al
data(HSJt35)
varr(HSJt35)
```

---

varRCA *Variance in Meta-Analytic Rho*

Description

Computes the estimate of the variance in the corrected correlation coefficient.

Usage

```
varRCA(x, aprox = FALSE)
```

Arguments

x	A matrix or data.frame with columns Rxy, n and artifacts (Rxx, Ryy, u): see EnterMeta
aprox	Logical test to determine if the approximate or exact var e is used

Details

Variance in Rho is computed as: $VarResT/CAFFA^2$

This is used to construct credibility intervals for rho CredIntRho

Value

A numeric value representing the variance in the population correlation coefficient

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

rhoCA, CAFAA, varResT, varRes CredIntRho

Examples

```
# From Arthur et al
data(ABHt32)
varRCA(ABHt32)

# From Hunter et al
data(HSJt35)
varRCA(HSJt35)
```

---

varRes — *Residual Variance in Meta-Analytic Correlation*

Description

Computes the residual variance in the sample-weighted correlation coefficient by removing variance due to sampling error.

Usage

```
varRes(x)
```

Arguments

x	A matrix or data.frame with columns Rxy and n: see EnterMeta

Details

computed as `varr` - `vare`

Useful in the construction of the SE for heterogenous populations SERHET

Value

A numeric value representing the residual variance

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

varr, vare, SERHET

Examples

```
# From Arthur et al
data(ABHt32)
varRes(ABHt32)

# From Hunter et al
data(HSJt35)
varRes(HSJt35)
```

---

varResT — *True residual variance in correlations*

Description

Residual variance attributed to both the variance due to sampling error and artifacts.

Usage

```
varResT(x, aprox = FALSE)
```

Arguments

x	A matrix or data.frame with columns Rxy, n and artifacts (Rxx, Ryy, u): see EnterMeta
aprox	Logical test to determine if the approximate or exact var e is used

Details

varResT <- varr - vare - varAV

varResT is used in the compution of the variance in rho, varRCA

Value

A numeric value representing the True residual variance

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Arthur, Jr., W., Bennett, Jr., W., and Huffcutt, A. I. (2001) *Conducting Meta-analysis using SAS.* Mahwah, NJ: Erlbaum.

Hunter, J.E. and Schmidt, F.L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings (2nd ed.).* Thousand Oaks: Sage Publications.

Hunter, J.E., Schmidt, F.L., and Jackson, G.B. (1982). *Meta-analysis: Cumulating research findings across studies.* Beverly Hills: Sage Publications.

See Also

varr, vare, varAV, varRCA

Examples

```
# From Arthur et al
data(ABHt32)
varResT(ABHt32)

# From Hunter et al
data(HSJt35)
varResT(HSJt35)
```

---

z2r *Fisher z' to r*

Description

Converts a Fishers z' to Pearson correlation coefficient

Usage

```
z2r(x)
```

Arguments

x	z' (Fishers z prime)

Details

r = (exp(2*z)-1)/exp(2*z)+1)

Value

A Pearson Correlation coefficient

Author(s)

Thomas D. Fletcher <t.d.fletcher05@gmail.com>

References

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.).* Mahwah, NJ: Lawrence Erlbaum.

See Also

r2z, CIr, CIz, SEz

Examples

```
# From ch. 2 in Cohen et al (2003)
zp <- r2z(.657)
zp
z2r(zp)
```

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