Package: RSSampling (via r-universe)

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Type Package

Title Ranked Set Sampling

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Imports LearnBayes, stats

Description Ranked set sampling (RSS) is introduced as an advanced method for data collection which is substantial for the statistical and methodological analysis in scientific studies by McIntyre (1952) (reprinted in 2005) <doi:10.1198/000313005X54180>. This package introduces the first package that implements the RSS and its modified versions for sampling. With 'RSSampling', the researchers can sample with basic RSS and the modified versions, namely, Median RSS, Extreme RSS, Percentile RSS, Balanced groups RSS, Double RSS, L-RSS, Truncation-based RSS, Robust extreme RSS. The 'RSSampling' also allows imperfect ranking using an auxiliary variable (concomitant) which is widely used in the real life applications. Applicants can also use this package for parametric and nonparametric inference such as mean, median and variance estimation, regression analysis and some distribution-free tests where the the samples are obtained via basic RSS.

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Contents

`con.Mrss` *Selecting a ranked set sample (classical or modified) with a concomitant variable*

Description

The `Mrss` function samples from a target population by using modified ranked set sampling methods. Ranking procedure of X is done by using the concomitant variable Y.

Usage

```
con.Mrss(X,Y,m,r=1,type="r",sets=FALSE,concomitant=FALSE,p)
```

Arguments

`X`	A vector of target population
`Y`	A vector of concomitant variable from target population
`m`	Size of units in each set
`r`	Number of cycles. (By default = 1)
`type`	type of the modified RSS method. "r" for traditional RSS, "p" for Percentile RSS, "m" for Median RSS, "bg" for Balanced Groups RSS, "e" for Extreme RSS. (By default = "r")
`sets`	logical; if TRUE, ranked set samples are given with ranked sets (see `rankedsets`)
`concomitant`	logical; if TRUE, ranked set sample of concomitant variable is given
`p`	Value of percentile for Percentile RSS method

Details

X and Y must be vectors and also they should be in same length. Value of percentile (p) must be between 0 and 1.

Value

`corr.coef`	the correlation coefficient between X and Y
`var.of.interest`	the sets of X, which are ranked by Y
`concomitant.var.`	the ranked sets of Y
`sample.x`	the obtained ranked set sample of X
`sample.y`	the obtained ranked set sample of Y

References

McIntyre, G. A. (1952). A method for unbiased selective sampling, using ranked sets. Australian Journal of Agricultural Research, 3(4), 385-390.

Samawi, H. M., Ahmed, M. S., & Abu-Dayyeh, W. (1996). Estimating the population mean using extreme ranked set sampling. Biometrical Journal, 38(5), 577-586.

Muttlak, H. A. (1997). Median ranked set sampling. Journal of Applied Statistical Sciences, 6(4), 245-255.

Muttlak, H. A. (2003). Modified ranked set sampling methods. Pakistan Journal Of Statistics, 19(3), 315-324.

Jemain, A. A., Al-Omari, A., & Ibrahim, K. (2008). Some variations of ranked set sampling. Electronic Journal of Applied Statistical Analysis, 1(1), 1-15.

See Also

`Mrss`, `Rrss`, `Drss`, `con.Rrss`

Examples

```
library("LearnBayes")
mu=c(1,12,2)
Sigma <- matrix(c(1,2,0,2,5,0.5,0,0.5,3), 3, 3)
x <- rmnorm(10000, mu, Sigma)
xx=as.numeric(x[,1])
xy=as.numeric(x[,3])

## Selecting modified ranked set samples
con.Mrss(xx, xy, m=5, r=3, type="r", concomitant=TRUE, sets=TRUE)
con.Mrss(xx, xy, m=4, r=7, type="m", concomitant=TRUE, sets=TRUE)
con.Mrss(xx, xy, m=5, r=2, type="e", concomitant=TRUE, sets=TRUE)
con.Mrss(xx, xy, m=8, r=3, type="p", concomitant=TRUE, sets=TRUE, p=0.25)
con.Mrss(xx, xy, m=6, r=5, type="bg", concomitant=TRUE, sets=TRUE)
```

con.Rrss *Selecting a robust ranked set sample with a concomitant variable*

Description

The con.Rrss function samples from a target population by using robust ranked set sampling methods. Ranking procedure of X is done by using the concomitant variable Y.

Usage

```
con.Rrss(X,Y,m,r=1,type="l",sets=FALSE,concomitant=FALSE,alpha)
```

Arguments

X	A vector of target population
Y	A vector of concomitant variable from target population
m	Size of units in each set
r	Number of cycles. (By default =1)
type	type of the modified RSS method. "l" for L-RSS, "tb" for truncation-based RSS, "re" for robust extreme RSS. (By default ="l")
sets	logical; if TRUE, ranked set sample is given with ranked sets (see rankedsets)
concomitant	logical; if TRUE, ranked set sample of concomitant variable is given
alpha	Coefficient of the method

Details

X and Y must be vectors and also they should be in same length. Coefficient of the method must be between 0 and 0.5.

Value

corr.coef	the correlation coefficient between X and Y
var.of.interest	the sets of X, which are ranked by Y
concomitant.var.	the ranked sets of Y
sample.x	the obtained ranked set sample of X
sample.y	the obtained ranked set sample of Y

References

Al-Nasser, A. D. (2007). L ranked set sampling: A generalization procedure for robust visual sampling. Communications in Statistics-Simulation and Computation, 36(1), 33-43.

Al-Omari, A. I., & Raqab, M. Z. (2013). Estimation of the population mean and median using truncation-based ranked set samples. Journal of Statistical Computation and Simulation, 83(8), 1453-1471.

Al-Nasser, A. D., & Mustafa, A. B. (2009). Robust extreme ranked set sampling. Journal of Statistical Computation and Simulation 79(7), 859-867.

See Also

Mrss, Rrss, Drss, con.Mrss

Examples

```
library("LearnBayes")
mu=c(1,12,2)
Sigma <- matrix(c(1,2,0,2,5,0.5,0,0.5,3), 3, 3)
x <- rmnorm(10000, mu, Sigma)
xx=as.numeric(x[,1])
xy=as.numeric(x[,3])

## Selecting robust ranked set samples
con.Rrss(xx,xy,m=8,r=4,type="l", sets=TRUE, concomitant=TRUE, alpha=0.3)
con.Rrss(xx,xy,m=5,r=2,type="re", sets=TRUE, concomitant=TRUE, alpha=0.2)
con.Rrss(xx,xy,m=6,r=3,type="tb", sets=TRUE, concomitant=TRUE, alpha=0.25)
```

---

con.rss *Selecting ranked set sample with a concomitant variable*

Description

The con.rss function samples from a target population by using ranked set sampling method. Ranking procedure of X is done by using concomitant variable Y.

Usage

```
con.rss(X,Y,m,r=1,sets=FALSE,concomitant=FALSE)
```

Arguments

X	A vector of interested variable from target population
Y	A vector of concomitant variable from target population
m	Size of units in each set
r	Number of cycles. (Default by = 1)
sets	logical; if TRUE, ranked set sample is given with ranked sets(see rankedsets)
concomitant	logical; if TRUE, ranked set sample of concomitant variable is given

Details

X and Y must be vectors and also they should be in same length.

Value

`corr.coef`	the correlation coefficient between X and Y
`var.of.interest`	the sets of X, which are ranked by Y
`concomitant.var.`	the ranked sets of Y
`sample.x`	the obtained ranked set sample of X
`sample.y`	the obtained ranked set sample of Y

References

McIntyre, G. A. (1952). A method for unbiased selective sampling, using ranked sets. Australian Journal of Agricultural Research, 3(4), 385-390.

Lynne Stokes, S. (1977). Ranked set sampling with concomitant variables. Communications in Statistics-Theory and Methods, 6(12), 1207-1211.

Chen, Z., Bai, Z., & Sinha, B. (2003). Ranked set sampling: theory and applications (Vol. 176). Springer Science & Business Media.

See Also

`rss`

Examples

```
library("LearnBayes")
mu=c(1,12,2)
Sigma <- matrix(c(1,2,0,2,5,0.5,0,0.5,3), 3, 3)
x <- rmnorm(10000, mu, Sigma)
xx=as.numeric(x[,1])
xy=as.numeric(x[,3])
con.rss(xx, xy, m=3, r=4, sets=TRUE, concomitant=TRUE)
```

Drss *Selecting double (classical or modified) ranked set sample*

Description

The `Drss` function samples from a target population by using multi-stage ranked set sampling methods.

Usage

```
Drss(X,m,r=1,type="d",sets=FALSE,p)
```

Arguments

X	A vector of target population
m	Size of units in each set
r	Number of cycles. (By default = 1)
sets	logical; if TRUE, ranked set samples are given with ranked sets (see rankedsets)
type	type of the modified RSS method. "d" for double RSS, "dm" for double median RSS, "dp" for double percentile RSS, "de" for double extreme RSS. (By default = "d")
p	Value of percentile for double percentile RSS method

Details

Target population X must be a vector. Value of percentile (p) must be between 0 and 1.

Value

sets	the ranked sets where ranked set sample is chosen from
sample	the obtained ranked set sample of X

References

Al-Saleh, M. F., & Al-Kadiri, M. A. (2000). Double-ranked set sampling. Statistics & Probability Letters, 48: 205-212.

Samawi, H.M. & Tawalbeh, E.M. (2002). Double median ranked set sampling: Comparison to other double ranked set samples for mean and ratio estimators. Journal of Modern Applied Statistical Methods, 1(2): 428-442.

Samawi, H.M. 2002. On double extreme ranked set sample with application to regression estimator. Metron, LXn1-2: 53-66.

Jemain, A.A. & Al-Omari, A.I. (2006). Double percentile ranked set samples for estimating the population mean. Advances and Applications in Statistics, 6(3): 261-276.

See Also

Mrss, Rrss, con.Mrss, con.Rrss

Examples

```
data=rnorm(10000)
##Seleceting a double ranked set sample
Drss(data,m=4,r=3,sets=TRUE)
##Seleceting a double median ranked set sample
Drss(data,m=4,r=3,type="dm",sets=TRUE)
```

```
##Seleceting a double extreme ranked set sample
Drss(data,m=4,r=3,type="de",sets=TRUE)
##Seleceting a double percentile ranked set sample
Drss(data,m=4,r=3,type="dm",sets=TRUE,p=0.6)
```

---

meanRSS *Mean estimation based on ranked set sampling*

Description

The meanRSS function estimates the population mean based on ranked set sampling. Also, it calculates confidence interval, p-value and z-statistics for hypothesis testing.

Usage

```
meanRSS(X,m,r,alpha=0.05,alternative="two.sided",mu_0)
```

Arguments

X	is an obtained ranked set sample
m	is the size of units in each set
r	is the number of cycles
alpha	is the alpha value for the confidence interval. (By default = 0.05)
alternative	is a character string, one of "greater","less" or "two.sided". For one sample test, alternative refers to the true mean of the parent population in relation to the hypothesized value mu_0
mu_0	is the initial value for mean in hypothesis testing formula

Details

An obtained ranked set sample X must be m by r matrix.

Value

mean	the estimated population mean based on ranked set sampling
CI	is a confidence interval for the true mean
z.test	the z-statistic for the test
p.value	the p-value for the test

References

Chen, Z., Bai Z., Sinha B. K. (2003). Ranked Set Sampling: Theory and Application. New York: Springer.

Examples

```
library("LearnBayes")
mu=c(1,12,2)
Sigma <- matrix(c(1,2,0,2,5,0.5,0,0.5,3), 3, 3)
x <- rmnorm(10000, mu, Sigma)
xx=as.numeric(x[,1])
xy=as.numeric(x[,2])
samplerss=con.Mrss(xx,xy,m=4,r=8,type="r",sets=FALSE,concomitant=FALSE)$sample.x

## mean estimation, confidence interval and hypothesis testing for ranked set sample
meanRSS(samplerss,m=4,r=8,mu_0=1)
```

`Mrss` *Selecting a ranked set sample (classical or modified)*

Description

The `Mrss` function samples from a target population by using modified ranked set sampling methods.

Usage

```
Mrss(X,m,r=1,type="r",sets=FALSE,p)
```

Arguments

`X`	A vector of target population
`m`	Size of units in each set
`r`	Number of cycles. (By default = 1)
`sets`	logical; if TRUE, ranked set samples are given with ranked sets (see `rankedsets`)
`type`	type of the modified RSS method. "r" for traditional RSS, "p" for Percentile RSS, "m" for Median RSS, "bg" for Balanced Groups RSS, "e" for Extreme RSS. (By default = "r")
`p`	Value of percentile for Percentile RSS method

Details

Target population X must be a vector.

Value

`sets`	the ranked sets where ranked set sample is chosen from
`sample`	the obtained ranked set sample of X

References

McIntyre, G. A. (1952). A method for unbiased selective sampling, using ranked sets. Australian Journal of Agricultural Research, 3(4), 385-390.

Samawi, H. M., Ahmed, M. S., & Abu-Dayyeh, W. (1996). Estimating the population mean using extreme ranked set sampling. Biometrical Journal, 38(5), 577-586.

Muttlak, H. A. (1997). Median ranked set sampling. Journal of Applied Statistical Sciences, 6(4), 245-255.

Muttlak, H. A. (2003). Modified ranked set sampling methods. Pakistan Journal Of Statistics, 19(3), 315-324.

Jemain, A. A., Al-Omari, A., & Ibrahim, K. (2008). Some variations of ranked set sampling. Electronic Journal of Applied Statistical Analysis, 1(1), 1-15.

See Also

con.Mrss, Rrss, Drss

Examples

```
data=rgamma(10000,1,1)
## Selecting a median ranked set sample
Mrss(data,m=4,r=5,sets=TRUE,type="m")
 ## Selecting an extreme ranked set sample
Mrss(data,m=3,r=5,sets=TRUE,type="e")
 ## Selecting a percentile ranked set sample
Mrss(data,m=4,r=3,sets=TRUE,type="p",p=0.2)
 ## Selecting a balanced groups ranked set sample
Mrss(data,m=6,r=2,sets=TRUE,type="bg")
```

---

mwwutestrss *Mann-Whitney-Wilcoxon test with RSS*

Description

In this function, we introduce the RSS version of the Mann-Whitney-Wilcoxon (MWW) test.

Usage

```
mwwutestrss(X,Y,m,r,l,n,delta0=0,alpha=0.05,lambda=0.5,alternative="two.sided")
```

Arguments

X	First obtained ranked set sample
Y	Second obtained ranked set sample
m	Set size which was used while sampling X
r	Cycles size which was used while sampling X
l	Set size which was used while sampling Y
n	Cycles size which was used while sampling Y
delta0	The median value of difference in the null hypothesis. (By Default = 0)
alpha	The significance level (by default = 0.05).
lambda	constant in the variance formula of the test statistic, see Chen et. al.(2003)
alternative	Character string defining the alternative hypothesis, one of "two.sided", "less" or "greater" (by default = "two.sided")

Details

The test statistics and an approximate confidence intervals are constructed by using the normal approximation. Also note that, we assume that the ranking mechanism in the RSS is consistent. For more details please refer to Chen et. al.(2003, pg. 115-124).

There should be two datasets to compare as "X" and "Y", respectively.

Value

medianX	median value of the first sample
medianY	median value of the second sample
MWW.test.mwwUrss	The value of the Mann-Whitney-Wilcoxon test statistic
C.I.	the confidence interval of the Mann-Whitney-Wilcoxon test statistic
z.test	the z statistic for test
p.value	the p value for the test

References

Chen, Z., Bai Z., Sinha B. K. (2003). Ranked Set Sampling: Theory and Application. New York: Springer.

Examples

```
library("LearnBayes")
mu=c(1,1.2,2)
Sigma <- matrix(c(1,2,0,2,5,0.5,0,0.5,3), 3, 3)
x <- rmnorm(10000, mu, Sigma)
xx=as.numeric(x[,1])
xy=as.numeric(x[,2])
samplerss=con.rss(xx,xy,m=3,r=12,concomitant=TRUE)
sample.x=as.numeric(samplerss$sample.x)
```

```
sample.y=as.numeric(samplerss$sample.y)
mwwutestrss(sample.x,sample.y,m=3,r=12,l=3,n=12,delta0=0)
```

`obsno.Mrss` *observation numbers based on classical and modified ranked set sampling methods*

Description

The `obsno.Mrss` function gives the observation numbers to sample from a target population by using modified ranked set sampling methods. Ranking is done using the concomitant variable Y.

Usage

```
obsno.Mrss(Y,m,r=1,type="r",p)
```

Arguments

`Y`	A vector of concomitant variable from target population
`m`	Size of units in each set
`r`	Number of cycles
`type`	type of the modified RSS method. "r" for traditional RSS, "p" for Percentile RSS, "m" for Median RSS, "bg" for Balanced Groups RSS, "e" for Extreme RSS. Default value is "r"
`p`	Value of percentile for Percentile RSS method

Details

Concomitant variable Y must be a vector.

References

McIntyre, G. A. (1952). A method for unbiased selective sampling, using ranked sets. Australian Journal of Agricultural Research, 3(4), 385-390.

Dell, T. R., & Clutter, J. L. (1972). Ranked set sampling theory with order statistics background. Biometrics, 28, 545-553.

Samawi, H. M., Ahmed, M. S., & Abu-Dayyeh, W. (1996). Estimating the population mean using extreme ranked set sampling. Biometrical Journal, 38(5), 577-586.

Muttlak, H. A. (1997). Median ranked set sampling. Journal of Applied Statistical Sciences, 6(4), 245-255.

Muttlak, H. A. (2003). Modified ranked set sampling methods. Pakistan Journal Of Statistics, 19(3), 315-324.

Jemain, A. A., Al-Omari, A., & Ibrahim, K. (2008). Some variations of ranked set sampling. Electronic Journal of Applied Statistical Analysis, 1(1), 1-15.

See Also

con.Mrss, Mrss, rss

Examples

```
y=rexp(10000)
## Determining the observation numbers of the units which are chosen to sample

y=rexp(10000)
obsno.Mrss(y,m=3,r=5)
obsno.Mrss(y,m=5,r=6,type="m")
obsno.Mrss(y,m=7,r=3,type="e")
obsno.Mrss(y,m=4,r=5,type="p",p=0.3)
obsno.Mrss(y,m=6,r=2,type="bg")
```

---

rankedsets *Selecting ranked sets*

Description

The rankedsets function selects ranked sets from a target population. The selection of units in a set is without replacement, but the sets are selecting with replacement.

Usage

```
rankedsets(X,m,s=m)
```

Arguments

X	A vector of target population
m	Size of units in each set
s	Number of sets. (by default = m)

Details

Target population X must be a vector.

Value

It returns a matrix of ranked sets.

References

McIntyre, G. A. (1952). A method for unbiased selective sampling, using ranked sets. Australian Journal of Agricultural Research, 3(4), 385-390.

Examples

```
data=rexp(10000,3)
## Creating m by m matrix (a regular cycle)
rankedsets(data,m=5)
## Creating m by s matrix
rankedsets(data,m=3,s=5)
```

---

regRSS *Regression estimator based on ranked set sampling*

Description

It obtains the regression estimator for mean of interested population based on ranked set sampling.

Usage

```
regRSS(X,Y,mu_Y)
```

Arguments

X	An obtained ranked set sample for interested variable from target population
Y	An obtained ranked set sample for concomitant variable from target population
mu_Y	The known mean for population Y

Details

In this code, variable X and Y represents interested and concomitant variable, respectively, please note that notation is vice versa in the reference (Yu&Lam(1997)).

X and Y must be in same length.

Value

B	the B coefficient
X_reg	the regression estimate for mean of X based on ranked set sampling

References

Yu, P.L.H. and Lam, K. (1997). "Regression Estimator in Ranked Set Sampling". Biometrics, Vol. 53, No. 3, pp. 1070-1080.

Examples

```
library("LearnBayes")
mu=c(1,12,2)
Sigma <- matrix(c(1,2,0,2,5,0.5,0,0.5,3), 3, 3)
x <- rmnorm(10000, mu, Sigma)
xx=as.numeric(x[,1])
xy=as.numeric(x[,2])
samplerss=con.rss(xx,xy,m=4,r=8,sets=FALSE,concomitant=TRUE)
sample.x=samplerss$sample.x
sample.y=samplerss$sample.y

regRSS(sample.x,sample.y,mu_Y=mean(xy))
```

Rrss *Selecting a robust ranked set sample*

Description

The Rrss function samples from a target population by using robust ranked set sampling methods.

Usage

```
Rrss(X,m,r=1,type="l",sets=FALSE,alpha)
```

Arguments

X	A vector of target population
m	Size of units in each set
r	Number of cycles. (By default = 1)
type	type of the modified RSS method. "l" for L-RSS, "tb" for truncation-based RSS, "re" for robust extreme RSS. (By default = "l")
sets	logical; if TRUE, ranked set samples are given with ranked sets (see rankedsets)
alpha	Coefficient of the method

Details

Target population X must be a vector. Coefficient of the method must be between 0 and 0.5.

Value

sets	the ranked sets where ranked set sample is chosen from
sample	the obtained ranked set sample of X

References

Al-Nasser, A. D. (2007). L ranked set sampling: A generalization procedure for robust visual sampling. Communications in Statistics-Simulation and Computation, 36(1), 33?43.

Al-Omari, A. I., & Raqab, M. Z. (2013). Estimation of the population mean and median using truncation-based ranked set samples. Journal of Statistical Computation and Simulation, 83(8), 1453?1471.

Al-Nasser, A. D., & Mustafa, A. B. (2009). Robust extreme ranked set sampling. Journal of Statistical Computation and Simulation, 79(7), 859?867.

See Also

con.Mrss, Rrss, Drss

Examples

```
data=rexp(10000)
## Selecting L-ranked set sample
Rrss(data, m=8, r=3, sets=TRUE, alpha=0.2)
 ## Selecting Truncation-based ranked set sample
Rrss(data, m=8, r=3, type="tb", sets=TRUE, alpha=0.1)
 ## Selecting Robust extreme ranked set sample
Rrss(data, m=8, r=3, type="re", sets=TRUE, alpha=0.4)
```

---

rss *Selecting classical ranked set sample*

Description

The rss function samples from a target population by using ranked set sampling method.

Usage

```
rss(X,m,r=1,sets=FALSE)
```

Arguments

X	A vector of target population
m	Size of units in each set
r	Number of cycles. (By default=1)
sets	logical; if TRUE, ranked set samples are given with ranked sets (see rankedsets)

Details

Target population X must be a vector.

Value

sets	randomly chosen ranked sets
sample	the obtained ranked set sample of X

References

McIntyre, G. A. (1952). A method for unbiased selective sampling, using ranked sets. Australian Journal of Agricultural Research, 3(4), 385-390.

See Also

con.rss

Examples

```
data=rnorm(10000,1,3)
## Selecting classical ranked set sample with set size \emph{m} and cycle size \emph{r}
rss(data,m=5,r=3,sets=TRUE)
```

---

sign1testrss *Sign Test with RSS*

Description

It performs the RSS version of the sign test given by Chen et. al.(2003).

Usage

```
sign1testrss(sampledata,m,r,median0,alpha=0.05,alternative="two.sided")
```

Arguments

sampledata	An obtained ranked set sample
m	Number of units in each set (set size)
r	Number of cycles
median0	The median value in the null hypothesis
alpha	The significance level (by default = 0.05).
alternative	Character string defining the alternative hypothesis, one of "two.sided", "less" or "greater" (by default = "two.sided")

Details

The test statistics and an approximate confidence intervals are constructed by using the normal approximation. Also note that, we assume that the ranking mechanism in the RSS is consistent. For more details please refer to Chen et. al.(2003, pg. 103-115).

Value

median	The median value of the given set
sign.test.stat	The value of the RSS sign test statistic
C.I.	the confidence interval for median
z.test	the z statistic for test
p.value	the p value for the test

References

Chen, Z., Bai Z., Sinha B. K. (2003). Ranked Set Sampling: Theory and Application. New York: Springer.

Examples

```
data=rnorm(10000,0,1)
samplerss=as.numeric(rss(data,m=3,r=12))
sign1testrss(samplerss,m=3,r=12,median0=0.5)
```

---

varRSS *Variance estimation based on ranked set sampling*

Description

The varRSS function estimates the variance based on ranked set sampling as types of Stokes or Montip&Sukuman.

Usage

```
varRSS(X,m,r,type)
```

Arguments

X	An obtained ranked set sample
m	Size of units in each set
r	Number of cycles
type	character string, one of "Stokes" or "Montip".

Details

An obtained ranked set sample X must be m by r matrix. Stokes (1980) showed that estimator for variance is biased. Montip and Sukuman(2003) showed that for one cycle there is no unbiased estimator for variance but for more than one cycle they proposed unbiased estimator for variance.

Value

var	the estimated population variance based on ranked set sampling

References

Al-Hadhrami, S.A. (2010). "Estimation of the Population Variance Using Ranked Set Sampling with Auxiliary Variable". Int. J. Contemp. Math. Sciences, Vol. 5, no. 52, 2567 - 2576.

Stokes, S.L. (1980). "Estimation of Variance Using Judgment Ordered Ranked Set Samples". Biometrics, Vol. 36, No. 1, pp. 35-42.

Examples

```
data=rnorm(10000,2,1)
samplerss=rss(data,m=4,r=3,sets=FALSE)
## Estimation of variance based on ranked set sample by Stokes
varRSS(samplerss,m=4,r=3,type="Stokes")
 ## Estimation of variance based on ranked set sample by Montip&Sukuman
varRSS(samplerss,m=4,r=3,type="Montip")
```

---

wsrtestrss *Wilcoxon signed rank test with RSS*

Description

It performs the RSS version of the Wilcoxon signed rank test given by Chen et. al.(2003).

Usage

```
wsrtestrss(sampledata,m,r,delta0=0,alpha=0.05,alternative="two.sided")
```

Arguments

sampledata	An obtained ranked set sample
m	Number of units in each set (set size)
r	Number of cycles
delta0	The median value of difference in the null hypothesis
alpha	The significance level (by default = 0.05).
alternative	Character string defining the alternative hypothesis, one of "two.sided", "less" or "greater" (by default = "two.sided")

Details

The test statistics and an approximate confidence intervals are constructed by using the normal approximation. Also note that, we assume that the ranking mechanism in the RSS is consistent. For more details please refer to Chen et. al.(2003, pg. 124-133).

Value

median	median value of the sample
sign.rank.test.stat	The value of the Wilcoxon signed rank test statistic
z.test	the z statistic for test
p.value	the p value for the test

References

Chen, Z., Bai Z., Sinha B. K. (2003). Ranked Set Sampling: Theory and Application. New York: Springer.

Examples

```
library("LearnBayes")
mu=c(1,1.2,2)
Sigma <- matrix(c(1,2,0,2,5,0.5,0,0.5,3), 3, 3)
x <- rmnorm(10000, mu, Sigma)
xx=as.numeric(x[,1])
xy=as.numeric(x[,2])
samplerss=con.rss(xx,xy,m=3,r=12,concomitant=TRUE)
sample.x=as.numeric(samplerss$sample.x)
sample.y=as.numeric(samplerss$sample.y)
difference=sample.x-sample.y
wsrtestrss(difference,m=3,r=12,delta0=0)
```

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