Package 'LagSequential'

January 17, 2019

Type Package

Title Functions for analyzing lag-sequential categorical data

Version 0.1.0

Date 2019-01-17

Author Zakary A. Draper & Brian P. O'Connor

Maintainer Brian P. O'Connor <brian.oconnor@ubc.ca>

Depends R(>= 1.9.0)

LazyLoad yes

LazyData yes

Description This paper describes simple and flexible programs for conducting lag sequential event analyses using SAS and SPSS. The programs read a stream of codes and produce a variety of lag sequential statistics, including transitional frequencies, expected transitional frequencies, transitional probabilities, z values, adjusted residuals, Yule's Q values, likelihood ratio tests of stationarity across time and homogeneity across groups or segments, transformed kappas for unidirectional dependence, bidirectional dependence, parallel and nonparallel dominance, and significance levels based on both parametric and randomization tests.

RoxygenNote 6.0.1

NeedsCompilation no

R topics documented:

`LagSequential-package` *Functions for analyzing lag-sequential categorical data*

Description

This paper describes simple and flexible programs for conducting lag sequential event analyses using SAS and SPSS. The programs read a stream of codes and produce a variety of lag sequential statistics, including transitional frequencies, expected transitional frequencies, transitional probabilities, z values, adjusted residuals, Yule's Q values, likelihood ratio tests of stationarity across time and homogeneity across groups or segments, transformed kappas for unidirectional dependence, bidirectional dependence, parallel and nonparallel dominance, and significance levels based on both parametric and randomization tests.

References

O'Connor, B. P. (1999). Simple and flexible SAS and SPSS programs for analyzing lag-sequential categorical data. Behavior Research Methods, Instrumentation, and Computers, 31, 718-726.

`bidirectional` *bidirectional*

Description

Tests the bidirectional dependence of behaviours.

Usage

```
bidirectional(data, ncodes = 6, labels = NULL, lag = 1,
  adjacent = 1, tailed = 1, permtest = 0, nperms = 10,
  nblocks = 3, confid = 95)
```

Arguments

`data`	An all-numeric dataframe or vector. The data are assumed to be a series of integer codes with values ranging from "1" to what ever value the user specifies in the "ncodes" argument. Cases with missing values are not permitted in the data file.
`ncodes`	The number of possible code values.
`labels`	Optional argument for providing labels to the code values. Accepts a list of string variables. Labels should not exceed five characters. If unspecified, codes will be labeled "Code1", "Code2", etc.
`lag`	The lag number for the analyses.
`adjacent`	Can adjacent values be coded the same? Enter "0" if adjacent events can never be the same. Enter "1" if adjacent events can always be the same. Enter "2" if some adjacent events can, and others cannot, be the same; then enter the appropriate onezero matrix for your data.
`tailed`	Specify whether significance tests are one-tailed or two-tailed. Options are "1" or "2".

`permtest` Do you want to run permutation tests of significance? Options are "0" for no, or "1" for yes. Warning: these computations can be time consuming.

`nperms` The number of permutations per block.

`nblocks` The number of blocks of permutations.

`confid` The percentage confidence intervals for the permutation tests. Options are "95" for 95 percent confidence intervals or 99 for 99 percent confidence intervals.

Details

This function tests the bidirectional dependence of behaviours *i* to *j*, and *j* to *i*, an additive sequential pattern described by Wampold and Margolin (1982) and Wampold (1989, 1992). Bidirectional dependence suggests a reciprocal effect of behaviours. That is, behaviour *i* influences behaviour *j* and behaviour *j* influences behaviour *i*. For example, if behaviour *i* is a husband's positive behaviour, and behaviour *j* is his wife's positive behaviour, a test of bidirectional dependence asks whether the husband reciprocates the wife's positive behaviour, *and* the wife reciprocates the husband's positive behaviour (See Margolin and Wampold, 1982).

Value

`Transitional frequencies`
Each cell indicates the number of times a given transition occurs. Rows indicate antecedents and columns indicate consequences, therefore the cell in row *i* and column *j* indicates the number of times state *j* is followed by state *i*.

`Observed bidirectional frequencies`
Each cell indicates the number of times a given state was either antecedent or consequence of another state. That is, the sum of the number of transitions from state *i* to state *j* and from state *j* to state *i*.

`Expected bidirectional frequencies`
Each cell indicates the expected transitions from state *i* to state *j* and from state *j* to state *i* based on chance alone.

`Bidirectional kappas`
Kappa provides an index of effect size. Values range from -1 to 1, with 0 being no effect. These values may be used in subsequent analyses.

`z Values for kappas`
Standardized kappa values.

`Significance levels of kappas`
p-values for kappas.

Author(s)

Zakary A. Draper & Brian P. O'Connor

References

O'Connor, B. P. (1999). Simple and flexible SAS and SPSS programs for analyzing lag-sequential categorical data. Behavior Research Methods, Instruments & Computers, 31, 718-726.

Wampold, B. E., & Margolin, G. (1982). Nonparametric strategies to test the independence of behavioral states in sequential data. Psychological Bulletin, 92, 755

Wampold, B. E. (1989). Kappa as a measure of pattern in sequential data. Quality & Quantity, 23, 171-187.

Wampold, B. E. (1992). The intensive examination of social interactions. In T. Kratochwill & J. Levin (Eds.), Single-case research design and analysis: New directions for psychology and education (pp. 93-131). Hillsdale, NJ: Erlbaum.

Examples

```
bidirectional(data_sequential, ncodes = 6)
```

`data_seqgroups` *data_seqgroups*

Description

A column vector of simulated data with 393 observations in 3 segments.

Details

A column vector of simulated data with 393 observations in 3 segments. The beginning of each segment is indicated by a number greater than 999. The data set is provided as trial data for the seqgroups function.

Examples

```
summary(data_seqgroups)
```

`data_sequential` *data_sequential*

Description

A column vector of hypothetical sequential data.

Details

A column vector with 122 observations. The data set is provided as trial data for the sequential, bidirectional, twocells, paradom, and nonparadom functions.

Examples

```
summary(data_sequential)
```

nonparadom *nonparadom*

Description

Tests for nonparallel dominance, a form of asymmetry in predictability, between i to j and k to L (Wampold, 1984, 1989, 1992, 1995).

Usage

```
nonparadom(data, ncodes = 6, i, j, k, L, labels = NULL, lag = 1, adjacent = 1, tailed = 1, permtest = 0
```

Arguments

`data`	An all-numeric dataframe or vector. The data are assumed to be a series of integer codes with values ranging from "1" to what ever value the user specifies in the "ncodes" argument. Cases with missing values are not permitted in the data file.
`ncodes`	The number of possible code values.
`i`	Code value for i.
`j`	Code value for j.
`k`	Code value for k.
`L`	Code value for L.
`labels`	Optional argument for providing labels to the code values. Accepts a list of string variables. Labels should not exceed five characters. If unspecified, codes will be labeled "Code1", "Code2", etc.
`lag`	The lag number for the analyses.
`adjacent`	Can adjacent values be coded the same? Options are "1" for yes or "0" for no.
`tailed`	Specify whether significance tests are one-tailed or two-tailed. Options are "1" or "2".
`permtest`	Do you want to run permutation tests of significance? Options are "0" for no, or "1" for yes. Warning: these computations can be time consuming.
`nperms`	The number of permutations per block.
`nblocks`	The number of blocks of permutations.
`confid`	The percentage confidence intervals for the permutation tests. Options are "95" for 95 percent confidence intervals or 99 for 99 percent confidence intervals.

Details

Tests for nonparallel dominance or asymmetry in predictability, which is the difference in predictability between i to j and k to L (e.g., whether a partner follows a negative behaviour with a positive behaviour), as described by Wampold (1984, 1989, 1992, 1995).

Value

Returns the transitional frequency matrix, expected fre- quencies, expected and observed nonparallel dominance frequencies, kappas, the z value for kappas, and significance levels.

`Transitional frequencies`
: Each cell indicates the number of times a state is followed by another state. The cell in row *i* and column *j* indicates the number of times state *j* is followed by state *i*.

`Expected frequencies`
: Each cell indicates the number of times a state would be expected to follow another state based on chance alone. For example, the cell in row *i* and column *j* indicates the number of times state *j* would be expected to follow state *i* based on chance.

`Dominance frequencies`

`Expected dominance frequencies`

`Dominance types`
: There are 4 sequential dominance case types described by Wampold (1989). These cases describe the direction of the effect for *i* on *j* and *j* on *i*. The four cases are: (1) *i* increases *j*, and *j* increases *i*, (2) *i* decreases *j*, and *j* decreases *i*, (3) *i* increases *j*, and *j* decreases *i*, and (4) *i* decreases *j*, and *j* increases *i*. Each cell of this matrix indicates the case that applies to the transition indicated by the cell.

`Dominance kappas`
: An index of effect size for nonparallel dominance. Kappa ranges from -1 to 1, with 0 being no effect.

`z values for kappas`
: Standardized kappa values.

`Significance levels of kappas`
: p-values for kappas.

Author(s)

Zakary A. Draper & Brian P. O'Connor

References

O'Connor, B. P. (1999). Simple and flexible SAS and SPSS programs for analyzing lag-sequential categorical data. Behavior Research Methods, Instruments & Computers, 31, 718-726.

Wampold, B. E. (1984). Tests of dominance in sequential categorical data. Psychological Bulletin, 96, 424-429.

Wampold, B. E. (1989). Kappa as a measure of pattern in sequential data. Quality & Quantity, 23, 171-187.

Wampold, B. E. (1992). The intensive examination of social interactions. In T. Kratochwill & J. Levin (Eds.), Single-case research design and analysis: New directions for psychology and education (pp. 93-131). Hillsdale, NJ: Erlbaum.

Wampold, B. E. (1995). Analysis of behavior sequences in psychotherapy. In J. Siegfried (Ed.), Therapeutic and everyday discourse as behavior change: Towards a micro-analysis in psychotherapy process research (pp. 189-214). Norwood, NJ: Ablex.

Examples

```
nonparadom(data_sequential, ncodes = 6, i = 5, j = 3, k = 6, L = 2)
```

`paradom` *paradom*

Description

Assesses parallel dominance in sequential data.

Usage

```
paradom(data, ncodes = 6, labels = NULL, lag = 1, adjacent = 1,
  tailed = 1, permtest = 0, nperms = 10, nblocks = 3,
  confid = 95)
```

Arguments

`data`	An all-numeric dataframe or vector. The data are assumed to be a series of integer codes with values ranging from "1" to what ever value the user specifies in the "ncodes" argument. Cases with missing values are not permitted in the data file.
`ncodes`	The number of possible code values.
`labels`	Optional argument for providing labels to the code values. Accepts a list of string variables. Labels should not exceed five characters. If unspecified, codes will be labeled "Code1", "Code2", etc.
`lag`	The lag number for the analyses.
`adjacent`	Can adjacent values be coded the same? Options are "1" for yes or "0" for no.
`tailed`	Specify whether significance tests are one-tailed or two-tailed. Options are "1" or "2".
`permtest`	Do you want to run permutation tests of significance? Options are "0" for no, or "1" for yes. Warning: these computations can be time consuming.
`nperms`	The number of permutations per block.
`nblocks`	The number of blocks of permutations.
`confid`	The percentage confidence intervals for the permutation tests. Options are "95" for 95 percent confidence intervals or 99 for 99 percent confidence intervals.

Details

Tests for parallel dominance or asymmetry in predictability, which is the difference in predictability between i to j and j to i (e.g., whether B's behaviour is more predictable from A's behaviour than vice versa), as described by Wampold (1984, 1989, 1992, 1995).

Value

Returns the transitional frequency matrix and matrices of expected frequencies, expected and observed parallel dominance frequencies, parallel dominance kappas, z values for the kappas, and significance levels. There are four possible cases, or kinds, of parallel dominance (see Wampold 1989, 1992, 1995), and the function returns a matrix indicating the kind of case for each cell in the transitional frequency matrix.

`Transitional frequencies`
: Each cell indicates the number of times a state is followed by another state. The cell in row *i* and column *j* indicates the number of times state *j* is followed by state *i*.

`Expected frequencies`
: Each cell indicates the number of times a state would be expected to follow another state based on chance alone. For example, the cell in row *i* and column *j* indicates the number of times state *j* would be expected to follow state *i* based on chance.

`Dominance frequencies`

`Expected dominance frequencies`

`Dominance types`
: There are 4 sequential dominance case types described by Wampold (1989). These cases describe the direction of the effect for *i* on *j* and *j* on *i*. The four cases are: (1) *i* increases *j*, and *j* increases *i*, (2) *i* decreases *j*, and *j* decreases *i*, (3) *i* increases *j*, and *j* decreases *i*, and (4) *i* decreases *j*, and *j* increases *i*. Each cell of this matrix indicates the case that applies to the transition indicated by the cell.

`Dominance kappas`
: An index of effect size for parallel dominance. Kappa ranges from -1 to 1, with 0 being no effect.

`z values for kappas`
: Standardized kappa values.

`Significance levels of kappas`
: p-values for kappas.

Author(s)

Zakary A. Draper & Brian P. O'Connor

References

O'Connor, B. P. (1999). Simple and flexible SAS and SPSS programs for analyzing lag-sequential categorical data. Behavior Research Methods, Instruments & Computers, 31, 718-726.

Wampold, B. E. (1984). Tests of dominance in sequential categorical data. Psychological Bulletin, 96, 424-429.

Wampold, B. E. (1989). Kappa as a measure of pattern in sequential data. Quality & Quantity, 23, 171-187.

Wampold, B. E. (1992). The intensive examination of social interactions. In T. Kratochwill &

J. Levin (Eds.), Single-case research design and analysis: New directions for psychology and education (pp. 93-131). Hillsdale, NJ: Erlbaum.

Wampold, B. E. (1995). Analysis of behavior sequences in psychotherapy. In J. Siegfried (Ed.), Therapeutic and everyday discourse as behavior change: Towards a micro-analysis in psychotherapy process research (pp. 189-214). Norwood, NJ: Ablex.

Examples

```
paradom(data_sequential, ncodes = 6)
```

`seqgroups` *seqgroups*

Description

Computes a variety of basic sequential analysis statistics for data that are in multiple groups, or segments.

Usage

```
seqgroups(alldata, ncodes = 6, labels = NULL, lag = 1, adjacent = 1,
  onezero = NULL, tailed = 2, test = 1, output = 2, outfile = 1)
```

Arguments

`alldata`	An all-numeric dataframe or vector. The data are assumed to be a series of integer codes with values ranging from "1" to what ever value the user specifies in the "ncodes" argument. The beginning of each segment, or group should be specified with a number greater than 999. Cases with missing values are not permitted in the data file.
`ncodes`	The number of possible code values.
`labels`	Optional argument for providing labels to the code values. Accepts a list of string variables. Labels should not exceed five characters. If unspecified, codes will be labeled "Code1", "Code2", etc.
`lag`	The lag number for the analyses.
`adjacent`	Can adjacent values be coded the same? Enter "0" if adjacent events can never be the same. Enter "1" if adjacent events can always be the same. Enter "2" if some adjacent events can, and others cannot, be the same; then enter the appropriate onezero matrix for your data.
`onezero`	Optional argument for specifying the one-zero matrix for the data. Accepts a square matrix of ones and zeros with length ncodes. A "1" indicates that the exprected frequency for a given cell is to be estimated, whereas a "0" indicates that the expected frequency for the cell should NOT be estimated, typically because it is a structural zero (codes that cannot follow one another). By default, the matrix that is created by the above commands has zeros along the main diagonal, and ones everywhere else, which will be appropriate for most data sets. However, if yor data happen to involve structural zeros that occur in cells other than the cells along the main diagonal, then you must create a ONEZERO matrix with ones and zeros that is appropriate for your data.

`tailed` Specify whether significance tests are one-tailed or two-tailed. Options are "1" or "2".

`test` Specify whether to run tests for homogeneity of homogeneity or stationarity. Homogeneity should be tested when groups in the data are actually different groups, whereas stationarity should be tested when groups in the data are segments of a single stream of observations. Options are "1" for homogeneity of "2" for stationarity.

`output` Specify the desired output. Options are "1" for pooled data only, or "2" for all data sets.

`outfile` Specify which results should be saved in an outfile.

Details

Simple function for computing a variety of sequential statistics for data that are in multiple groups, or segments. This is the same as the sequential() provided in this package, but allows for the data to be segmented. Sequential statistics are calculated for each segment, as well as for the data pooled across all segments.

Value

For each of the groups or segments and for the pooled data, returns square matrices (the cells of which correspond with the cells of the transitional frequency matrix) for each of the following: transitional frequencies with row and column totals, expected frequencies, transitional probabilities, adjusted residuals and significance levels, Yule's Q values, transformed Kappas (Wampold, 1989, 1992, 1995), z values for the kappas, and significance levels.

`Transitional frequencies`
Each cell indicates the number of times a state is followed by another state. The cell in row *i* and column *j* indicates the number of times state *j* is followed by state *i*.

`Expected frequencies`
Each cell indicates the number of times a state would be expected to follow another state based on chance alone. For example, the cell in row *i* and column *j* indicates the number of times state *j* would be expected to follow state *i* based on chance.

`Transitional probabilities`
Each cell indicates the probability that the state indicated by the column follows the state indicated by the row.

`Chi-square test`
Significance test of difference between the transitional frequencies matrix and the expected frequencies matrix.

`Adjusted Residuals`
Given by the observed count minus the expected count divided by an estimate of the standard error. Adjusted residuals are standardized values with a mean of 0 and standard deviation of 1.

`Significance sevels`
Significance of difference between transitional and expected frequencies for each cell.

`Yule's Q values`
An indication of the strength of the relationship between the antecedent and the consequence (i.e., an index of effect size).

`Transformed kappas`
: Kappa provides an index of effect size. Values range from -1 to 1, with 0 being no effect. These values may be used in subsequent analyses, as they represent the extent to which the antecedent predicts the consequence for each case.

`z values for kappas`
: Standardized kappa values.

`Significance levels of kappas`
: p-values for kappas.

Author(s)

Zakary A. Draper & Brian P. O'Connor

References

O'Connor, B. P. (1999). Simple and flexible SAS and SPSS programs for analyzing lag-sequential categorical data. Behavior Research Methods, Instruments & Computers, 31, 718-726.

Wampold, B. E. (1989). Kappa as a measure of pattern in sequential data. Quality & Quantity, 23, 171-187.

Wampold, B. E. (1992). The intensive examination of social interactions. In T. Kratochwill & J. Levin (Eds.), Single-case research design and analysis: New directions for psychology and education (pp. 93-131). Hillsdale, NJ: Erlbaum.

Wampold, B. E. (1995). Analysis of behavior sequences in psychotherapy. In J. Siegfried (Ed.), Therapeutic and everyday discourse as behavior change: Towards a micro-analysis in psychotherapy process research (pp. 189-214). Norwood, NJ: Ablex.

Examples

```
seqgroups(data_seqgroups, ncodes = 6)
```

`sequential` *sequential*

Description

Computes a variety of basic sequential analysis statistics.

Usage

```
sequential(data, ncodes = 6, labels = NULL, lag = 1, adjacent = 1,
  onezero = NULL, tailed = 2, permtest = 0, nperms = 10,
  nblocks = 3, confid = 95)
```

Arguments

`data` An all-numeric dataframe or vector. The data are assumed to be a series of integer codes with values ranging from "1" to what ever value the user specifies in the "ncodes" argument. Cases with missing values are not permitted in the data file.

`ncodes` The number of possible code values.

`labels` Optional argument for providing labels to the code values. Accepts a list of string variables. Labels should not exceed five characters. If unspecified, codes will be labeled "Code1", "Code2", etc.

`lag` The lag number for the analyses.

`adjacent` Can adjacent values be coded the same? Enter "0" if adjacent events can never be the same. Enter "1" if adjacent events can always be the same. Enter "2" if some adjacent events can, and others cannot, be the same; then enter the appropriate onezero matrix for your data.

`onezero` Optional argument for specifying the one-zero matrix for the data. Accepts a square matrix of ones and zeros with length ncodes. A "1" indicates that the expected frequency for a given cell is to be estimated, whereas a "0" indicates that the expected frequency for the cell should NOT be estimated, typically because it is a structural zero (codes that cannot follow one another). By default, the matrix that is created by the above commands has zeros along the main diagonal, and ones everywhere else, which will be appropriate for most data sets. However, if yor data happen to involve structural zeros that occur in cells other than the cells along the main diagonal, then you must create a ONEZERO matrix with ones and zeros that is appropriate for your data.

`tailed` Specify whether significance tests are one-tailed or two-tailed. Options are "1" or "2".

`permtest` Do you want to run permutation tests of significance? Options are "0" for no, or "1" for yes. Warning: these computations can be time consuming.

`nperms` The number of permutations per block.

`nblocks` The number of blocks of permutations.

`confid` The percentage confidence intervals for the permutation tests. Options are "95" for 95 percent confidence intervals or 99 for 99 percent confidence intervals.

Details

Tests unidirectional dependence of states. That is, tests the hypothesis that state *i* (the consequence) follows state *j* (the antecedent) with a greater than chance probability. Computes a variety of statistics including two indices of effect size with corresponding significance tests. The larger the effect the more like the consequence is to follow the antecedent.

Value

Returns square matrices (the cells of which correspond with the cells of the transitional frequency matrix) for each of the following: transitional frequencies with row and column totals, expected frequencies, transitional probabilities, adjusted residuals and significance levels, Yule's Q values, transformed Kappas (Wampold, 1989, 1992, 1995), z values for the kappas, and significance levels.

`Transitional frequencies`
Each cell indicates the number of times a state is followed by another state. The cell in row *i* and column *j* indicates the number of times state *j* is followed by state *i*.

`Expected frequencies`
: Each cell indicates the number of times a state would be expected to follow another state based on chance alone. For example, the cell in row *i* and column *j* indicates the number of times state *j* would be expected to follow state *i* based on chance.

`Transitional probabilities`
: Each cell indicates the probability that the state indicated by the column follows the state indicated by the row.

`Chi-square test`
: Significance test of difference between the transitional frequencies matrix and the expected frequencies matrix.

`Adjusted Residuals`
: Given by the observed count minus the expected count divided by an estimate of the standard error. Adjusted residuals are standardized values with a mean of 0 and standard deviation of 1.

`Significance sevels`
: Significance of difference between transitional and expected frequencies for each cell.

`Yule's Q values`
: An indication of the strength of the relationship between the antecedent and the consequence (i.e., an index of effect size).

`Transformed kappas`
: Kappa provides an index of effect size. Values range from -1 to 1, with 0 being no effect. These values may be used in subsequent analyses, as they represent the extent to which the antecedent predicts the consequence for each case.

`z Values for kappas`
: Standardized kappa values.

`Significance levels of kappas`
: p-values for kappas.

Author(s)

Brian P. O'Connor & Zakary A. Draper

References

O'Connor, B. P. (1999). Simple and flexible SAS and SPSS programs for analyzing lag-sequential categorical data. Behavior Research Methods, Instruments & Computers, 31, 718-726.

Wampold, B. E. (1989). Kappa as a measure of pattern in sequential data. Quality & Quantity, 23, 171-187.

Wampold, B. E. (1992). The intensive examination of social interactions. In T. Kratochwill & J. Levin (Eds.), Single-case research design and analysis: New directions for psychology and education (pp. 93-131). Hillsdale, NJ: Erlbaum.

Wampold, B. E. (1995). Analysis of behavior sequences in psychotherapy. In J. Siegfried (Ed.), Therapeutic and everyday discourse as behavior change: Towards a micro-analysis in psychotherapy process research (pp. 189-214). Norwood, NJ: Ablex.

Examples

```
sequential(data_sequential, ncodes = 6)
```

twocells *twocells*

Description

Simultaneously tests the the unidirectional dependence of *i* to *j*, and the unidirectional dependence of *k* to *L*, an additive pattern described by Wampold and Margolin (1982) and Wampold (1989, 1992).

Usage

```
twocells(data, i, j, k, L, ncodes = 6, labels = NULL, lag = 1,
  adjacent = 1, tailed = 1, permtest = 0, nperms = 10,
  nblocks = 3, confid = 95)
```

Arguments

`data`	An all-numeric dataframe or vector. The data are assumed to be a series of integer codes with values ranging from "1" to what ever value the user specifies in the "ncodes" argument. Cases with missing values are not permitted in the data file.
`i`	Code value for *i*.
`j`	Code value for *j*.
`k`	Code value for *k*.
`L`	Code value for *L*.
`ncodes`	The number of possible code values.
`labels`	Optional argument for providing labels to the code values. Accepts a list of string variables. Labels should not exceed five characters. If unspecified, codes will be labeled "Code1", "Code2", etc.
`lag`	The lag number for the analyses.
`adjacent`	Can adjacent values be coded the same? Options are "1" for yes, and "0" for no.
`tailed`	Specify whether significance tests are one-tailed or two-tailed. Options are "1" or "2".
`permtest`	Do you want to run permutation tests of significance? Options are "0" for no, or "1" for yes. Warning: these computations can be time consuming.
`nperms`	The number of permutations per block.
`nblocks`	The number of blocks of permutations.
`confid`	The percentage confidence intervals for the permutation tests. Options are "95" for 95 percent confidence intervals or 99 for 99 percent confidence intervals.

Details

This function simultaneously tests the unidirectional dependence of *i* to *j* and the unidirectional dependence of *k* to *L*. The user specifies the code values used for *i*, *j*, *k*, and *L* in the analyses. This function is useful for answering theoretical questions about behaviour. For example, Wampold and Margolin (1982) described a situation wherein a spouse responds to negative behaviours with something other than a negative behaviour.

Value

Returns the transitional frequency matrix, observed and expected values for the two cell test, kappa, the z value for kappa, and the significance level.

`Transitional frequncies`
: Each cell indicates the number of times a state is followed by another state. The cell in row *i* and column *j* indicates the number of times state *j* is followed by state *i*.

`Expected frequency`
: The expected number of transitions from *i* to *j* and from *k* to *L* based on chance alone.

`Observed frequency`
: The observed number of transitions from *i* to *j* and from *k* to *L*.

`Kappa`
: Kappa provides an index of effect size. Values range from -1 to 1, with 0 being no effect. These values may be used in subsequent analyses.

`z value for kappa`
: Standardized kappa value.

`Significance level of kappa`
: p-values for kappa.

Author(s)

Zakary A. Draper & Brian P. O'Connor

References

O'Connor, B. P. (1999). Simple and flexible SAS and SPSS programs for analyzing lag-sequential categorical data. Behavior Research Methods, Instruments & Computers, 31, 718-726.

Wampold, B. E. (1989). Kappa as a measure of pattern in sequential data. Quality & Quantity, 23, 171-187.

Wampold, B. E. (1992). The intensive examination of social interactions. In T. Kratochwill & J. Levin (Eds.), Single-case research design and analysis: New directions for psychology and education (pp. 93-131). Hillsdale, NJ: Erlbaum.

Wampold, B. E., & Margolin, G. (1982). Nonparametric strategies to test the independence of behavioral states in sequential data. Psychological Bulletin, 92, 755-765.

Examples

```
twocells(data_sequential, ncodes = 6, i = 1, j = 6, k = 5, L = 2)
```

Index