Package 'LagSequential'

May 16, 2019

Type Package

Title Lag-Sequential Categorical Data Analysis

Version 0.1.1

Date 2019-05-15

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Depends R(>= 1.9.0)

LazyLoad yes

LazyData yes

Description Lag-sequential analysis is a method of assessing of patterns (what tends to follow what?) in sequences of codes. The codes are typically for discrete behaviors or states. The functions in this package read a stream of codes, or a frequency transition matrix, 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. The methods are described in Bakeman & Quera (2011) <doi:10.1017/CBO9781139017343>, O'Connor (1999) <doi:10.3758/BF03200753>, Wampold & Margolin (1982) <doi:10.1037/0033-2909.92.3.755>, and Wampold (1995, ISBN:0-89391-919-5).

License GPL (>= 2)

NeedsCompilation no

Repository CRAN

Date/Publication 2019-05-16 15:50:11 UTC

R topics documented:

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LagSequential-package   *Lag-Sequential Categorical Data Analysis*

Description

This package provides functions for conducting lag sequential analyses of categorical data.The functions are R versions of the programs provided by O'Connor (1999). The functions read a stream of codes, or a frequency transition matrix, 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.

When data is a frequency transition matrix, the code value that preceded the first code in the sequence, and the code value that followed the final code value, are usually unknown/unavailable. This missing information may cause slight inaccuracies in some of the provided statistics, most likely only at the second decimal place. The inaccuracies will be negligible in longer data sequences.

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 for bidirectional dependence between pairs of lag sequential transitions.

Usage

```
bidirectional(data, labels = NULL, lag = 1, adjacent = TRUE,
              tailed = 1, permtest = FALSE, nperms = 10)
```

Arguments

data	A one-column dataframe, or a vector of code sequences, or a square frequency transition matrix. If data is not a frequency transition matrix, then data must be either (a) a series of string (non-numeric) code values, or (b) a series of integer codes with values ranging from "1" to what ever value the user specifies in the "ncodes" argument. There should be no code values with zero frequencies. Missing values are not permitted.
labels	Optional argument for providing labels to the code values. Accepts a list of string variables. 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 "FALSE" if adjacent events can never be the same. Enter "TRUE" if adjacent events can always be the same.
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 "FALSE" for no, or "TRUE" for yes. Warning: these computations can be time consuming.
nperms	The number of permutations per block.

Details

This function tests the bidirectional dependence of behaviors 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 behaviors. That is, behavior i influences behavior j and behavior j influences behavior i. For example, if behavior i is a husband's positive behavior, and behavior j is his wife's positive behavior, a test of bidirectional dependence asks whether the husband reciprocates the wife's positive behavior, *and* the wife reciprocates the husband's positive behavior (See Margolin and Wampold, 1982). Bidirectional dependence is sometimes called a "circuit".

Value

A list with the following elements:

freqs	The transitional frequency matrix
bifreqs	The bidirectional frequencies
expbifreqs	The expected bidirectional frequencies
kappas	The bidirectional kappas
z	The z values for the kappas
pk	The p values (significance levels) for the 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, Instrumentation, and 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,* 755-765.

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_Wampold_1982,
              labels = c('HPos','HNeu','HNeg','WPos','WNeu','WNeg'),
              permtest = TRUE, nperms = 100)
```

---

data_seqgroups_numeric

data_seqgroups_numeric

Description

A column vector of simulated data with 393 observations in 3 segments (which could, e.g., be groups or dyads).

Details

A column vector of numeric data with 393 observations in 3 segments (which could, e.g., be groups or dyads). 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. It is a numeric version of the data in data_seqgroups_strings.

Examples

```
table(data_seqgroups_numeric)
```

---

data_seqgroups_strings

data_seqgroups_strings

Description

A column vector of simulated data with 393 observations in 3 segments (which could, e.g., be groups or dyads).

Details

A column vector of string data with 393 observations in 3 segments (which could, e.g., be groups or dyads). The beginning of each segment is indicated by the word "segment". The data set is provided as trial data for the seqgroups function. It is a string/character version of the data in data_seqgroups_numeric.

Examples

```
table(data_seqgroups_strings)
```

---

data_sequential   *data_sequential*

Description

A column vector of trial data for sequential analyses.

Details

A column vector with 122 observations (codes). The data are provided as trial data for the sequential, bidirectional, twocells, paradom, and nonparadom functions.

Examples

```
table(data_sequential)
```

---

data_Wampold_1982   *data_Wampold_1982*

Description

A vector of code sequences that mimic the frequency transition matrix and the statistical results reported in Wampold & Margolin (1982).

Details

A column vector of 200 sequential codes. The data are provided as trial data for the paradom and nonparadom functions.

References

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

Examples

```
table(data_Wampold_1982)
```

---

data_Wampold_1984   *data_Wampold_1984*

Description

A vector of code sequences that mimic the frequency transition matrix and the statistical results reported in Wampold (1984).

Details

A column vector of 200 sequential codes. The data are provided as trial data for the paradom and nonparadom functions.

References

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

Examples

```
table(data_Wampold_1984)
```

---

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, i, j, k, L, labels = NULL, lag = 1, adjacent = TRUE,
           tailed = 1, permtest = FALSE, nperms = 10)
```

Arguments

data	A one-column dataframe, or a vector of code sequences, or a square frequency transition matrix. If data is not a frequency transition matrix, then data must be either (a) a series of string (non-numeric) code values, or (b) a series of integer codes with values ranging from "1" to what ever value the user specifies in the "ncodes" argument. There should be no code values with zero frequencies. Missing values are not permitted.
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. 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 "TRUE" for yes or "FALSE" 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 "FALSE" for no, or "TRUE" for yes. Warning: these computations can be time consuming.
nperms	The number of permutations per block.

Details

Tests for nonparallel dominance or asymmetry in predictability, which is the difference in predictability between i to j and k to L, as described by Wampold (1984, 1989, 1992, 1995). Parallel dominance (another function in this package) is the difference in predictability between i to j and j to i. In parallel dominance the i and j values across the two pairs of codes are the same. In nonparallel dominance, the i and j values across the two pairs of codes may vary, i.e., they do not have to be the same.

Value

Displays the transitional frequency matrix, expected frequencies, expected and observed nonparallel dominance frequencies, kappas, the z values for the kappas, and the significance levels.

Returns a list with the following elements:

`freqs`	The transitional frequency matrix
`expfreqs`	The expected frequencies
`npdomfreqs`	The nonparallel dominance frequencies
`expnpdomfreqs`	The expected nonparallel dominance frequencies
`domtypes`	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.
`kappas`	The nonparallel dominance kappas
`z`	The z values for the kappas
`pk`	The p-values for the 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, Instrumentation, and 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,* 755-765.

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_Wampold_1984, i = 6, j = 1, k = 3, L = 4,
           labels = c('HPos','HNeu','HNeg','WPos','WNeu','WNeg'),
           permtest = TRUE, nperms = 1000)
```

---

paradom   *paradom*

Description

Tests for parallel dominance in lag sequential data.

Usage

```
paradom(data, labels = NULL, lag = 1, adjacent = TRUE,
        tailed = 1, permtest = FALSE, nperms = 10)
```

Arguments

data	A one-column dataframe, or a vector of code sequences, or a square frequency transition matrix. If data is not a frequency transition matrix, then data must be either (a) a series of string (non-numeric) code values, or (b) a series of integer codes with values ranging from "1" to what ever value the user specifies in the "ncodes" argument. There should be no code values with zero frequencies. Missing values are not permitted.
labels	Optional argument for providing labels to the code values. Accepts a list of string variables. 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 "TRUE" for yes or "FALSE" 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 "FALSE" for no, or "TRUE" for yes. Warning: these computations can be time consuming.
nperms	The number of permutations per block.

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 behavior is more predictable from A's behavior than vice versa), as described by Wampold (1984, 1989, 1992, 1995).

Value

Displays 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.

Returns a list with the following elements:

freqs	The transitional frequency matrix
expfreqs	The expected frequencies
domfreqs	The parallel dominance frequencies
expdomfreqs	The expected parallel dominance frequencies
domtypes	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.
kappas	The parallel dominance kappas
z	The z values for the kappas
pk	The p-values for the 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, Instrumentation, and 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_Wampold_1984,
        labels = c('HPos','HNeu','HNeg','WPos','WNeu','WNeg'),
        permtest = TRUE, nperms = 1000)
```

---

seqgroups	*seqgroups*

Description

Computes a variety of sequential analysis statistics for data that are in segments (e.g, for multiple dyads or groups).

Usage

```
seqgroups(alldata, labels = NULL, lag = 1, adjacent = TRUE,
          onezero = NULL, tailed = 2, test = "homogeneity",
          output = "all")
```

Arguments

alldata	A one-column dataframe, or a vector of code sequences, which can be numeric or strings. Missing values are not permitted.
	If alldata is numeric, then the integers must range from "1" to the total number of possible code values (which is not the total number of codes in a sequence), and a number greater than 999 must be used in alldata to separate the codes sequences for different groups/dyads. See "data_seqgroups" for an example.
	If alldata consists of strings/characters, then the word "segment" must be used in alldata to separate the code sequences for different groups/dyads. See "data_seqgroups" for an example.
labels	Optional argument for providing labels to the code values. Accepts a list of string variables. 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 "FALSE" if adjacent events can never be the same. Enter "TRUE" if adjacent events can always be the same. Enter "TRUE" 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. Useful when some adjacent events can, and others cannot, be the same. 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 your 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 "homogeneity" or "stationarity".

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

Details

Computes a variety of sequential analysis statistics for data that are in segments (e.g, for multiple dyads or groups. This is the same as the "sequential" function 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, displays the transitional frequency matrix, 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.

Returns a list with the following elements:

freqs   The transitional frequency matrix

expfreqs   The expected frequencies

probs   The transitional probabilities

chi   The overall chi-square test of the difference between the observed and expected transitional frequencies

adjres   The adjusted residuals

p   The statistical significance levels

YulesQ   Yule's Q values, indicating the strength of the relationships between the antecedent and the consequence transitions

kappas   The nonparallel dominance kappas

z   The z values for the kappas

pk   The p-values for the kappas

output   The requested output data

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, Instrumentation, and 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_strings)
```

---

sequential *sequential*

Description

Computes a variety of lag sequential analysis statistics for one series of codes.

Usage

```
sequential(data, labels = NULL, lag = 1, adjacent = TRUE,
           onezero = NULL, tailed = 2, permtest = FALSE, nperms = 10)
```

Arguments

data	A one-column dataframe, or a vector of code sequences, or a square frequency transition matrix. If data is not a frequency transition matrix, then data must be either (a) a series of string (non-numeric) code values, or (b) a series of integer codes with values ranging from "1" to what ever value the user specifies in the "ncodes" argument. There should be no code values with zero frequencies. Missing values are not permitted.
labels	Optional argument for providing labels to the code values. Accepts a list of string variables. 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 "FALSE" if adjacent events can never be the same. Enter "TRUE" if any adjacent events can be the same. If some adjacent events can, and others cannot, be the same, then enter the appropriate onezero matrix for your data using the onezero argument.
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 your 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 "FALSE" for no, or "TRUE" for yes. Warning: these computations can be time consuming.
nperms	The number of permutations per block.

Details

Tests unidirectional dependence of states (codes). Specifically, this function tests the hypothesis that state *i* (the antecedent) follows state *j* (the consequence) 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

Displays the transitional frequency matrix, 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.

Returns a list with the following elements:

freqs	The transitional frequency matrix
expfreqs	The expected frequencies
probs	The transitional probabilities
chi	The overall chi-square test of the difference between the observed and expected transitional frequencies
adjres	The adjusted residuals
p	The statistical significance levels
YulesQ	Yule's Q values, indicating the strength of the relationships between the antecedent and the consequence transitions
kappas	The nonparallel dominance kappas
z	The z values for the kappas
pk	The p-values for the 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, Instrumentation, and 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

```
# data is a one-column dataframe of code sequences
sequential(data_sequential, permtest = TRUE, nperms = 100)


# in this case, data is the frequency transition matrix from
# Griffin, W. A., & Gottman, J. M. (1990). Statistical methods for analyzing family
# interaction. In G. R. Patterson (Ed.), Family social interaction: Content and methodology
# issues in the study of aggression and depression (p. 137). Hillsdale, NJ: Erlbaum.
freqs <- t(matrix(c(
0, 0, 0, 0, 2, 2,
0,10, 5, 5,60,20,
0, 9, 2, 1, 3, 0,
0, 3, 0, 1, 5, 0,
3,54, 6, 2,24, 8,
1,24, 2, 1, 3, 12  ), 6, 6) )

sequential(freqs, adjacent = 1,
   labels = c('H+','Ho','H-','W+','Wo','W-'))


# Data from p 159 of Bakeman & Quera (2011), Sequential Analysis and Observational
# Methods for the Behavioral Sciences. Cambridge University Press.
data_BQ2011 <- t(matrix(c(
2,1,4,3,3,4,3,4,2,1,4,4,5,4,1,3,4,5,3,2,2,1,4,1,2,
5,2,1,2,3,3,1,4,4,1,4,1,3,3,3,1,5,2,1,1,3,1,4,1,2,
3,3,4,5,5,2,3,3,5,2,5,4,4,2,3,1,5,5,2,2,1,3,3,3,3 )) )

sequential(data_BQ2011, labels=c('Chat','Write','Read','Ask','Attentive'),
          permtest = TRUE, nperms = 1000, tailed = 1)
```

| twocells | *twocells* |

Description

Simultaneously tests 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, labels = NULL, lag = 1,
        adjacent = TRUE, tailed = 1, permtest = FALSE, nperms = 10)
```

Arguments

data	A one-column dataframe, or a vector of code sequences, or a square frequency transition matrix. If data is not a frequency transition matrix, then data must be either (a) a series of string (non-numeric) code values, or (b) a series of integer codes with values ranging from "1" to what ever value the user specifies in the "ncodes" argument. There should be no code values with zero frequencies. Missing values are not permitted.
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. 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 "TRUE" for yes, and "FALSE" 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 "FALSE" for no, or "TRUE" for yes. Warning: these computations can be time consuming.
nperms	The number of permutations per block.

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. For example, Wampold and Margolin (1982) described a situation wherein a spouse responds to negative behaviors with something other than a negative behavior.

Value

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

Returns a list with the following elements:

`freqs`	The transitional frequency matrix
`expfreqs`	The expected frequencies
`twocellfreq`	The observed number of transitions from *i* to *j* and from *k* to *L*.
`kappa`	The twocells kappa
`z`	The z value for the kappa
`pk`	The p-value for the 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, Instrumentation, and 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,* 755-765.

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

```
twocells(data_Wampold_1982, i = 6, j = 1, k = 3, L = 4,
         labels = c('HPos','HNeu','HNeg','WPos','WNeu','WNeg'),
         permtest = TRUE, nperms = 100)
```

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