Package ‘multicmp’
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Type Package
Title Flexible Modeling of Multivariate Count Data via the Multivariate Conway-Maxwell-Poisson Distribution
Version 1.1
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Description A toolkit containing statistical analysis models motivated by multivariate forms of the Conway-Maxwell-Poisson (COM-Poisson) distribution for flexible modeling of multivariate count data, especially in the presence of data dispersion. Currently the package only supports bivariate data, via the bivariate COM-Poisson distribution described in Sellers et al. (2016) <doi:10.1016/j.jmva.2016.04.007>. Future development will extend the package to higher-dimensional data.
Imports stats, numDeriv
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### accidents

**Description**

The number of accidents incurred by 122 shunters in two consecutive year periods, namely 1937 - 1942 and 1943 - 1947

**Usage**

accidents

**Format**

A dataframe with 122 rows and 2 variables:

- x Number of shunter accidents between 1937 and 1942
- y Number of shunter accidents between 1943 and 1947

**Source**

A. Arbous, J.E. Kerrick, Accident statistics and the concept of accident proneness, Biometrics 7 (1951) 340-432.

### dbivCMP

**Description**

Density for the Bivariate Conway-Maxwell-Poisson (CMP) distribution

**Usage**

dbivCMP(lambda, nu, bivprob, x, y, maxit)

**Arguments**

- **lambda**: Mean/rate parameter under Poisson model.
- **nu**: Dispersion parameter.
- **bivprob**: Bivariate probabilities, p00, p01, p10, p11.
- **x**: x values
- **y**: y values
- **maxit**: Number of terms used to truncate infinite sum calculations.
References


Examples

```
dbicMP(lambda=10, nu=1, bivprob=c(0.4, 0.2, 0.3, 0.1), x=2, y=3, maxit = 100)
```

#this is equivalent to the pmf P(X=2,Y=3) of a bivariate Poisson
##with lambda1=3, lambda2=2, lambda3=1

**multicmpests**  Bivariate COM-Poisson Parameter Estimation

Description

`multicmpests` computes the maximum likelihood estimates of a bivariate COM-Poisson distribution (based on the model described in Sellers et al. (2016)) for given count data and conducts a test for significant data dispersion, relative to a bivariate Poisson model. The bivariate Poisson case is addressed via the bivpois package by Karlis and Ntzoufras (2009).

Usage

```
multicmpests(data, max = 100, startvalues = NULL)
```

Arguments

- **data**: A two-column dataset of counts.
- **max**: Truncation term for infinite summation associated with the Z function. See Sellers et al. (2016) for details.
- **startvalues**: A vector of starting values for maximum likelihood estimation. The values are read as follows: c(lambda, nu, p00, p10, p01, p11). The default is c(1,1,0.25,0.25,0.25,0.25).

Value

`multicmpests` will return a list of four elements: $\text{par}$ (Parameter Estimates), $\text{negll}$ (Negative Log-Likelihood), $\text{LRTbpd}$ (Dispersion Test Statistic), and $\text{pbpd}$ (Dispersion Test P-Value).

References


Examples

```r
x1 <- c(3, 2, 5, 4, 1)
x2 <- c(0, 4, 1, 0, 1)
ex.data <- cbind(x1, x2)

# starting close to the optimum for sake of run time
multicmpests(ex.data, startvalues = c(12.5, 1.7, 0, 0.25, 0.75, 0))
```
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