# Package: CorBin (via r-universe)

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**Type** Package

**Title** Generate High-Dimensional Binary Data with Correlation Structures

**Version** 1.0.0

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**Description** We design algorithms with linear time complexity with respect to the dimension for three commonly studied correlation structures, including exchangeable, decaying-product and K-dependent correlation structures, and extend the algorithms to generate binary data of general non-negative correlation matrices with quadratic time complexity. Jiang, W., Song, S., Hou, L. and Zhao, H. ``A set of efficient methods to generate high-dimensional binary data with specified correlation structures." The American Statistician. See <doi:10.1080/00031305.2020.1816213> for a detailed presentation of the method.

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## `cBern` *Main function*

### Description

The main function of our package, through which we can simulate correlated binary data under different settings.

### Usage

```
cBern(n, p, rho, type, k = NULL)
```

### Arguments

| | |
|---|---|
| `n` | number of observations |
| `p` | the vector of marginal probabilities with dimension m |
| `rho` | For the first three types, rho is either a non-negative value indecating the shared correlation coefficient or and m-1 vector indicating the correlation coefficients between adjacent variables. For the general case, rho should be a list, the i-th element of which specifies the coefficients on the i-th minor diagnal. |
| `type` | including 4 types.<br>type="exchange"<br>type="DCP"<br>type="1-dependent"<br>type="General" |
| `k` | (for 'General' use only). The number of layers setting for k-dependent structure. k=m-1 for the general case. |

### Value

an n*p matrix of binary data

### References

Jiang, W., Song, S., Hou, L. and Zhao, H. A set of efficient methods to generate high-dimensional binary data with specified correlation structures. *The American Statistician*. DOI:10.1080/00031305.2020.1816213

## See Also

cBernEx, cBernDCP, cBern1dep

## Examples

```
X <- cBern(10, rep(0.5,3), 0.5, type="exchange")

X <- cBern(10, rep(0.5,3), c(0.2,0.2), type="DCP")

X <- cBern(5, c(0.4,0.5,0.6), c(0.2,0.3), type="1-dependent")

rho <- list()
rho[[1]] <- c(0.2,0.3)
rho[[2]] <- 0.1
X <- cBern(2, c(0.7,0.8,0.9),rho=rho,type="General", k=2)
```

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# cBern1dep *Generate binary data with 1-dependent correlated structure*

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## Description

Equivalent to cBern(n, p, rho, type="1-dependent")

## Usage

```
cBern1dep(n, p, rho)
```

## Arguments

| | |
|---|---|
| n | number of observations |
| p | the vector of marginal probabilities with dimension m |
| rho | either a non-negative value indecating the shared correlation coefficient or and m-1 vector indicating the correlation coefficients between adjacent variables. |

## Value

an n*p matrix of binary data

## Examples

```
X <- cBern1dep(5, c(0.4,0.5,0.6), c(0.2,0.3))
```

## cBernDCP *Generate binary data with decaying-product correlated structure*

### Description

Equivalent to cBern(n, p, rho, type="DCP")

### Usage

```
cBernDCP(n, p, rho)
```

### Arguments

`n` number of observations

`p` the vector of marginal probabilities with dimension m

`rho` either a non-negative value indecating the shared correlation coefficient or and m-1 vector indicating the correlation coefficients between adjacent variables.

### Value

an n*p matrix of binary data

### Examples

```
X <- cBernDCP(10, rep(0.5,3), c(0.2,0.2))
```

## cBernEx *Generate binary data with exchangeable correlated structure*

### Description

Equivalent to cBern(n, p, rho, type="exchange")

### Usage

```
cBernEx(n, p, rho)
```

### Arguments

`n` number of observations

`p` the vector of marginal probabilities with dimension m

`rho` a non-negative value indecating the shared correlation coefficient

### Value

an n*p matrix of binary data

### Examples

```
X <- cBernEx(10, rep(0.5,3), 0.5)
```

## rhoMax1dep *To calculate the maximal allowed correlations max for using cBern1dep to generate binary data with 1-dependent structure*

### Description

To calculate the maximal allowed correlations max for using cBern1dep to generate binary data with 1-dependent structure

### Usage

```
rhoMax1dep(p)
```

### Arguments

| | |
|---|---|
| p | the vector of marginal probabilities with dimension m |

### Value

an (m-1)-dimensional vector rho, which is the maximum the correlation between the adjacent variables

## rhoMaxDCP *For calculating the maximal allowed correlations max for binary data with decaying-product structure.*

### Description

For calculating the maximal allowed correlations max for binary data with decaying-product structure.

### Usage

```
rhoMaxDCP(p)
```

### Arguments

| | |
|---|---|
| p | marginal probabilities |

### Value

an (m-1)-dimensional vector rho, which is the maximum the correlation between the adjacent variables

## rhoMaxEx *For calculating the maximal allowed correlation coefficient for binary data with exchangeable structure.*

### Description

For calculating the maximal allowed correlation coefficient for binary data with exchangeable structure.

### Usage

```
rhoMaxEx(p)
```

### Arguments

| | |
|---|---|
| `p` | the vector of marginal probabilities with dimension m |

### Value

the maximal allowed correlation coefficient

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