

# Package ‘drcarlate’

May 8, 2026

**Type** Package

**Title** Improving Estimation Efficiency in CAR with Imperfect Compliance

**Version** 1.2.0

**Description** We provide a list of functions for replicating the results of the Monte Carlo simulations and empirical application of Jiang et al. (2022).

In particular, we provide corresponding functions for generating the three types of random data described in this paper, as well as all the estimation strategies.

Detailed information about the data generation process and estimation strategy can be found in Jiang et al. (2022) <[doi:10.48550/arXiv.2201.13004](https://doi.org/10.48550/arXiv.2201.13004)>.

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## Contents

ATEDGP .....	2
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ATEJLTZ . . . . .	3
ATEOutput . . . . .	4
ATETrueValue . . . . .	5
CovAdptRnd . . . . .	6
data_table . . . . .	6
feasiblePostLassoMatTool . . . . .	9
FuncDGP . . . . .	10
JLTZ . . . . .	11
LinearLogit . . . . .	12
LogisticReg . . . . .	13
norminv . . . . .	14
Output . . . . .	14
pihat . . . . .	15
splinebasis . . . . .	16
stanE . . . . .	17
tau . . . . .	18
TrueValue . . . . .	19
<b>Index</b>	<b>21</b>

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ATEDGP

*Simulates the data for ATE estimators*

---

### Description

ATEDGP is the version of FuncDGP under full compliance.

### Usage

```
ATEDGP(dgptype, rndflag, n, g, pi)
```

### Arguments

dgptype	A scalar. 1, 2, 3 (Almost the same as 1-3 in the paper except that it does not have the DGP for D(1) or D(0)).
rndflag	A scalar. method of covariate-adaptive randomization. 1-SRS; 2-WEI; 3-BCD; 4-SBR.
n	Sample size.
g	Number of strata. The authors set $g = 4$ in the Jiang et al. (2022).
pi	A $g \times 1$ vector. Targeted assignment probabilities across strata.

### Value

ATEDGP returns a list containing 7  $n \times 1$  vectors named Y, X, S, A, Y1, Y0 and D. These seven vectors are the same as defined in Jiang et al. (2022). Note that vector X does not contain the constant term.

## References

Jiang L, Linton O B, Tang H, Zhang Y. Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance [J]. 2022.

## Examples

```
ATEDGP(dgptype = 1, rndflag = 1, n = 200, g = 4, pi = c(0.5, 0.5, 0.5, 0.5))
```

---

ATEJLTZ

*ATEJLTZ runs the code for ATE estimator*

---

## Description

ATEJLTZ is the version of JLTZ under full compliance.

## Usage

```
ATEJLTZ(iMonte, dgptype, n, g, pi, iPert, iq = 0.05, iridge = 0.001, seed = 1)
```

## Arguments

<code>iMonte</code>	A scalar. Monte Carlo sizes.
<code>dgptype</code>	A scalar. The value can be string 1, 2, or 3, respectively corresponding to the three DGP schemes in the paper (See Jiang et al. (2022) for DGP details).
<code>n</code>	Sample size.
<code>g</code>	Number of strata. The authors set $g=4$ in Jiang et al. (2022).
<code>pi</code>	Targeted assignment probability across strata.
<code>iPert</code>	A scalar. $iPert = 0$ means size. Otherwise means power: $iPert$ is the perturbation of false null.
<code>iq</code>	A scalar. Size of hypothesis testing. The authors set $iq = 0.05$ in Jiang et al. (2022).
<code>iridge</code>	A scalar. The penalization parameter in ridge regression.
<code>seed</code>	A scalar. The random seed, the authors set $seed = 1$ in Jiang et al. (2022).

## Value

A table summarizing the estimated results, `mProd`.

## References

Jiang L, Linton O B, Tang H, Zhang Y. Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance [J]. 2022.

**Examples**

```
# size, iPert = 0
ATEJLTZ(iMonte = 10, dgptype = 1, n = 200, g = 4,
        pi = c(0.5, 0.5, 0.5, 0.5), iPert = 0, iq = 0.05, iridge = 0.001)

# power, iPert = 1
ATEJLTZ(iMonte = 10, dgptype = 1, n = 200, g = 4,
        pi = c(0.5, 0.5, 0.5, 0.5), iPert = 1, iq = 0.05, iridge = 0.001)
```

ATEOutput

*Computes linear, nonparametric and regularized ATE estimator***Description**

ATEOutput is the version of Output under full compliance.

**Usage**

```
ATEOutput(ii, tau, dgptype, rndflag, n, g, pi, iPert, iq, iridge)
```

**Arguments**

<code>ii</code>	Monte Carlo index.
<code>tau</code>	A scalar. The simulated true LATE effect.
<code>dgptype</code>	A Scalar. 1, 2, 3 (See Jiang et al. (2022) for DGP details).
<code>rndflag</code>	Method of CAR (covariate-adaptive randomizations). Its value can be 1, 2, 3 or 4. 1-SRS; 2-WEI; 3-BCD; 4-SBR. See Jiang et al. (2022) for more details about CAR.
<code>n</code>	Sample size.
<code>g</code>	Number of strata. The authors set $g=4$ in Jiang et al. (2022).
<code>pi</code>	Targeted assignment probability across strata.
<code>iPert</code>	A scalar. $iPert=0$ means size. Otherwise means power: $iPert$ is the perturbation of false null.
<code>iq</code>	Size of hypothesis testing. We set $iq = 0.05$ .
<code>iridge</code>	A scalar. The penalization parameter in ridge regression.

**Value**

A list containing four matrices named `vtauhat`, `vsighat`, `vstat` and `vdeci` respectively. `vtauhat` is a  $1 \times 4$  vector: (1) L (2) NL (3) R( $dgp = 1$  or 2) (4) R( $dgp = 3$ ). `vsighat` is a  $1 \times 4$  vector: unscaled standard errors for `vtauhat`. `vstat` is a  $1 \times 4$  vector: test statistic. `vdeci` is a  $1 \times 4$  logical vector: if applicable, 1 means rejecting the null. 0 means not rejecting the null.

**Examples**

```
ATEOutput(ii = 1, tau = 0.9122762, dgptype = 1,
          rndflag = 4, n = 2000, g = 4, pi = c(0.5,0.5,0.5,0.5),
          iPert = 1, iq = 0.05, iridge = 0.001)
```

---

ATETrueValue	<i>Calculates the true ATE effect.</i>
--------------	--

---

**Description**

ATETrueValue is the version of TrueValue under full compliance.

**Usage**

```
ATETrueValue(dgptype, vIdx, n, g, pi)
```

**Arguments**

dgptype	A scalar. The value can be string 1, 2, or 3, respectively corresponding to the three DGP schemes in the paper (See Jiang et al. (2022) for DGP details).
vIdx	A 1xR vector. The authors set vIdx=[1 2 3 4] in Jiang et al. (2022). Every number declares the method of covariate-adaptive randomization. 1-SRS; 2-WEI; 3-BCD; 4-SBR.
n	Sample size.
g	Number of strata. The authors set g=4 in Jiang et al. (2022).
pi	Targeted assignment probability across strata.

**Value**

A 1xR vector. Simulated true ATE effect.

**References**

Jiang L, Linton O B, Tang H, Zhang Y. Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance [J]. 2022.

**Examples**

```
ATETrueValue(dgptype = 1, vIdx = c(1,2,3,4), n = 100, g = 4, pi = c(0.5,0.5,0.5,0.5))
ATETrueValue(dgptype = 2, vIdx = c(1,2,3,4), n = 100, g = 4, pi = c(0.5,0.5,0.5,0.5))
ATETrueValue(dgptype = 3, vIdx = c(1,2,3,4), n = 100, g = 4, pi = c(0.5,0.5,0.5,0.5))
```

---

CovAdptRnd

*Generate treatment assignment under various CARs*


---

**Description**

Generate treatment assignment under various CARs.

**Usage**

```
CovAdptRnd(rndflag, S, pi)
```

**Arguments**

<code>rndflag</code>	Index of the assignment rule. 1 for SRS; 2 for WEI; 3 for BCD; 4 for SBR
<code>S</code>	A nx1 vector.
<code>pi</code>	Targeted assignment probability across strata. It should be a vector with the length of max(S), It should be noted that the treatment assignment process is independent of pi when <code>rndflag == 2</code> or 3.

**Value**

A nx1 treatment assignment vector generated according to the specified method.

**References**

Jiang L, Linton O B, Tang H, Zhang Y. Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance [J]. 2022.

**Examples**

```
CovAdptRnd(rndflag = 1, S = matrix(sample(1:4,100,TRUE)), pi = c(0.5, 0.5, 0.5, 0.5))
CovAdptRnd(rndflag = 2, S = matrix(sample(1:4,100,TRUE)), pi = c(0.5, 0.5, 0.5, 0.5))
CovAdptRnd(rndflag = 3, S = matrix(sample(1:4,100,TRUE)), pi = c(0.5, 0.5, 0.5, 0.5))
CovAdptRnd(rndflag = 4, S = matrix(sample(1:4,100,TRUE)), pi = c(0.5, 0.5, 0.5, 0.5))
```

---

data\_table

*Data used to reproduce Table 5 results in Jiang et. al. (2022)*


---

**Description**

Data used to reproduce Table 5 results in Jiang et. al. (2022).

**Usage**

```
data("data_table")
```

**Format**

A data frame with 2159 observations on the following 69 variables.

- X1 a numeric vector
- X2 a numeric vector
- X3 a numeric vector
- X4 a numeric vector
- X5 a numeric vector
- X6 a numeric vector
- X7 a numeric vector
- X8 a numeric vector
- X9 a numeric vector
- X10 a numeric vector
- X11 a numeric vector
- X12 a numeric vector
- X13 a numeric vector
- X14 a numeric vector
- X15 a numeric vector
- X16 a numeric vector
- X17 a numeric vector
- X18 a numeric vector
- X19 a numeric vector
- X20 a numeric vector
- X21 a numeric vector
- X22 a numeric vector
- X23 a numeric vector
- X24 a numeric vector
- X25 a numeric vector
- X26 a numeric vector
- X27 a numeric vector
- X28 a numeric vector
- X29 a numeric vector
- X30 a numeric vector
- X31 a numeric vector
- X32 a numeric vector
- X33 a numeric vector
- X34 a numeric vector
- X35 a numeric vector

X36 a numeric vector  
X37 a numeric vector  
X38 a numeric vector  
X39 a numeric vector  
X40 a numeric vector  
X41 a numeric vector  
X42 a numeric vector  
X43 a numeric vector  
X44 a numeric vector  
X45 a numeric vector  
X46 a numeric vector  
X47 a numeric vector  
X48 a numeric vector  
X49 a numeric vector  
X50 a numeric vector  
X51 a numeric vector  
X52 a numeric vector  
X53 a numeric vector  
X54 a numeric vector  
X55 a numeric vector  
X56 a numeric vector  
X57 a numeric vector  
X58 a numeric vector  
X59 a numeric vector  
X60 a numeric vector  
X61 a numeric vector  
X62 a numeric vector  
X63 a numeric vector  
X64 a numeric vector  
X65 a numeric vector  
X66 a numeric vector  
X67 a numeric vector  
X68 a numeric vector  
X69 a numeric vector

## References

Jiang L, Linton O B, Tang H, Zhang Y. Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance [J]. 2022.

---

`feasiblePostLassoMatTool`*Feasible Post Lasso Mat Tool*

---

## Description

Under the condition of high dimensional data, the function first selects covariables through lasso regression, then performs logit regression or linear regression according to the caller's requirements, and finally returns the adjusted Lasso regression coefficient vector. This function has been slightly adapted for this package.

## Usage

```
feasiblePostLassoMatTool(  
  x,  
  y,  
  MaxIter = 30,  
  UpsTol = 1e-06,  
  beta0 = c(),  
  clusterVar = c(),  
  Dist = "normal",  
  link = "identity",  
  glmTol = 1e-08,  
  initScale = 0.5  
)
```

## Arguments

<code>x</code>	A $n \times k$ Matrix.
<code>y</code>	A $n \times 1$ vector.
<code>MaxIter</code>	Maximum iteration. The default value is 30.
<code>UpsTol</code>	Upper limit of tolerance. The default value is $1e-6$ .
<code>beta0</code>	NULL.
<code>clusterVar</code>	NULL.
<code>Dist</code>	The default value is normal.
<code>link</code>	Link can be identity or logit. This determines the method used for regression with the selected write variable after lasso. See Jiang et al. (2022) for more details.
<code>glmTol</code>	Maximum tolerance in GLM. The default value is $1e-8$ .
<code>initScale</code>	Initial scale, the default value is 0.5.

## Value

A  $k \times 1$  vector, the coefficients  $b$ .

## References

Belloni, A., Chernozhukov, V., Fernández-Val, I. and Hansen, C. (2017), Program Evaluation and Causal Inference With High-Dimensional Data. *Econometrica*, 85: 233-298. <https://doi.org/10.3982/ECTA12723>

## Examples

```
set.seed(1)
# Notice that when we set dgptype = 3, FuncDGP will generate a high dimensional data for us.
DGP <- FuncDGP(dgptype = 3, rndflag = 1, n = 10000, g = 4, pi = c(0.5, 0.5, 0.5, 0.5))
X <- DGP$X
Y <- DGP$Y
A <- DGP$A
S <- DGP$S
D <- DGP$D
feasiblePostLassoMatTool(x = X[S==1 & A==0,], y = Y[S==1 & A==0,])
feasiblePostLassoMatTool(x = X[S==1 & A==0,], y = D[S==1 & A==0,], link = "logit")
```

---

FuncDGP

*Generate Data for LATE*

---

## Description

Generate data according to one of the three DGPs in Jiang et al. (2022).

## Usage

```
FuncDGP(dgptype, rndflag, n, g, pi)
```

## Arguments

dgptype	A Scalar. 1, 2, 3 (See Jiang et al. (2022) for DGP details)
rndflag	A Scalar. Declare the method of covariate-adaptive randomization. 1-SRS; 2-WEI; 3-BCD; 4-SBR.
n	Sample size
g	Number of strata. The authors set g=4 in the Jiang et al. (2022).
pi	Targeted assignment probability across strata.

## Value

FuncDGP returns a list containing 9 nx1 vectors named Y, X, S, A, Y1, Y0, D1, D0 and D. These nine vectors are the same as defined in Jiang et al. (2022). Note that vector X does not contain the constant term.

## References

Jiang L, Linton O B, Tang H, Zhang Y. Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance [J]. 2022.

## Examples

```
FuncDGP(dgptype = 1, rndflag = 1, n = 200, g = 4, pi = c(0.5,0.5,0.5,0.5))
FuncDGP(dgptype = 1, rndflag = 2, n = 200, g = 4, pi = c(0.5,0.5,0.5,0.5))
FuncDGP(dgptype = 1, rndflag = 3, n = 200, g = 4, pi = c(0.5,0.5,0.5,0.5))
FuncDGP(dgptype = 1, rndflag = 4, n = 200, g = 4, pi = c(0.5,0.5,0.5,0.5))

FuncDGP(dgptype = 2, rndflag = 1, n = 200, g = 4, pi = c(0.5,0.5,0.5,0.5))
FuncDGP(dgptype = 2, rndflag = 2, n = 200, g = 4, pi = c(0.5,0.5,0.5,0.5))
FuncDGP(dgptype = 2, rndflag = 3, n = 200, g = 4, pi = c(0.5,0.5,0.5,0.5))
FuncDGP(dgptype = 2, rndflag = 4, n = 200, g = 4, pi = c(0.5,0.5,0.5,0.5))

FuncDGP(dgptype = 3, rndflag = 1, n = 200, g = 4, pi = c(0.5,0.5,0.5,0.5))
FuncDGP(dgptype = 3, rndflag = 2, n = 200, g = 4, pi = c(0.5,0.5,0.5,0.5))
FuncDGP(dgptype = 3, rndflag = 3, n = 200, g = 4, pi = c(0.5,0.5,0.5,0.5))
FuncDGP(dgptype = 3, rndflag = 4, n = 200, g = 4, pi = c(0.5,0.5,0.5,0.5))
```

---

JLTZ

*Reproduce the results of the Jiang et al. (2022)*

---

## Description

Helps the user reproduce the results of the data simulation section of Jiang et al. (2022).

## Usage

```
JLTZ(iMonte, dgptype, n, g, pi, iPert, iq = 0.05, iridge = 0.001, seed = 1)
```

## Arguments

iMonte	A scalar. Monte Carlo sizes.
dgptype	A scalar. The value can be string 1, 2, or 3, respectively corresponding to the three random data generation methods in the paper (See Jiang et al. (2022) for DGP details).
n	Sample size.
g	Number of strata. We set g=4 in Jiang et al. (2022).
pi	Targeted assignment probability across strata.
iPert	A scalar. iPert = 0 means size. Otherwise means power: iPert is the perturbation of false null.
iq	A scalar. Size of hypothesis testing. The authors set iq = 0.05.
iridge	A scalar. The penalization parameter in ridge regression.
seed	A scalar. The random seed, the authors set seed = 1 in Jiang et al. (2022).

**Value**

A table summarizing the estimated results, mProd.

**References**

Jiang L, Linton O B, Tang H, Zhang Y. Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance [J]. 2022.

**Examples**

```
# size, iPert = 0
JLTZ(iMonte = 10, dgptype = 1, n = 200, g = 4,
     pi = c(0.5, 0.5, 0.5, 0.5), iPert = 0, iq = 0.05, iridge = 0.001, seed = 1)

# power, iPert = 1
JLTZ(iMonte = 10, dgptype = 1, n = 200, g = 4,
     pi = c(0.5, 0.5, 0.5, 0.5), iPert = 1, iq = 0.05, iridge = 0.001, seed = 1)
```

---

 LinearLogit

*Linear Regression or Logit Regression*


---

**Description**

LinearLogit generates estimated pseudo true values for parametric models. Different estimation strategies are adopted according to different values of modelflag. See Jiang et al. (2022) for more details about different strategies.

**Usage**

```
LinearLogit(Y, D, A, X, S, s, modelflag, iridge)
```

**Arguments**

Y	The outcome vector. A nx1 vector.
D	A nx1 vector.
A	The treatment assignment. A nx1 vector.
X	Extra covariate matrix, A nxK matrix without constant.
S	The strata variable.
s	A particular stratum.
modelflag	Its value ranges from characters 1, 2, and 3, respectively declaring different estimation strategies. 1-L; 2-NL; 3-R.
iridge	A scalar. The penalization parameter in ridge regression.

**Value**

theta\_0s, theta\_1s, beta\_0s, beta\_1s are estimated coefficients vectors. The dimension is  $K \times 1$  if `modelflag = 1`;  $(K+1) \times 1$  if `modelflag = 2` or `3`.

**References**

Jiang L, Linton O B, Tang H, Zhang Y. Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance [J]. 2022.

**Examples**

```
#' set.seed(1)
DGP <- FuncDGP(dgptype = 3, rndflag = 1, n = 10000, g = 4, pi = c(0.5, 0.5, 0.5, 0.5))
X <- DGP$X
Y <- DGP$Y
A <- DGP$A
S <- DGP$S
D <- DGP$D
LinearLogit(Y = Y, D = D, A = A, X = X, S = S, s = 1, modelflag = 1, iridge = 0.001)
LinearLogit(Y = Y, D = D, A = A, X = X, S = S, s = 2, modelflag = 2, iridge = 0.001)
LinearLogit(Y = Y, D = D, A = A, X = X, S = S, s = 3, modelflag = 3, iridge = 0.001)
LinearLogit(Y = Y, D = D, A = A, X = X, S = S, s = 4, modelflag = 3, iridge = 0.001)
```

---

 LogisticReg

*Logistic Regression Function*


---

**Description**

Logestic CDF(cumulative distribution function).

**Usage**

```
LogisticReg(x)
```

**Arguments**

`x`                    A  $n \times 1$  matrix.

**Value**

`y` A  $n \times 1$  matrix. `y` equals to  $\exp(x)/(1+\exp(x))$  if `y` is not NA and 0 else.

**Examples**

```
x <- pracma::rand(5,1)
y <- LogisticReg(x = x)
```

---

norminv	<i>Inverse of the normal cumulative distribution function (cdf)</i>
---------	---

---

**Description**

Returns the inverse cdf for the normal distribution with mean MU and standard deviation SIGMA at P value Reference: <https://rdr.io/github/maxto/qapi/src/R/stats.R>

**Usage**

```
norminv(p, mu = 0, sigma = 1)
```

**Arguments**

p	probability value in range 0-1
mu	mean value
sigma	standard deviation

**Value**

numeric

**Examples**

```
xx <- c(0.003,0.026,0.015,-0.009,-0.014,-0.024,0.015,0.066,-0.014,0.039)
norminv(0.01,mean(xx),sd(xx))
```

---

Output	<i>Computes All the Estimators</i>
--------	------------------------------------

---

**Description**

Output is an integrated function that computes all the estimates (including NA, TSLS, L, NL, F, NP, R) used in Jiang et al. (2022). See the paper for more details.

**Usage**

```
Output(ii, tau, dgptype, rndflag, n, g, pi, iPert, iq, iridge)
```

**Arguments**

ii	Monte Carlo index.
tau	A scalar. The simulated true LATE effect.
dgptype	A Scalar. 1, 2, 3 (See Jiang et al. (2022) for DGP details).
rndflag	Method of CAR (covariate-adaptive randomizations). Its value can be 1, 2, 3 or 4. 1-SRS; 2-WEI; 3-BCD; 4-SBR. See Jiang et al. (2022) for more details about CAR.
n	Sample size.
g	Number of strata. The authors set $g=4$ in Jiang et al. (2022).
pi	Targeted assignment probability across strata.
iPert	A scalar. iPert = 0 means size. Otherwise means power: iPert is the perturbation of false null.
iq	Size of hypothesis testing. The authors set $iq = 0.05$ in Jiang et al. (2022).
iridge	A scalar. The penalization parameter in ridge regression.

**Value**

A list containing four matrices named vtauhat, vsighat, vstat and vdeci respectively. vtauhat is a 1x8 vector: (1) NA (2) LP (3) LG (4) F (5) NP (6) R (when  $dgp = 3$ ) (7) 2SLS (8) R (when  $dgp = 1$  or 2). vsighat is a 1x8 vector: unscaled standard errors for vtauhat. vstat is a 1x8 vector: test statistic. vdeci is a 1x8 logical vector: if applicable, 1 means rejecting the null. 0 means not rejecting the null.

**References**

Jiang L, Linton O B, Tang H, Zhang Y. Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance [J]. 2022.

**Examples**

```
Output(ii = 1, tau = 0.9122762, dgptype = 1,
       rndflag = 4, n = 2000, g = 4, pi = c(0.5,0.5,0.5,0.5),
       iPert = 1, iq = 0.05, iridge = 0.001)
```

---

pihat

*Compute Estimated Treatment Assignment Probabilities*

---

**Description**

Pihat computes the targeted treatment assignment probabilities across all strata in Jiang et al. (2022) and stacks them in an  $n \times 1$  vector.

**Usage**

```
pihat(A, S, stratnum = NULL)
```

**Arguments**

A	A nx1 vector.
S	A nx1 vector.
stratum	A nx1 vector about the unique strata numbers, the default value is NULL.

**Value**

A nx1 vector, each element corresponds to the targeted treatment assignment probabilities across all strata in Jiang et al. (2022).

**References**

Jiang L, Linton O B, Tang H, Zhang Y. Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance [J]. 2022.

**Examples**

```
DGP <-FuncDGP(dgptype = 1, rndflag = 2, n = 100, g = 4, pi = c(0.5, 0.5, 0.5, 0.5))
A <- DGP[["A"]]
S <- DGP[["S"]]
pihat(A = A, S = S)
```

---

splinebasis

*For each column of an input matrix, elements which are less than the median of that column are set to 0, leaving the rest of the elements unchanged*

---

**Description**

For each column of an input matrix, elements which are less than the median of that column are set to 0, leaving the rest of the elements unchanged.

**Usage**

```
splinebasis(X)
```

**Arguments**

X The extra covariates, a n x K matrix. No constant included.

**Value**

H A n x K matrix. All elements of the X that are less than the median of their corresponding columns are set to 0, leaving the rest unchanged.

**Examples**

```
library(pracma)
X <- rand(4,4)
H <- splinebasis(X = X)
```

stanE

*Compute the Estimated Standard Error of the Input Estimator***Description**

stanE Computes the estimated standard error of the input estimator.

**Usage**

```
stanE(muY1, muY0, muD1, muD0, A, S, Y, D, tauhat, stratnum = NULL)
```

**Arguments**

muY1	A nx1 vector of $\hat{\mu}^{Y(A=1)}$ s.
muY0	A nx1 vector of $\hat{\mu}^{Y(A=0)}$ s.
muD1	A nx1 vector of $\hat{\mu}^{D(A=1)}$ s.
muD0	A nx1 vector of $\hat{\mu}^{D(A=0)}$ s.
A	A nx1 vector. Each of its elements is the treatment assignment of the corresponding observation.
S	A nx1 vector. Each of its elements is the stratum of corresponding observation.
Y	A nx1 vector. Each of its elements is the observed outcome of interest of corresponding observation.
D	A nx1 vector. Each of its elements is a binary random variable indicating whether the individual $i$ received treatment ( $D_i = 1$ ) or not ( $D_i = 0$ ) in the actual study.
tauhat	A scalar. LATE estimate.
stratnum	A scalar. Number of stratum.

**Value**

A scalar. The estimated standard deviation in Jiang et al. (2022).

**References**

Jiang L, Linton O B, Tang H, Zhang Y. Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance [J]. 2022.

**Examples**

```

DGP <- FuncDGP(dgptype = 1, rndflag = 1, n = 200, g = 4, pi = c(0.5,0.5,0.5,0.5))
muY1 <- DGP[["Y1"]]
muY0 <- DGP[["Y0"]]
muD1 <- DGP[["D1"]]
muD0 <- DGP[["D0"]]
A <- DGP[["A"]]
S <- DGP[["S"]]
Y <- DGP[["Y"]]
D <- DGP[["D"]]
tauhat <- tau(muY1, muY0, muD1, muD0, A, S, Y, D)
stanE(muY1, muY0, muD1, muD0, A, S, Y, D, tauhat)

```

---

tau

---

*Compute Estimated LATE*


---

**Description**

Computes the estimated LATE in Jiang et al. (2022).

**Usage**

```
tau(muY1, muY0, muD1, muD0, A, S, Y, D, stratnum = NULL)
```

**Arguments**

muY1	A nx1 vector of $\hat{\mu}^{Y(A=1)}$ s.
muY0	A nx1 vector of $\hat{\mu}^{Y(A=0)}$ s.
muD1	A nx1 vector of $\hat{\mu}^{D(A=1)}$ s.
muD0	A nx1 vector of $\hat{\mu}^{D(A=0)}$ s.
A	A nx1 vector. Each of its elements is the treatment assignment of the corresponding observation.
S	A nx1 vector. Each of its elements is the stratum of corresponding observation.
Y	A nx1 vector. Each of its elements is the observed outcome of interest of corresponding observation.
D	A nx1 vector. Each of its elements is a binary random variable indicating whether the individual $i$ received treatment ( $D_i = 1$ ) or not ( $D_i = 0$ ) in the actual study.
stratnum	A nx1 vector about the unique strata numbers, the default value is NULL.

**Value**

A scalar. LATE estimate.

## References

Jiang L, Linton O B, Tang H, Zhang Y. Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance [J]. 2022.

## Examples

```
DGP <- FuncDGP(dgptype = 1, rndflag = 1, n = 200, g = 4, pi = c(0.5, 0.5, 0.5, 0.5))
muY1 <- DGP[["Y1"]]
muY0 <- DGP[["Y0"]]
muD1 <- DGP[["D1"]]
muD0 <- DGP[["D0"]]
A <- DGP[["A"]]
S <- DGP[["S"]]
Y <- DGP[["Y"]]
D <- DGP[["D"]]
tau(muY1, muY0, muD1, muD0, A, S, Y, D)
```

---

TrueValue

*Calculate the True LATE tau.*

---

## Description

Calculate the true LATE tau in Jiang et al. (2022).

## Usage

```
TrueValue(dgptype, vIdx, n, g, pi)
```

## Arguments

dgptype	A scalar. The value can be string 1, 2, or 3, respectively corresponding to the three random data generation methods in the paper (See Jiang et al. (2022)for DGP details)
vIdx	A 1xR vector. The authors set vIdx=[1 2 3 4]. Every number declares the method of covariate-adaptive randomization which simulates the LATE across different CAR schemes: 1-SRS; 2-WEI; 3-BCD; 4-SBR.
n	Sample size.
g	Number of strata. The authors set g=4 in Jiang et al. (2022).
pi	Targeted assignment probability across strata.

## Value

A list containing two vectors named tau and mPort. tau is a 1xR vector which Simulated true LATE effect, mPort is a 3xR vector. The 1st row of mPort: the LATE of never takers across varies CAR schemes, the 2nd row of mPort: the LATE of compliers across varies CAR schemes, the 3rd row of mPort: the LATE of always takers across varies CAR schemes.

**References**

Jiang L, Linton O B, Tang H, Zhang Y. Improving estimation efficiency via regression-adjustment in covariate-adaptive randomizations with imperfect compliance [J]. 2022.

**Examples**

```
TrueValue(dgptype = 1, vIdx = c(1,2,3,4), n=100, g = 4, pi = c(0.5,0.5,0.5,0.5))  
TrueValue(dgptype = 2, vIdx = c(1,2,3,4), n=100, g = 4, pi = c(0.5,0.5,0.5,0.5))  
TrueValue(dgptype = 3, vIdx = c(1,2,3,4), n=100, g = 4, pi = c(0.5,0.5,0.5,0.5))
```

# Index

## \* datasets

data\_table, 6

ATEDGP, 2

ATEJLTZ, 3

ATEOutput, 4

ATETrueValue, 5

CovAdptRnd, 6

data\_table, 6

feasiblePostLassoMatTool, 9

FuncDGP, 10

JLTZ, 11

LinearLogit, 12

LogisticReg, 13

norminv, 14

Output, 14

pihat, 15

splinebasis, 16

stanE, 17

tau, 18

TrueValue, 19