Package ‘tvmediation’

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### Description

Part of the set of internal functions for estimating bootstrapped CIs for the coefficients of the mediation model for continuous outcome and two treatment groups.

### Usage

```r
bootci_coeff_2trt(trt, t.seq, M, Y, t.est, deltat, replicates)
```

### Arguments

- `trt` a vector indicating treatment group
- `t.seq` a vector of time points for each observation
- `M` matrix of mediator values in wide format
- `Y` matrix of outcome values in wide format
- `t.est` time points at which to make the estimation. Default = `t.seq`
- `deltat` a small constant which controls the time-lag of the effect of the mediator on the outcome.
- `replicates` number of replicates for bootstrapping confidence intervals. Default = 1000
Value

- CI.upper.alpha: CI upper limit for coefficient hat.alpha
- CI.lower.alpha: CI lower limit for coefficient hat.alpha
- CI.upper.gamma: CI upper limit for coefficient hat.gamma
- CI.lower.gamma: CI lower limit for coefficient hat.gamma
- CI.upper.beta: CI upper limit for coefficient hat.beta
- CI.lower.beta: CI lower limit for coefficient hat.beta
- CI.upper.tau: CI upper limit for coefficient hat.tau
- CI.lower.tau: CI lower limit for coefficient hat.tau

Description

Part of the set of internal functions for estimating bootstrapped confidence intervals for the coefficients of the mediation model for a continuous outcome and three treatment groups.

Usage

```r
bootci_coeff_3trt(
  T1, 
  T2, 
  t.seq, 
  mediator, 
  outcome, 
  t.est, 
  original.coeff, 
  boot.sample = 1000
)
```

Arguments

- `T1`: a vector indicating assignment to treatment 1
- `T2`: a vector indicating assignment to treatment 2
- `t.seq`: a vector of time points for each observation
- `mediator`: matrix of mediator values in wide format
- `outcome`: matrix of outcome values in wide format
- `t.est`: time points at which to make the estimation. Default = `t.seq`
- `original.coeff`: a list of the estimated coefficients.
- `boot.sample`: number of replicates for bootstrapping confidence intervals. Default = 1000.
Value

alw1 CI lower limit for estimated Treatment 1 effect on mediator
aup1 CI upper limit for estimated Treatment 1 effect on mediator
alw2 CI lower limit for estimated Treatment 2 effect on mediator
aup2 CI upper limit for estimated Treatment 2 effect on mediator
glw1 CI lower limit for estimated Treatment 1 direct effect on outcome
gup1 CI upper limit for estimated Treatment 1 direct effect on outcome
glw2 CI lower limit for estimated Treatment 2 direct effect on outcome
gup2 CI upper limit for estimated Treatment 2 direct effect on outcome
tlw1 CI lower limit for estimated Treatment 1 total effect on outcome
tup1 CI upper limit for estimated Treatment 1 total effect on outcome
tlw2 CI lower limit for estimated Treatment 2 total effect on outcome
tup2 CI upper limit for estimated Treatment 2 total effect on outcome
blw CI lower limit for estimated effect of mediator on outcome
bup CI upper limit for estimated effect of mediator on outcome

bootci_coeff_binary Bootstrap samples to estimate confidence intervals for binary outcome coefficients.

Description

Internal function for estimating bootstrapped confidence intervals for the coefficients of the mediation model for a binary outcome.

Usage

bootci_coeff_binary(
  treatment,  # a vector indicating treatment group
  t.seq,      # a vector of unique time points for each observation
  m,          # matrix of mediator values in wide format
  outcome,    # matrix of outcome values in wide format
  span = 0.75, # Numeric value of the span to be used for LOESS regression. Default = 0.75.
  replicates = 1000  # Number of replicates for bootstrapping confidence intervals. Default = 1000.
)

Arguments

treatment     a vector indicating treatment group
t.seq          a vector of unique time points for each observation
m              matrix of mediator values in wide format
outcome        matrix of outcome values in wide format
span           Numeric value of the span to be used for LOESS regression. Default = 0.75.
replicates     Number of replicates for bootstrapping confidence intervals. Default = 1000.
**Value**

- **t.seq**  
  time points of estimation
- **CI.lower.a**  
  CI lower limit for alpha_hat
- **CI.upper.a**  
  CI upper limit for alpha_hat
- **CI.lower.g**  
  CI lower limit for gamma_hat
- **CI.upper.g**  
  CI upper limit for gamma_hat
- **CI.lower.b**  
  CI lower limit for beta_hat
- **CI.upper.b**  
  CI upper limit for beta_hat
- **CI.lower.t**  
  CI lower limit for tau_hat
- **CI.upper.t**  
  CI upper limit for tau_hat

---

**bootci_tvmb**  
*Bootstrap samples to estimate confidence intervals for the mediation effect for a binary outcome.*

---

**Description**

Part of the set of internal functions for estimating bootstrapped confidence intervals for the mediation effect for a binary outcome when user argument CI="boot".

**Usage**

```r
bootci_tvmb(
  treatment,
  t.seq,
  m,
  outcome,
  coeff_data,
  span = 0.75,
  replicates = 1000
)
```

**Arguments**

- **treatment**  
  a vector indicating treatment group
- **t.seq**  
  a vector of unique time points for each observation
- **m**  
  matrix of mediator values in wide format
- **outcome**  
  matrix of outcome values in wide format
- **coeff_data**  
  a merged dataset of indirect and direct effects and CIs estimated from `bootci_coeff_binary`
- **span**  
  Numeric value of the span to be used for LOESS regression. Default = 0.75.
- **replicates**  
  number of replicates for bootstrapping CIs. Default = 1000.
Value

- timeseq: time points of estimation
- alpha_hat: time-varying treatment effect on the mediator
- CI.lower.a: CI lower limit for estimated coefficient alpha_hat
- CI.upper.a: CI upper limit for estimated coefficient alpha_hat
- gamma_hat: time-varying treatment effect on the outcome (direct effect)
- CI.lower.g: CI lower limit for estimated coefficient gamma_hat
- CI.upper.g: CI upper limit for estimated coefficient gamma_hat
- beta_hat: time-varying effect of the mediator on the outcome
- CI.lower.b: CI lower limit for estimated coefficient beta_hat
- CI.upper.b: CI upper limit for estimated coefficient beta_hat
- tau_hat: time-varying treatment effect on outcome (total effect)
- CI.lower.t: CI lower limit for estimated coefficient tau_hat
- CI.upper.t: CI upper limit for estimated coefficient tau_hat
- medEffect: time varying mediation effect
- CI.lower: CI lower limit for medEffect
- CI.upper: CI upper limit for medEffect

---

`bootci_tvm_3trt` *Bootstrap samples to estimate confidence intervals for continuous outcome and three treatment groups.*

Description

Internal function for estimating bootstrapped confidence intervals for the mediation effect of continuous outcome and three treatment groups when user argument CI="boot".

Usage

`bootci_tvm_3trt(boot.sample, orig.data, t.est)`

Arguments

- `boot.sample`: number of replicates for bootstrapping confidence intervals. Default = 1000.
- `orig.data`: a list of original data T1, T2, mediator, outcome and t.seq.
- `t.est`: time points at which to make the estimation. Default = t.seq.
**coeff**

**Value**

- **plw1**: CI lower limit for estimated mediation effect of T1
- **pup1**: CI upper limit for estimated mediation effect of T1
- **plw2**: CI lower limit for estimated mediation effect of T2
- **pup2**: CI upper limit for estimated mediation effect of T2
- **orig.se1.all**: estimated standard errors for the mediation effect of T1
- **orig.se2.all**: estimated standard errors for the mediation effect of T2
- **orig.mediation1**: time varying mediation effect for T1
- **orig.mediation2**: time varying mediation effect for T2

**Description**

Part of the set of internal functions called within the tvmcurve_3trt function to assist in the estimation of time varying mediation effect.

**Usage**

```r
coeff(j, T1, T2, x, y)
```

**Arguments**

- **j**: a number indicating time point of observation
- **T1**: a vector indicating assignment to treatment 1
- **T2**: a vector indicating assignment to treatment 2
- **x**: matrix of mediator values in wide format
- **y**: matrix of outcome outcomes in wide format

**Value**

- **coeff.est**: estimated coefficients of the mediation model
- **nomissing.index**: index of complete cases
estBootCIs  

*Bootstrapping samples to estimate mediation effects confidence intervals for continuous outcome and two treatment (exposure) groups.*

**Description**

Part of the set of internal functions for estimating bootstrapped confidence intervals for continuous outcome and two treatment groups when user argument CI="boot".

**Usage**

```r
estBootCIs(trt, t.seq, M, Y, t.est, deltat, replicates)
```

**Arguments**

- **trt**: a vector indicating treatment group
- **t.seq**: a vector of time points at each obs
- **M**: matrix of mediator values
- **Y**: matrix of outcome values
- **t.est**: time points at which to make the estimation
- **deltat**: a small constant which controls the time-lag of the effect of the mediator on the outcome, half the time between two time points
- **replicates**: number of replicates for bootstrapping confidence intervals.

**Value**

- `boot.se`: bootstrapped standard error for the estimated mediation effect
- `CI.upperpercentile`: bootstrapped CI upper limit for the estimated mediation effect
- `CI.lowerpercentile`: bootstrapped CI lower limit for the estimated mediation effect

---

estCoeff  

*Function to estimate coefficients at time t.*

**Description**

Part of the set of internal functions called within the `tvma` function to assist in the estimation of the time varying mediation effect.

**Usage**

```r
estCoeff(newMO.j.est)
```
Arguments

newMO.j.est  a list containing mean centered mediators and outcomes

Value

coeff.est    estimated coefficients of the mediation model

Description

Transposing a dataset with repeated measurements/responses for each subject from longitudinal to wide format.

Usage

LongToWide(subject.id, time.sequence, outcome, verbose = FALSE)

Arguments

subject.id    a column of subject identifiers
time.sequence a column of time points
outcome       a column to be transposed
verbose       TRUE or FALSE (default = FALSE) prints output to screen (OPTIONAL INPUT)

Details

If data is not sorted by subject.id, a warning message will appear. The function will then sort the data by subject.id. It is recommended that the user sorts the data prior to using this function.

Value

mat.wide      a matrix in wide format, in which each column is the outcome for each subject and each row is the time sequence

Examples

# CREATING A TRANSPOSED MATRIX FOR MEDIATOR `WantToSmokeLst15min`
data(smoker)
mat.wide <- LongToWide(smoker$SubjectID, 
                     smoker$timeseq, 
                     smoker$WantToSmokeLst15min)
**newMediatorOutcome**  
*Function to compute new Mediator and Outcome using time t and t-1 mean centered on the individual.*

**Description**

Part of the set of internal functions called within the `tvma` function to assist in the estimation of time varying mediation effect.

**Usage**

```r
newMediatorOutcome(trt, M, Y)
```

**Arguments**

- **trt**: numeric binary treatment group indicator for each individual
- **M**: (t.seq x N) matrix where N = number of observations. Column 1 is mediator at time t-1. Column 2 is mediator at time t.
- **Y**: (Nx1) matrix were N = number of observations. Column 1 is outcome at time t-1.

**Value**

- **newMO**: list containing new mediators, outcomes, and index of complete cases

---

**smoker**  
*Wisconsin Smokers’ Health Study 2*

**Description**

The dataset is **simulated** based on the Wisconsin Smokers’ Health Study 2.

**Usage**

```r
data(smoker)
```

**Format**

A data frame with 40,130 observations on 12 variables.

1. **SubjectID**: Subject ID
2. **treatment**: Treatment group (2 = patch, 3 = varenicline, 4 = combination nicotine replacement therapy)
3. **patch**: Received patch (0 = No, 1 = Yes)
4. **varenicline**: Received varenicline (0 = No, 1 = Yes)
smoothest

5. comboNRT: Received combination nicotine replacement therapy (0 = No, 1 = Yes)
6. DaysFromTQD: Number of days from quit date
7. time.of.day: Time of day (0 = am, 1 = pm)
8. timeseq: Number of days from quit date (.5 indicates pm)
9. WantToSmokeLst15min: How did you feel in the last 15 min: wanting to smoke (1 = not at all, 7 = extremely)
10. NegMoodLst15min: How did you feel in the last 15 min: Negative mood (1 = not at all, 7 = extremely)
11. cessFatig: Cessation fatigue - I am tired of trying to quit smoking (1 = strongly disagree, 7 = strongly agree)
12. CigCount: Cigarettes smoked over entire day
13. smoke_status: Did you smoke (0 = No, 1 = Yes)

See Also
tvmb, tvma_3trt tvma, LongToWide

Examples
data(smoker)

smoothest Function to compute local polynomial estimation using rule of thumb for bandwidth selection

Description
Part of the set of internal functions called within the tvma function to assist in the estimation of the time varying mediation effect.

Usage
smoothest(t.seq, t.coeff, t.est, deltat)

Arguments
  t.seq a vector of time points at each observation
  t.coeff estimated coefficients
  t.est time points at which to make the estimation
  deltat a small constant which controls the time-lag of the effect of the mediator on the outcome, half the time between two time points
Value

bw_alpha  a number computed via Fan and Gijbels' (1996) rule of thumb for bandwidth selector for alpha coefficient.

bw_gamma  a number computed via Fan and Gijbels' (1996) rule of thumb for bandwidth selector for gamma coefficient.

bw_beta   a number computed via Fan and Gijbels' (1996) rule of thumb for bandwidth selector for beta coefficient.

hat.alpha estimated treatment effect on mediator

hat.gamma estimated treatment effect on outcome, adjusted for mediator

hat.beta  estimated mediator effect on outcome

hat.tau   estimated treatment effect on outcome, not adjusting for mediator

est.M     estimated mediation effect, product of hat.alpha and hat.beta

Description

Function to estimate the time-varying mediation effect and bootstrap standard errors for two treatment groups and a continuous outcome.

Usage

```
tvma(
  treatment,  # a vector indicating treatment group
  t.seq,      # a vector of time points for each observation
  mediator,   # matrix of mediator values in wide format
  outcome,    #
  t.est = t.seq, #
  plot = FALSE, #
  CI = "boot", #
  replicates = 1000, #
  verbose = FALSE #
)
```

Arguments

treatment  a vector indicating treatment group

t.seq      a vector of time points for each observation

mediator   matrix of mediator values in wide format
outcome matrix of outcome values in wide format

t.est a vector of time points at which to estimate. Default = t.seq (OPTIONAL ARGUMENT)

plot TRUE or FALSE for producing plots. Default = "FALSE" (OPTIONAL ARGUMENT)

CI "none" or "boot" method of deriving confidence intervals. Default = "boot" (OPTIONAL ARGUMENT)

replicates number of replicates for bootstrapping confidence intervals. Default = 1000 (OPTIONAL ARGUMENT)

verbose TRUE or FALSE for printing results to screen. Default = "FALSE" (OPTIONAL ARGUMENT)

Value

hat.alpha estimated time-varying treatment effect on mediator

CI.lower.alpha CI lower limit for estimated coefficient hat.alpha

CI.upper.alpha CI upper limit for estimated coefficient hat.alpha

hat.gamma estimated time-varying treatment effect on outcome (direct effect)

CI.lower.gamma CI lower limit for estimated coefficient hat.gamma

CI.upper.gamma CI upper limit for estimated coefficient hat.gamma

hat.beta estimated time-varying effect of the mediator on outcome

CI.lower.beta CI lower limit for estimated coefficient hat.beta

CI.upper.beta CI upper limit for estimated coefficient hat.beta

hat.tau estimated time-varying treatment effect on outcome (total effect)

CI.lower.tau CI lower limit for estimated coefficient hat.tau

CI.upper.tau CI upper limit for estimated coefficient hat.tau

est.M time varying mediation effect

boot.se.m estimated standard error for est.M

CI.lower CI lower limit for est.M

CI.upper CI upper limit for est.M

Plot Returns

1. Alpha_CI plot for hat.alpha with CIs over t.est
2. Gamma_CI plot for hat.gamma with CIs over t.est
3. Beta_CI plot for hat.beta with CIs over t.est
4. Tau_CI plot for hat.tau with CIs over t.est
5. MedEff plot for est.M over t.est
6. MedEff_CI plot for est.M with CIs over t.est
Note

1. ** IMPORTANT ** An alternate way of formatting the data and calling the function is documented in detail in the tutorial for the tvmb() function.

References


Examples

```r
## Not run: data(smoker)

# REDUCE DATA SET TO ONLY 2 TREATMENT CONDITIONS (EXCLUDING COMBINATION NRT)
smoker.sub <- smoker[smoker$treatment != 4, ]

# GENERATE WIDE FORMATTED MEDIATORS
mediator <- LongToWide(smoker.sub$SubjectID, 
                        smoker.sub$timeseq, 
                        smoker.sub$NegMoodLst15min)

# GENERATE WIDE FORMATTED OUTCOMES
outcome <- LongToWide(smoker.sub$SubjectID, 
                       smoker.sub$timeseq, 
                       smoker.sub$c essFatig)

# GENERATE A BINARY TREATMENT VARIABLE
trt <- as.numeric(unique(smoker.sub[,c("SubjectID","varenicline")])[,2])-1

# GENERATE A VECTOR OF UNIQUE TIME POINTS
t.seq <- sort(unique(smoker.sub$timeseq))

# COMPUTE TIME VARYING MEDIATION ANALYSIS USING BOOTSTRAPPED CONFIDENCE INTERVALS
results <- tvma(trt, t.seq, mediator, outcome)

# COMPUTE TIME VARYING MEDIATION ANALYSIS FOR SPECIFIED POINTS IN TIME USING 250 REPLICATES
results <- tvma(trt, t.seq, mediator, outcome,
```
tvma_3trt

Description

Function to estimate the time-varying mediation effect and bootstrap standard errors for three treatment groups and a continuous outcome.

Usage

tvma_3trt(
  T1, 
  T2, 
  t.seq, 
  mediator, 
  outcome, 
  t.est = t.seq, 
  plot = FALSE, 
  CI = "boot", 
  replicates = 1000, 
  grpname = "T", 
  verbose = FALSE
)

Arguments

T1 a vector indicating assignment to treatment 1
T2 a vector indicating assignment to treatment 2
t.seq a vector of time points for each observation
mediator matrix of mediator values in wide format
outcome matrix of outcome values in wide format
t.est a vector of time points at which to make the estimation. Default = t.seq. (OPTIONAL ARGUMENT)
plot TRUE or FALSE for plotting mediation effect. Default = "FALSE". (OPTIONAL ARGUMENT)
CI "none" or "boot" method of deriving confidence intervals. Default = "boot". (OPTIONAL ARGUMENT)
replicates number of replicates for bootstrapping confidence intervals. Default = 1000. (OPTIONAL ARGUMENT)
grpname : name of the treatment arms (exposure groups) to be displayed in the results. Default = "T". (OPTIONAL ARGUMENT)

verbose : TRUE or FALSE for printing results to screen. Default = "FALSE". (OPTIONAL ARGUMENT)

Value

hat.alpha1 : estimated Treatment 1 effect on mediator
CI.lower.alpha1 : CI lower limit for estimated coefficient hat.alpha1
CI.upper.alpha1 : CI upper limit for estimated coefficient hat.alpha1

hat.alpha2 : estimated Treatment 2 effect on mediator
CI.lower.alpha2 : CI lower limit for estimated coefficient hat.alpha2
CI.upper.alpha2 : CI upper limit for estimated coefficient hat.alpha2

hat.gamma1 : estimated Treatment 1 direct effect on outcome
CI.lower.gamma1 : CI lower limit for estimated coefficient hat.gamma1
CI.upper.gamma1 : CI upper limit for estimated coefficient hat.gamma1

hat.gamma2 : estimated Treatment 2 direct effect on outcome
CI.lower.gamma2 : CI lower limit for estimated coefficient hat.gamma2
CI.upper.gamma2 : CI upper limit for estimated coefficient hat.gamma2

hat.tau1 : estimated Treatment 1 total effect on outcome
CI.lower.tau1 : CI lower limit for estimated coefficient hat.tau1
CI.upper.tau1 : CI upper limit for estimated coefficient hat.tau1

hat.tau2 : estimated Treatment 2 total effect on outcome
CI.lower.tau2 : CI lower limit for estimated coefficient hat.tau2
CI.upper.tau2 : CI upper limit for estimated coefficient hat.tau2

hat.beta : estimated mediator effect on outcome
CI.lower.beta : CI lower limit for estimated coefficient hat.beta
CI.upper.beta : CI upper limit for estimated coefficient hat.beta

hat.mediation1 : time varying mediation effect for Treatment 1 on outcome
SE_MedEff1 : estimated standard errors of hat.mediation1
CI.upper.T1 : CI upper limit for hat.mediation1
CI.lower.T1 : CI lower limit for hat.mediation1

hat.mediation2 : time varying mediation effect for Treatment 2 on outcome
SE_MedEff2 : estimated standard errors of hat.mediation2
CI.upper.T2 : CI upper limit for hat.mediation2
CI.lower.T2 : CI lower limit for hat.mediation2
Plot Returns

1. plot1_a1 plot for hat.alpha1 with CIs over t.est
2. plot2_a2 plot for hat.alpha2 with CIs over t.est
3. plot3_g1 plot for hat.gamma1 with CIs over t.est
4. plot4_g2 plot for hat.gamma2 with CIs over t.est
5. plot5_t1 plot for hat.tau1 with CIs over t.est
6. plot6_t2 plot for hat.tau2 with CIs over t.est
7. plot7_b plot for hat.beta with CIs over t.est
8. MedEff_T1 plot for hat.mediation1 over t.est
9. MedEff_T2 plot for hat.mediation2 over t.est
10. MedEff_CI_T1 plot for hat.mediation1 with CIs over t.est
11. MedEff_CI_T2 plot for hat.mediation2 with CIs over t.est

References


Examples

```r
## Not run: data(smoker)

# GENERATE WIDE FORMATTED MEDIATORS
mediator <- LongToWide(smoker$SubjectID, 
                        smoker$timeseq, 
                        smoker$NegMoodLst15min)

# GENERATE WIDE FORMATTED OUTCOMES
outcome <- LongToWide(smoker$SubjectID, 
                      smoker$timeseq, 
                      smoker$cessFatig)

# GENERATE TWO BINARY TREATMENT VARIABLES
```
NRT1 <- as.numeric(unique(smoker[,c("SubjectID","varenicline")])[,2])-1
NRT2 <- as.numeric(unique(smoker[,c("SubjectID","comboNRT")])[,2])-1

# GENERATE A VECTOR OF UNIQUE TIME POINTS
t.seq <- sort(unique(smoker$timeseq))

# COMPUTE TIME VARYING MEDIATION ANALYSIS USING BOOTSTRAPPED CONFIDENCE INTERVALS
results <- tvma_3trt(NRT1, NRT2, t.seq, mediator, outcome)

# COMPUTE TIME VARYING MEDIATION ANALYSIS FOR SPECIFIED POINTS IN TIME USING 250 REPLICATES
results <- tvma_3trt(NRT1, NRT2, t.seq, mediator, outcome,
    t.est = c(0.2, 0.4, 0.6, 0.8),
    replicates = 250)

## End(Not run)

tvmb

Time Varying Mediation Function: Binary Outcome and Two Treatment Groups

Description

Function to estimate the time-varying mediation effect and bootstrap standard errors, involving two treatment groups and binary outcome.

Usage

```r
tvmb(
    treatment,
    t.seq,
    mediator,
    outcome,
    span = 0.75,
    plot = FALSE,
    CI = "boot",
    replicates = 1000,
    verbose = FALSE
)
```

Arguments

treatment  a vector indicating treatment group
t.seq       a vector of unique time points for each observation
mediator    matrix of mediator values in wide format
outcome     matrix of outcome values in wide format
span        Numeric value of the span to be used for LOESS regression. Default = 0.75.
plot  TRUE or FALSE for producing plots. Default = "FALSE". (OPTIONAL ARGUMENT)
CI  "none" or "boot" method of deriving confidence intervals. Default = "boot". (OPTIONAL ARGUMENT)
replicates  Number of replicates for bootstrapping confidence intervals. Default = 1000. (OPTIONAL ARGUMENT)
verbose  TRUE or FALSE for printing results to screen. Default = "FALSE". (OPTIONAL ARGUMENT)

timeseq  time points of estimation
alpha_hat  estimated treatment effect on mediator
CI.lower.a  CI lower limit for estimated coefficient alpha_hat
CI.upper.a  CI upper limit for estimated coefficient alpha_hat
gamma_hat  estimated treatment effect on outcome (direct effect)
CI.lower.g  CI lower limit for estimated coefficient gamma_hat
CI.upper.g  CI upper limit for estimated coefficient gamma_hat
beta_hat  estimated mediator effect on outcome
CI.lower.b  CI lower limit for estimated coefficient beta_hat
CI.upper.b  CI upper limit for estimated coefficient beta_hat
tau_hat  estimated treatment effect on outcome (total effect)
CI.lower.t  CI lower limit for estimated coefficient tau_hat
CI.upper.t  CI upper limit for estimated coefficient tau_hat
medEffect  time varying mediation effect
CI.lower  CI lower limit for medEffect
CI.upper  CI upper limit for medEffect

1. plot1_a plot for alpha_hat with CIs over t.seq
2. plot2_g plot for gamma_hat with CIs over t.seq
3. plot3_b plot for beta_hat with CIs over t.seq
4. plot4_t plot for tau_hat with CIs over t.seq
5. MedEff plot for medEffect over t.seq
6. MedEff_CI plot for medEffect with CIs over t.seq
7. bootstrap plot for estimated medEffect from bootstrapped samples over t.seq

Note

1. Currently supports 2 treatment groups
2. ** IMPORTANT ** An alternate way of formatting the data and calling the function is documented in detail in the tutorial for the tvmb() function.
References


Examples

```r
## Not run: data(smoker)

# REDUCE DATA SET TO ONLY 2 TREATMENT CONDITIONS (EXCLUDE COMBINATION NRT)
smoker.sub <- smoker[smoker$treatment != 4, ]

# GENERATE WIDE FORMATTED MEDIATORS
mediator <- LongToWide(smoker.sub$SubjectID,
                        smoker.sub$timeseq,
                        smoker.sub$NegMoodLst15min)

# GENERATE WIDE FORMATTED OUTCOMES
outcome <- LongToWide(smoker.sub$SubjectID,
                      smoker.sub$timeseq,
                      smoker.sub$smoke_status)

# GENERATE A BINARY TREATMENT VARIABLE
trt <- as.numeric(unique(smoker.sub[, c("SubjectID","varenicline")][, 2])-1

# GENERATE A VECTOR OF UNIQUE TIME POINTS
t.seq <- sort(unique(smoker.sub$timeseq))

# COMPUTE TIME VARYING MEDIATION ANALYSIS USING BOOTSTRAPPED CONFIDENCE INTERVALS
results <- tvmb(trt, t.seq, mediator, outcome)
## End(Not run)
```

tvmcurve_3trt

Main function for time varying mediation function for continuous outcome and three treatment arms (i.e., exposure groups).

---

20 tvmcurve_3trt

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Description

Part of the set of internal functions to estimate the time-varying mediation effect and bootstrap standard errors for three treatment groups and continuous outcome.

Usage

tvmcurve_3trt(T1, T2, t.seq, x, y, t.est)

Arguments

T1 a vector indicating assignment to treatment 1
T2 a vector indicating assignment to treatment 2
t.seq a vector of time points for each observation
x matrix of mediator values in wide format
y matrix of outcome values in wide format
t.est time points at which to make the estimation. Default = t.seq

Value

hat.alpha1 estimated Treatment 1 effect on mediator
hat.alpha2 estimated Treatment 2 effect on mediator
hat.gamma1 estimated Treatment 1 direct effect on outcome
hat.gamma2 estimated Treatment 2 direct effect on outcome
hat.tau1 estimated Treatment 1 total effect on outcome
hat.tau2 estimated Treatment 2 total effect on outcome
hat.beta estimated mediator effect on outcome
hat.mediation1 time varying mediation effect for Treatment 1 on outcome
hat.mediation2 time varying mediation effect for Treatment 2 on outcome
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