Package ‘panelhetero’

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Type Package

Title Panel Data Analysis with Heterogeneous Dynamics

Version 1.0.1

Description Understanding the dynamics of potentially heterogeneous variables is important in statistical applications.
This package provides tools for estimating the degree of heterogeneity across cross-sectional units in the panel data analysis.

Depends R (>= 3.6)

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The HPJ bias-corrected empirical CDF estimation

Description

The 'hpjecdf()' function enables to implement the HPJ bias-corrected estimation of the cumulative distribution function (CDF) of the heterogeneous mean, the heterogeneous autocovariance, and the heterogeneous autocorrelation. The method is developed by Okui and Yanagi (2019). For more details, see the package vignette with 'vignette("panelhetero")'.

Usage

hpjecdf(data, acov_order = 0, acor_order = 1, R = 1000, ci = TRUE)

Arguments

data A matrix of panel data. Each row corresponds to individual time series.
acov_order A non-negative integer of the order of autocovariance. Default is 0.
acor_order A positive integer of the order of autocorrelation. Default is 1.
R A positive integer of the number of bootstrap repetitions. Default is 1000.
ci A logical whether to estimate the confidence interval. Default is TRUE.

Value

A list that contains the following elements.

mean A plot of the corresponding CDF
acov A plot of the corresponding CDF
acor A plot of the corresponding CDF
mean_func A function that returns the corresponding CDF
acov_func A function that returns the corresponding CDF
acor_func A function that returns the corresponding CDF
mean_ci_func A function that returns the 95 percent confidence interval for the corresponding CDF
hpjkd

acov_ci_func  A function that returns the 95 percent confidence interval for the corresponding CDF
acor_ci_func  A function that returns the 95 percent confidence interval for the corresponding CDF
quantity      A matrix of the estimated heterogeneous quantities
acov_order    The order of autocovariance
acor_order    The order of autocorrelation
N             The number of cross-sectional units
S             The length of time series
R             The number of bootstrap repetitions

References


Examples

data <- panelhetero::simulation(N = 300, S = 50)
panelhetero::hpjecdf(data = data, R = 50)

hpjkd  The HPJ bias-corrected kernel density estimation

Description

The `hpjkd()` function enables to implement the HPJ bias-corrected kernel density estimation for the heterogeneous mean, the autocovariance, and the autocorrelation. The method is developed by Okui and Yanagi (2020). For more details, see the package vignette with `vignette("panelhetero")`.

Usage

hpjkd(
  data,
  acov_order = 0,
  acor_order = 1,
  mean_bw = NULL,
  acov_bw = NULL,
  acor_bw = NULL
)
Arguments

- **data**: A matrix of panel data. Each row corresponds to individual time series.
- **acov_order**: A non-negative integer of the order of autocovariance. Default is 0.
- **acor_order**: A positive integer of the order of autocorrelation. Default is 1.
- **mean_bw**: A scalar of bandwidth used for the estimation of the density of mean. Default is NULL, and the plug-in bandwidth is used.
- **acov_bw**: A scalar of bandwidth used for the estimation of the density of autocovariance. Default is NULL, and the plug-in bandwidth is used.
- **acor_bw**: A scalar of bandwidth used for the estimation of the density of autocorrelation. Default is NULL, and the plug-in bandwidth is used.

Value

A list that contains the following elements:

- **mean**: A plot of the corresponding density
- **acov**: A plot of the corresponding density
- **acor**: A plot of the corresponding density
- **mean_func**: A function that returns the corresponding density
- **acov_func**: A function that returns the corresponding density
- **acor_func**: A function that returns the corresponding density
- **bandwidth**: A Vector of the bandwidths
- **quantity**: A matrix of the estimated heterogeneous quantities
- **acov_order**: The order of autocovariance
- **acor_order**: The order of autocorrelation
- **N**: The number of cross-sectional units
- **S**: The length of time series

References


Examples

```r
data <- panelhetero::simulation(N = 300, S = 50)
panelhetero::hpjkd(data = data)
```
The HPJ bias-corrected estimation of the moments

Description

The `hpjmoment()` function enables to implement the HPJ bias-corrected estimation of the moments of the heterogeneous mean, the heterogeneous autocovariance, and the heterogeneous autocorrelation. The method is developed by Okui and Yanagi (2019). For more details, see the package vignette with `vignette("panelhetero")`.

Usage

`hpjmoment(data, acov_order = 0, acor_order = 1, R = 1000)`

Arguments

data A matrix of panel data. Each row corresponds to individual time series.
acov_order A non-negative integer of the order of autocovariance. Default is 0.
acor_order A positive integer of the order of autocorrelation. Default is 1.
R A positive integer of the number of bootstrap repetitions. Default is 1000.

Value

A list that contains the following elements.

estimate A vector of the parameter estimates
se A vector of the standard errors
ci A matrix of the 95 percent confidence intervals
quantity A matrix of the estimated heterogeneous quantities
acov_order The order of autocovariance
acor_order The order of autocovariance
N The number of cross-sectional units
S The length of time series
R The number of bootstrap repetitions

References


Examples

data <- panelhetero::simulation(N = 300, S = 50)
panelhetero::hpjmoment(data = data)
neecdf

The naive empirical CDF estimation without bias correction

Description

The ‘neecdf()’ function enables to implement the naive estimation of the cumulative distribution function (CDF) of the heterogeneous mean, the heterogeneous autocovariance, and the heterogeneous autocorrelation. The method is developed by Okui and Yanagi (2019). For more details, see the package vignette with ‘vignette("panelhetero")’.

Usage

neecdf(data, acov_order = 0, acor_order = 1, R = 1000, ci = TRUE)

Arguments

data
acov_order
acor_order
R
ct

A matrix of panel data. Each row corresponds to individual time series.
A non-negative integer of the order of autocovariance. Default is 0.
A positive integer of the order of autocorrelation. Default is 1.
A positive integer of the number of bootstrap repetitions. Default is 1000.
A logical whether to estimate the confidence interval. Default is TRUE.

Value

A list that contains the following elements.

mean
acov
acor
mean_func
acov_func
acor_func
mean_ci_func
acov_ci_func
acor_ci_func
quantity
acov_order
acor_order
N
S
R

A plot of the corresponding CDF
A plot of the corresponding CDF
A plot of the corresponding CDF
A function that returns the corresponding CDF
A function that returns the corresponding CDF
A function that returns the corresponding CDF
A function that returns the 95 percent confidence interval for the corresponding CDF
A function that returns the 95 percent confidence interval for the corresponding CDF
A function that returns the 95 percent confidence interval for the corresponding CDF
A matrix of the estimated heterogeneous quantities
The order of autocovariance
The order of autocorrelation
The number of cross-sectional units
The length of time series
The number of bootstrap repetitions
nekd

References


Examples

data <- panelhetero::simulation(N = 300, S = 50)
panelhetero::neecdf(data = data, R = 50)

nekd

The naive kernel density estimation

Description

The ‘nekd()’ function enables to implement the naive kernel density estimation without bias correction for the heterogeneous mean, the autocovariance, and the autocorrelation. The method is developed by Okui and Yanagi (2020). For more details, see the package vignette with ‘vignette("panelhetero")’.

Usage

nekd(
  data,
  acov_order = 0,
  acor_order = 1,
  mean_bw = NULL,
  acov_bw = NULL,
  acor_bw = NULL
)

Arguments

data A matrix of panel data. Each row corresponds to individual time series.
acov_order A non-negative integer of the order of autocovariance. Default is 0.
acor_order A positive integer of the order of autocorrelation. Default is 1.
mean_bw A scalar of bandwidth used for the estimation of the density of mean. Default is NULL, and the plug-in bandwidth is used.
acov_bw A scalar of bandwidth used for the estimation of the density of autocovariance. Default is NULL, and the plug-in bandwidth is used.
acor_bw A scalar of bandwidth used for the estimation of the density of autocorrelation. Default is NULL, and the plug-in bandwidth is used.
Value

A list that contains the following elements:

- `mean`: A plot of the corresponding density
- `acov`: A plot of the corresponding density
- `acor`: A plot of the corresponding density
- `mean_func`: A function that returns the corresponding density
- `acov_func`: A function that returns the corresponding density
- `acor_func`: A function that returns the corresponding density
- `bandwidth`: A Vector of the bandwidths
- `quantity`: A matrix of the estimated heterogeneous quantities
- `acov_order`: The order of autocovariance
- `acor_order`: The order of autocorrelation
- `N`: The number of cross-sectional units
- `S`: The length of time series

References


Examples

```r
data <- panelhetero::simulation(N = 300, S = 50)
panelhetero::nekd(data = data)
```

Description

The `nemoment()` function enables to implement the naive estimation of the moments of the heterogeneous mean, the heterogeneous autocovariance, and the heterogeneous autocorrelation. The method is developed by Okui and Yanagi (2019). For more details, see the package vignette with `vignette("panelhetero")`.

Usage

```r
nemoment(data, acov_order = 0, acor_order = 1, R = 1000)
```
simulation

Arguments

data A matrix of panel data. Each row corresponds to individual time series.
acov_order A non-negative integer of the order of autocovariance. Default is 0.
acor_order A positive integer of the order of autocorrelation. Default is 1.
R A positive integer of the number of bootstrap repetitions. Default is 1000.

Value

A list that contains the following elements.
estimate A vector of the parameter estimates
se A vector of the standard errors
ci A matrix of the 95 percent confidence intervals
quantity A matrix of the estimated heterogeneous quantities
acov_order The order of autocovariance
acor_order The order of autocovariance
N The number of cross-sectional units
S The length of time series
R The number of bootstrap repetitions

References


Examples

data <- panelhetero::simulation(N = 300, S = 50)
panelhetero::nemoment(data = data)

Description

The ‘simulation()’ function enables to generate artificial data from an AR(1) model with random coefficients. The function is used in the package vignette.

Usage

simulation(N, S)
Arguments

- **N**  The number of cross-sectional units
- **S**  The length of time series

Value

An N times S matrix of panel data

Examples

```
panelhetero::simulation(N = 300, S = 50)
```

Description

The `tojecdf()` function enables to implement the TOJ bias-corrected estimation of the cumulative distribution function (CDF) of the heterogeneous mean, the heterogeneous autocovariance, and the heterogeneous autocorrelation. The method is developed by Okui and Yanagi (2019). For more details, see the package vignette with `vignette("panelhetero")`.

Usage

```
tojecdf(data, acov_order = 0, acor_order = 1, R = 1000, ci = TRUE)
```

Arguments

- **data**  A matrix of panel data. Each row corresponds to individual time series.
- **acov_order**  A non-negative integer of the order of autocovariance. Default is 0.
- **acor_order**  A positive integer of the order of autocorrelation. Default is 1.
- **R**  A positive integer of the number of bootstrap repetitions. Default is 1000.
- **ci**  A logical whether to estimate the confidence interval. Default is TRUE.

Value

A list that contains the following elements.

- **mean**  A plot of the corresponding CDF
- **acov**  A plot of the corresponding CDF
- **acor**  A plot of the corresponding CDF
- **mean_func**  A function that returns the corresponding CDF
- **acov_func**  A function that returns the corresponding CDF
- **acor_func**  A function that returns the corresponding CDF
mean_ci_func  A function that returns the 95 percent confidence interval for the corresponding CDF
acov_ci_func  A function that returns the 95 percent confidence interval for the corresponding CDF
acor_ci_func  A function that returns the 95 percent confidence interval for the corresponding CDF
quantity  A matrix of the estimated heterogeneous quantities
acov_order  The order of autocovariance
acor_order  The order of autocorrelation
N  The number of cross-sectional units
S  The length of time series
R  The number of bootstrap repetitions

References

Examples
```r
data <- panelhetero::simulation(N = 300, S = 50)
panelhetero::tojecdf(data = data, R = 50)
```

Description
The `tojkd()` function enables to implement the TOJ bias-corrected kernel density estimation for the heterogeneous mean, the autocovariance, and the autocorrelation. The method is developed by Okui and Yanagi (2020). For more details, see the package vignette with `vignette("panelhetero")`.

Usage
```r
tojkd(
  data,
  acov_order = 0,
  acor_order = 1,
  mean_bw = NULL,
  acov_bw = NULL,
  acor_bw = NULL
)
```
Arguments

data          A matrix of panel data. Each row corresponds to individual time series.
acov_order    A non-negative integer of the order of autocovariance. Default is 0.
acor_order    A positive integer of the order of autocorrelation. Default is 1.
mean_bw       A scalar of bandwidth used for the estimation of the density of mean. Default is NULL, and the plug-in bandwidth is used.
acov_bw       A scalar of bandwidth used for the estimation of the density of autocovariance. Default is NULL, and the plug-in bandwidth is used.
acor_bw       A scalar of bandwidth used for the estimation of the density of autocorrelation. Default is NULL, and the plug-in bandwidth is used.

Value

A list that contains the following elements:

mean          A plot of the corresponding density
acov          A plot of the corresponding density
acor          A plot of the corresponding density
mean_func     A function that returns the corresponding density
acov_func     A function that returns the corresponding density
acor_func     A function that returns the corresponding density
bandwidth     A Vector of the bandwidths
quantity      A matrix of the estimated heterogeneous quantities
acov_order    The order of autocovariance
acor_order    The order of autocorrelation
N             The number of cross-sectional units
S             The length of time series

References


Examples

data <- panelhetero::simulation(N = 300, S = 50)
panelhetero::tojkd(data = data)
tojmoment

The TOJ bias-corrected estimation of the moments

Description

The `tojmoment()` function enables to implement the TOJ bias-corrected estimation of the moments of the heterogeneous mean, the heterogeneous autocovariance, and the heterogeneous autocorrelation. The method is developed by Okui and Yanagi (2019). For more details, see the package vignette with 'vignette("panelhetero")'.

Usage

```r
tojmoment(data, acov_order = 0, acor_order = 1, R = 1000)
```

Arguments

- `data`: A matrix of panel data. Each row corresponds to individual time series.
- `acov_order`: A non-negative integer of the order of autocovariance. Default is 0.
- `acor_order`: A positive integer of the order of autocorrelation. Default is 1.
- `R`: A positive integer of the number of bootstrap repetitions. Default is 1000.

Value

A list that contains the following elements.

- `estimate`: A vector of the parameter estimates
- `se`: A vector of the standard errors
- `ci`: A matrix of the 95 percent confidence intervals
- `quantity`: A matrix of the estimated heterogeneous quantities
- `acov_order`: The order of autocovariance
- `acor_order`: The order of autocovariance
- `N`: The number of cross-sectional units
- `S`: The length of time series
- `R`: The number of bootstrap repetitions

References


Examples

```r
data <- panelhetero::simulation(N = 300, S = 50)
panelhetero::tojmoment(data = data)
```
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