Package: panelhetero (via r-universe)

October 21, 2024

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. The methods are developed by Okui and Yanagi (2019) <doi:10.1016/j.jeconom.2019.04.036> and Okui and Yanagi (2020) <doi:10.1093/ectj/utz019>.

Depends R (>= 3.6)

Encoding UTF-8

LazyData true

Suggests testthat, knitr, rmarkdown

RoxygenNote 7.2.3

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Imports boot, ggplot2, KernSmooth, Rearrangement, stats

VignetteBuilder knitr

URL https://tkhdyanagi.github.io/panelhetero/

Repository https://tkhdyanagi.r-universe.dev

RemoteUrl https://github.com/tkhdyanagi/panelhetero

RemoteRef HEAD

RemoteSha 688dc596ca75fe8ea87d6565f94cdd332dff6ff1

Contents

`hpjecdf` *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
`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

Okui, R. and Yanagi, T., 2019. Panel data analysis with heterogeneous dynamics. Journal of Econometrics, 212(2), pp.451-475.

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 denisty of mean. Default is NULL, and the plug-in bandwidth is used.
acov_bw	A scalar of bandwidth used for the estimation of the denisty of autocovariance. Default is NULL, and the plug-in bandwidth is used.
acor_bw	A scalar of bandwidth used for the estimation of the denisty 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

Okui, R. and Yanagi, T., 2020. Kernel estimation for panel data with heterogeneous dynamics. The Econometrics Journal, 23(1), pp.156-175.

Examples

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

`hpjmoment` *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

Okui, R. and Yanagi, T., 2019. Panel data analysis with heterogeneous dynamics. Journal of Econometrics, 212(2), pp.451-475.

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	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

Okui, R. and Yanagi, T., 2019. Panel data analysis with heterogeneous dynamics. Journal of Econometrics, 212(2), pp.451-475.

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 denisty of mean. Default is NULL, and the plug-in bandwidth is used.
acov_bw	A scalar of bandwidth used for the estimation of the denisty of autocovariance. Default is NULL, and the plug-in bandwidth is used.
acor_bw	A scalar of bandwidth used for the estimation of the denisty 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

Okui, R. and Yanagi, T., 2020. Kernel estimation for panel data with heterogeneous dynamics. The Econometrics Journal, 23(1), pp.156-175.

Examples

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

---

nemoment *The naive estimation of the moments*

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

```
nemoment(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

Okui, R. and Yanagi, T., 2019. Panel data analysis with heterogeneous dynamics. Journal of Econometrics, 212(2), pp.451-475.

Examples

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

---

simulation *Generate artificial 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)
```

---

tojecdf *The TOJ bias-corrected empirical CDF estimation*

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

Okui, R. and Yanagi, T., 2019. Panel data analysis with heterogeneous dynamics. Journal of Econometrics, 212(2), pp.451-475.

Examples

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

---

tojkd *The TOJ bias-corrected kernel density estimation*

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

```
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 denisty of mean. Default is NULL, and the plug-in bandwidth is used.
acov_bw	A scalar of bandwidth used for the estimation of the denisty of autocovariance. Default is NULL, and the plug-in bandwidth is used.
acor_bw	A scalar of bandwidth used for the estimation of the denisty 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

Okui, R. and Yanagi, T., 2020. Kernel estimation for panel data with heterogeneous dynamics. The Econometrics Journal, 23(1), pp.156-175.

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

```
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

Okui, R. and Yanagi, T., 2019. Panel data analysis with heterogeneous dynamics. Journal of Econometrics, 212(2), pp.451-475.

Examples

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

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