

Package ‘xtcspqardl’

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Type Package

Title Cross-Sectionally Augmented Panel Quantile ARDL

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Description Implements the Cross-Sectionally Augmented Panel Quantile Autoregressive Distributed Lag (CS-PQARDL) model and the Quantile Common Correlated Effects Mean Group (QCCEMG) estimator for panel data with cross-sectional dependence. The package handles unobserved common factors through cross-sectional averages following Pesaran (2006) [<doi:10.1111/j.1468-0262.2006.00692.x>](https://doi.org/10.1111/j.1468-0262.2006.00692.x) and Chudik and Pesaran (2015) [<doi:10.1016/j.jeconom.2015.03.007>](https://doi.org/10.1016/j.jeconom.2015.03.007). Quantile regression for dynamic panels follows Harding, Lamarche, and Pesaran (2018) [<doi:10.1016/j.jeconom.2018.07.010>](https://doi.org/10.1016/j.jeconom.2018.07.010). The ARDL approach to cointegration testing is based on Pesaran, Shin, and Smith (2001) [<doi:10.1002/jae.616>](https://doi.org/10.1002/jae.616).

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URL <https://github.com/muhammedalkhalaf/xtcspqardl>

BugReports <https://github.com/muhammedalkhalaf/xtcspqardl/issues>

NeedsCompilation no

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coef.xtcsppardl	<i>Extract coefficients from xtcsppardl object</i>
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Description

Extract coefficients from xtcsppardl object

Usage

```
## S3 method for class 'xtcsppardl'
coef(object, tau = NULL, type = "short_run", ...)
```

Arguments

object	An object of class "xtcsppardl".
tau	Optional quantile(s) to extract. If NULL, returns all.
type	Character; "short_run" or "long_run".
...	Additional arguments (ignored).

Value

Named numeric vector or list of coefficients.

compute_csa	<i>Compute Cross-Sectional Averages</i>
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Description

Computes cross-sectional averages (CSA) of all variables at each time period, following the CCE approach of Pesaran (2006).

Usage

```
compute_csa(data, id, time, depvar, indepvars, cr_lags = 0)
```

Arguments

data	Data frame with panel data.
id	Character string naming the cross-sectional identifier.
time	Character string naming the time variable.
depvar	Character string naming the dependent variable.
indepvars	Character vector of independent variable names.
cr_lags	Integer number of lags for CSA (Chudik & Pesaran, 2015).

Details

Cross-sectional averages are computed as:

$$\bar{z}_t = \frac{1}{N} \sum_{i=1}^N z_{it}$$

for each variable z in $\{y, x_1, x_2, \dots\}$.

Following Chudik and Pesaran (2015), lagged CSA are included with default lag order $\text{floor}(T^{1/3})$.

Value

A list containing:

data	Data frame with CSA columns added.
csa_vars	Character vector of CSA variable names.

References

Chudik, A. and Pesaran, M.H. (2015). Common Correlated Effects Estimation of Heterogeneous Dynamic Panel Data Models with Weakly Exogenous Regressors. *Journal of Econometrics*, 188(2), 393-420. doi:[10.1016/j.jeconom.2015.03.007](https://doi.org/10.1016/j.jeconom.2015.03.007)

Pesaran, M.H. (2006). Estimation and Inference in Large Heterogeneous Panels with a Multifactor Error Structure. *Econometrica*, 74(4), 967-1012. doi:[10.1111/j.14680262.2006.00692.x](https://doi.org/10.1111/j.14680262.2006.00692.x)

fitted.xtcsppardl *Fitted values from xtcsppardl model*

Description

Fitted values from xtcsppardl model

Usage

```
## S3 method for class 'xtcsppardl'
fitted(object, ...)
```

Arguments

object An object of class "xtcsppardl".
 ... Additional arguments (ignored).

Value

This function is not yet implemented for xtcsppardl objects.

print.summary.xtcsppardl
 Print method for summary.xtcsppardl

Description

Print method for summary.xtcsppardl

Usage

```
## S3 method for class 'summary.xtcsppardl'
print(x, digits = 4, signif.stars = TRUE, ...)
```

Arguments

x An object of class "summary.xtcsppardl".
 digits Number of significant digits.
 signif.stars Logical; print significance stars.
 ... Additional arguments (ignored).

Value

Invisibly returns the input object.

`print.xtcspqardl` *Print method for xtcspqardl objects*

Description

Print method for xtcspqardl objects

Usage

```
## S3 method for class 'xtcspqardl'  
print(x, ...)
```

Arguments

`x` An object of class "xtcspqardl".
`...` Additional arguments (ignored).

Value

Invisibly returns the input object.

`residuals.xtcspqardl` *Residuals from xtcspqardl model*

Description

Residuals from xtcspqardl model

Usage

```
## S3 method for class 'xtcspqardl'  
residuals(object, ...)
```

Arguments

`object` An object of class "xtcspqardl".
`...` Additional arguments (ignored).

Value

This function is not yet implemented for xtcspqardl objects.

summary.xtcsqardl *Summary method for xtcsqardl objects*

Description

Summary method for xtcsqardl objects

Usage

```
## S3 method for class 'xtcsqardl'
summary(object, ...)
```

Arguments

object An object of class "xtcsqardl".
 ... Additional arguments (ignored).

Value

An object of class "summary.xtcsqardl".

vcov.xtcsqardl *Extract variance-covariance matrix from xtcsqardl object*

Description

Extract variance-covariance matrix from xtcsqardl object

Usage

```
## S3 method for class 'xtcsqardl'
vcov(object, tau = NULL, ...)
```

Arguments

object An object of class "xtcsqardl".
 tau Optional quantile to extract. If NULL, returns all.
 ... Additional arguments (ignored).

Value

Variance-covariance matrix or list of matrices.

xtcspqardl

*Cross-Sectionally Augmented Panel Quantile ARDL***Description**

Estimates the Cross-Sectionally Augmented Panel Quantile ARDL (CS-PQARDL) model or the Quantile Common Correlated Effects Mean Group (QCCEMG/QCCEPMG) estimator for panel data with cross-sectional dependence.

Usage

```
xtcspqardl(
  formula,
  data,
  id,
  time,
  tau = 0.5,
  estimator = c("qccemg", "qccepmg", "cspqardl"),
  p = 1L,
  q = 1L,
  cr_lags = NULL,
  constant = TRUE,
  model = c("pmg", "mg", "dfe")
)
```

Arguments

formula	A formula of the form $y \sim x_1 + x_2 \mid z_1 + z_2$ where variables before \mid are short-run regressors and variables after \mid are long-run regressors (for CS-PQARDL). For QCCEMG, use $y \sim x_1 + x_2$.
data	A data frame containing panel data.
id	Character string naming the cross-sectional unit identifier.
time	Character string naming the time variable.
tau	Numeric vector of quantiles to estimate (between 0 and 1).
estimator	Character string specifying the estimator: "qccemg" for Quantile CCE Mean Group (default), "qccepmg" for Quantile CCE Pooled Mean Group, "cspqardl" for CS Panel Quantile ARDL.
p	Integer specifying the number of lags for the dependent variable (default 1, for CS-PQARDL).
q	Integer or vector specifying the number of lags for each regressor (default 1, for CS-PQARDL).
cr_lags	Integer specifying the number of lags for cross-sectional averages. Default is $\text{floor}(T^{(1/3)})$ following Chudik and Pesaran (2015).

constant	Logical; if TRUE (default), include a constant term.
model	Character string for CS-PQARDL pooling: "pmg" for Pooled Mean Group (default), "mg" for Mean Group, "dfe" for Dynamic Fixed Effects.

Details

The package implements two main estimators for panel quantile regression with cross-sectional dependence:

QCCEMG (Quantile CCE Mean Group): Estimates unit-by-unit quantile regressions augmented with cross-sectional averages, then aggregates using mean group estimator. The model is:

$$y_{it} = \lambda_i y_{i,t-1} + \beta_i' x_{it} + \delta_i' \bar{z}_t + u_{it}$$

where \bar{z}_t contains cross-sectional averages of y and x .

CS-PQARDL (CS Panel Quantile ARDL): Extends the ARDL approach to cointegration (Pesaran, Shin & Smith, 2001) to quantile regression with CCE augmentation. Estimates error-correction form with long-run relationships.

Cross-sectional dependence is handled through the CCE approach (Pesaran, 2006), which augments regressions with cross-sectional averages of all variables. Lagged CSA follow Chudik & Pesaran (2015) with default $\text{floor}(T^{1/3})$ lags.

Value

An object of class "xtcspqardl" containing:

coefficients	Mean group coefficients across panels.
se	Standard errors using mean group variance.
vcov	Variance-covariance matrix.
individual	List of unit-specific estimates.
long_run	Long-run coefficient estimates.
speed_adj	Speed of adjustment coefficients.
half_life	Half-life of adjustment.
tau	Quantiles estimated.
call	The matched call.
formula	The formula used.
n_panels	Number of panels.
n_obs	Total observations.
avg_T	Average time periods per panel.

References

Chudik, A. and Pesaran, M.H. (2015). Common Correlated Effects Estimation of Heterogeneous Dynamic Panel Data Models with Weakly Exogenous Regressors. *Journal of Econometrics*, 188(2), 393-420. doi:10.1016/j.jeconom.2015.03.007

Harding, M., Lamarche, C., and Pesaran, M.H. (2018). Common Correlated Effects Estimation of Heterogeneous Dynamic Panel Quantile Regression Models. *Journal of Applied Econometrics*, 35(3), 294-314. doi:10.1016/j.jeconom.2018.07.010

Pesaran, M.H. (2006). Estimation and Inference in Large Heterogeneous Panels with a Multifactor Error Structure. *Econometrica*, 74(4), 967-1012. doi:10.1111/j.14680262.2006.00692.x

Pesaran, M.H., Shin, Y., and Smith, R.J. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics*, 16(3), 289-326. doi:10.1002/jae.616

Examples

```
# Generate example panel data
set.seed(123)
N <- 20 # panels
T <- 50 # time periods
data <- data.frame(
  id = rep(1:N, each = T),
  time = rep(1:T, N),
  x = rnorm(N * T),
  y = rnorm(N * T)
)
# Add dynamics
for (i in 1:N) {
  idx <- ((i-1)*T + 2):(i*T)
  data$y[idx] <- 0.5 * data$y[idx-1] + 0.3 * data$x[idx] + rnorm(T-1, sd=0.5)
}

# QCCEMG estimation
fit <- xtcspqardl(y ~ x, data = data, id = "id", time = "time",
                 tau = c(0.25, 0.50, 0.75), estimator = "qccemg")
summary(fit)
```

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