Package: xtcspqardl (via r-universe)

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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> and Chudik and Pesaran (2015) <doi:10.1016/j.jeconom.2015.03.007>. Quantile regression for dynamic panels follows Harding, Lamarche, and Pesaran (2020) <doi:10.1002/jae.2753>. The ARDL approach to cointegration testing is based on Pesaran, Shin, and Smith (2001) <doi:10.1002/jae.616>.

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

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

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`coef.xtcspqardl` *Extract coefficients from xtcspqardl object*

Description

Extract coefficients from xtcspqardl object

Usage

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

Arguments

`object`	An object of class `"xtcspqardl"`.
`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` *Compute Cross-Sectional Averages*

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 $\{y, x_1, x_2, ...\}$.

Following Chudik and Pesaran (2015), lagged CSA are included with default lag order `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

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

`fitted.xtcspqardl` *Fitted values from xtcspqardl model*

Description

Fitted values from xtcspqardl model

Usage

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

Arguments

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

Value

This function is not yet implemented for xtcspqardl objects.

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

Description

Print method for summary.xtcspqardl

Usage

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

Arguments

`x`	An object of class `"summary.xtcspqardl"`.
`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.xtcspqardl *Summary method for xtcspqardl objects*

Description

Summary method for xtcspqardl objects

Usage

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

Arguments

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

Value

An object of class "summary.xtcspqardl".

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

Description

Extract variance-covariance matrix from xtcspqardl object

Usage

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

Arguments

object	An object of class "xtcspqardl".
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 ~ x1 + x2 | z1 + z2` where variables before `|` are short-run regressors and variables after `|` are long-run regressors (for CS-PQARDL). For QCCEMG, use `y ~ x1 + x2`.
`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 `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 `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. (2020). Common Correlated Effects Estimation of Heterogeneous Dynamic Panel Quantile Regression Models. *Journal of Applied Econometrics*, 35(3), 294-314. doi:10.1002/jae.2753

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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