Package 'ConnectednessApproach'

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Type Package

Title Connectedness Approach

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Description The estimation of static and dynamic connectedness measures is created in a modular and user-friendly way. Besides, the time domain connectedness approaches, this package further allows to estimate the frequency connectedness approach, the joint spillover index and the extended joint connectedness approach. In addition, all connectedness frameworks can be based upon orthogonalized and generalized VAR, QVAR, LASSO VAR, Ridge VAR, Elastic Net VAR and TVP-VAR models. Furthermore, the package includes the conditional, decomposed and partial connectedness measures as well as the pairwise connectedness index, influence index and corrected total connectedness index. Finally, a battery of datasets are available allowing to replicate a variety of connectedness papers.

License GPL-3

Encoding UTF-8

LazyData true

RoxygenNote 7.2.3

Depends R (>= 4.1)

Imports frequencyConnectedness, rmgarch, rugarch, igraph, utils, quantreg, MASS, progress, glmnet, xts, zoo, urca, moments, riskParityPortfolio, methods, PerformanceAnalytics, car, L1pack

Suggests rmarkdown, knitr

NeedsCompilation no

Repository CRAN

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Contents

`aaacgo2022` *Dataset of Adekoya, Akinseye, Antonakakis, Chatziantoniou, Gabauer and Oliyide (2022)*

Description

For detailed information see: Adekoya, O. B., Akinseye, A., Antonakakis, N., Chatziantoniou, I., Gabauer, D., and Oliyide, J. A. (2021). Crude oil and Islamic sectoral stocks: Asymmetric connectedness and investment strategies. Available at SSRN.

Usage

```
data(aaacgo2022)
```

Format

zoo data.frame

acg2020 *Dataset of Antonakakis, Chatziantoniou and Gabauer (2020)*

Description

For detailed information see: Antonakakis, N., Chatziantoniou, I., & Gabauer, D. (2020). Refined measures of dynamic connectedness based on time-varying parameter vector autoregressions. Journal of Risk and Financial Management, 13(4), 84.

Usage

```
data(acg2020)
```

Format

zoo data.frame

AggregatedConnectedness *Aggregated Connectedness Measures*

Description

This function results in aggregated connectedness measures.

Usage

```
AggregatedConnectedness(dca, groups, start = NULL, end = NULL)
```

Arguments

dca	Dynamic connectedness object
groups	List of at least two group vectors
start	Start index
end	End index

Value

Get connectedness measures

Author(s)

David Gabauer

References

Chatziantoniou, I., Gabauer, D., & Stenfor, A. (2021). Independent Policy, Dependent Outcomes: A Game of Cross-Country Dominoes across European Yield Curves (No. 2021-06). University of Portsmouth, Portsmouth Business School, Economics and Finance Subject Group.

Examples

```
#Replication of Gabauer and Gupta (2018)
data("gg2018")
dca = ConnectednessApproach(gg2018,
                            nlag=1,
                            nfore=10,
                            model="VAR",
                            connectedness="Time")
ac = AggregatedConnectedness(dca, groups=list("US"=c(1,2,3,4), "JP"=c(5,6,7,8)))
```

`BayesPrior` *Bayes Prior*

Description

Get Bayes prior

Usage

```
BayesPrior(x, size = NULL, nlag)
```

Arguments

`x`	zoo data matrix
`size`	Sample size used to calculate prior parameters
`nlag`	Lag length

Value

Get Bayes Prior

Author(s)

David Gabauer

References

Primiceri, G. E. (2005). Time varying structural vector autoregressions and monetary policy. The Review of Economic Studies, 72(3), 821-852.

Examples

```
data("dy2012")
prior = BayesPrior(dy2012, nlag=1)
```

---

bcg2022 *Dataset of Broadstock, Chatziantoniou and Gabauer (2022)*

Description

For detailed information see: Broadstock, D., Broadstock, D. C., Chatziantoniou, I., & Gabauer, D. (2022). Minimum connectedness portfolios and the market for green bonds: Advocating socially responsible investment (SRI) activity. In Applications in Energy Finance (pp. 217-253). Palgrave Macmillan, Cham.

Usage

```
data(bcg2022)
```

Format

zoo data.frame

---

bgu2021 *Dataset of Balcilar, Gabauer and Umar (2021)*

Description

For detailed information see: Balcilar, M., Gabauer, D., & Umar, Z. (2021). Crude Oil futures contracts and commodity markets: New evidence from a TVP-VAR extended joint connectedness approach. Resources Policy, 73, 102219.

Usage

```
data(bgu2021)
```

Format

zoo data.frame

`BivariateDCCGARCH` *Bivariate DCC-GARCH*

Description

This function multiple Bivariate DCC-GARCH models that captures more accurately conditional covariances and correlations

Usage

```
BivariateDCCGARCH(
  x,
  spec,
  copula = "mvt",
  method = "Kendall",
  transformation = "parametric",
  time.varying = TRUE,
  asymmetric = FALSE
)
```

Arguments

`x`	zoo dataset
`spec`	A cGARCHspec A cGARCHspec object created by calling cgarchspec.
`copula`	"mvnorm" or "mvt" (see, rmgarch package)
`method`	"Kendall" or "ML" (see, rmgarch package)
`transformation`	"parametric", "empirical" or "spd" (see, rmgarch package)
`time.varying`	Boolean value to either choose DCC-GARCH or CCC-GARCH
`asymmetric`	Whether to include an asymmetry term to the DCC model (thus estimating the aDCC).

Value

Estimate Bivariate DCC-GARCH

Author(s)

David Gabauer

References

Cocca, T., Gabauer, D., & Pomberger, S. (2024). Clean energy market connectedness and investment strategies: New evidence from DCC-GARCH R2 decomposed connectedness measures. Energy Economics.

Engle, R. (2002). Dynamic conditional correlation: A simple class of multivariate generalized autoregressive conditional heteroskedasticity models. Journal of Business & Economic Statistics, 20(3), 339-350.

`BivariatePortfolio` *Kroner and Ng (1998) optimal bivariate portfolio weights*

Description

This function calculates the optimal portfolio weights according to Kroner and Ng (1998)

Usage

```
BivariatePortfolio(
  x,
  H,
  method = c("cumsum", "cumprod"),
  long = TRUE,
 statistics = c("Fisher", "Bartlett", "Fligner-Killeen", "Levene", "Brown-Forsythe"),
  metric = "StdDev",
  digit = 2
)
```

Arguments

`x`	zoo return matrix (in percentage)
`H`	Residual variance-covariance, correlation or pairwise connectedness matrix
`method`	Cumulative sum or cumulative product
`long`	Allow only long portfolio position
`statistics`	Hedging effectiveness statistic
`metric`	Risk measure of Sharpe Ratio (StdDev, VaR, or CVaR)
`digit`	Number of decimal places

Value

Get bivariate portfolio weights

Author(s)

David Gabauer

References

Kroner, K. F., & Ng, V. K. (1998). Modeling asymmetric comovements of asset returns. The Review of Financial Studies, 11(4), 817-844.

Ederington, L. H. (1979). The hedging performance of the new futures markets. The Journal of Finance, 34(1), 157-170.

Antonakakis, N., Cunado, J., Filis, G., Gabauer, D., & de Gracia, F. P. (2020). Oil and asset classes implied volatilities: Investment strategies and hedging effectiveness. Energy Economics, 91, 104762.

Examples

```
data("g2020")
fit = VAR(g2020, configuration=list(nlag=1))
bpw = BivariatePortfolio(g2020/100, fit$Q, method="cumsum", statistics="Fisher")
bpw$TABLE
```

---

cegg2022 *Dataset of Chatziantoniou, Elsayed, Gabauer and Gozgor (2022)*

Description

For detailed information see: Chatziantoniou, I., Elsayed, AH., Gabauer, D. and Gozgor, G. (2021). Oil price shocks and exchange rate dynamics: New evidence from internal, external and partial connectedness measures for oil importing and exporting countries

Usage

```
data(cegg2022)
```

Format

zoo data.frame

---

cg2021 *Dataset of Chatziantoniou and Gabauer (2021)*

Description

For detailed information see: Chatziantoniou, I., & Gabauer, D. (2021). EMU risk-synchronisation and financial fragility through the prism of dynamic connectedness. The Quarterly Review of Economics and Finance, 79, 1-14.

Usage

```
data(cg2021)
```

Format

zoo data.frame

cgg2022 *Dataset of Chatziantoniou, Gabauer and Gupta (2022)*

Description

For detailed information see: Chatziantoniou, I., Gabauer, D., & Gupta, R. (2021). Integration and Risk Transmission in the Market for Crude Oil: A Time-Varying Parameter Frequency Connectedness Approach.

Usage

```
data(cgg2022)
```

Format

zoo data.frame

cgp2024 *Dataset of Cocca, Gabauer, and Pomberger (2024)*

Description

For detailed information see: Cocca, T., Gabauer, D., & Pomberger, S. (2024). Clean energy market connectedness and investment strategies: New evidence from DCC-GARCH R2 decomposed connectedness measures. Energy Economics.

Usage

```
data(cgp2024)
```

Format

zoo data.frame

cgs2021 *Dataset of Chatziantoniou, Gabauer and Stenfors (2021)*

Description

For detailed information see: Chatziantoniou, I., Gabauer, D., & Stenfors, A. (2021). Interest rate swaps and the transmission mechanism of monetary policy: A quantile connectedness approach. Economics Letters, 204, 109891.

Usage

```
data(cgs2021)
```

Format

zoo data.frame

cgs2022 *Dataset of Chatziantoniou, Gabauer and Stenfors (2022)*

Description

For detailed information see: Chatziantoniou, I., Gabauer, D., & Stenfors, A. Independent Policy, Dependent Out-comes: A Game of Cross-Country Dom-inoes across European Yield Curves.

Usage

```
data(cgs2022)
```

Format

zoo data.frame

`ConditionalConnectedness` *ConditionalConnectedness*

Description

This function computes the conditional connectedness measures.

Usage

```
ConditionalConnectedness(dca, group = c(1, 2, 3), start = NULL, end = NULL)
```

Arguments

`dca`	Dynamic connectedness object
`group`	Group vector
`start`	Start index
`end`	End index

Value

Get connectedness measures

Author(s)

David Gabauer

References

Chatziantoniou, I., Gabauer, D., & Stenfors, A. (2021). Independent Policy, Dependent Outcomes: A Game of Cross-Country Dominoes across European Yield Curves (No. 2021-06). University of Portsmouth, Portsmouth Business School, Economics and Finance Subject Group.

Examples

```
#Replication of Chatzianzoniou, Gabauer and Stenfors (2022)
data("cgs2022")
dca = ConnectednessApproach(cgs2022,
                            nlag=1,
                            nfore=10,
                            window.size=250,
                            model="VAR",
                            connectedness="Time")
cc = ConditionalConnectedness(dca, group=c(1,4,7,10,13,16))
```

ConditionalCorrelation *Partial Conditional Correlations*

Description

Compute partial conditional correlations

Usage

```
ConditionalCorrelation(Q)
```

Arguments

Q	Variance-covariance matrix of dimension

Value

Get partial conditional correlations

Author(s)

David Gabauer

Examples

```
data("dy2012")
fit = VAR(dy2012, configuration=list(nlag=1))
pcc = ConditionalCorrelation(fit$Q)
```

ConnectednessApproach *Connectedness Approach*

Description

This function provides a modular framework combining various models and connectedness frameworks.

Usage

```
ConnectednessApproach(
  x,
  nlag = 1,
  nfore = 10,
  window.size = NULL,
  corrected = FALSE,
 model = c("VAR", "QVAR", "LAD", "LASSO", "Ridge", "Elastic", "TVP-VAR", "DCC-GARCH"),
  connectedness = c("Time", "Frequency", "Joint", "Extended Joint", "R2"),
 VAR_config = list(QVAR = list(tau = 0.5, method = "fn"), ElasticNet = list(nfolds = 10,
   alpha = NULL, loss = "mae", n_alpha = 10), TVPVAR = list(kappa1 = 0.99, kappa2 =
    0.99, prior = "BayesPrior", gamma = 0.01)),
  DCC_config = list(standardize = FALSE),
  Connectedness_config = list(TimeConnectedness = list(generalized = TRUE),
   FrequencyConnectedness = list(partition = c(pi, pi/2, 0), generalized = TRUE,
   scenario = "ABS"), R2Connectedness = list(method = "pearson", decomposition = TRUE,
    relative = FALSE))
)
```

Arguments

x	zoo data matrix
nlag	Lag length
nfore	H-step ahead forecast horizon
window.size	Rolling-window size or Bayes Prior sample size
corrected	Boolean value whether corrected or standard TCI should be computed
model	Estimation model
connectedness	Type of connectedness approach
VAR_config	Config for VAR model
DCC_config	Config for DCC-GARCH model
Connectedness_config	Config for connectedness approach

Value

Get connectedness measures

Author(s)

David Gabauer

References

Diebold, F. X., & Yilmaz, K. (2009). Measuring financial asset return and volatility spillovers, with application to global equity markets. The Economic Journal, 119(534), 158-171.

Diebold, F. X., & Yilmaz, K. (2012). Better to give than to receive: Predictive directional measurement of volatility spillovers. International Journal of Forecasting, 28(1), 57-66.

Barunik, J., & Krehlik, T. (2018). Measuring the frequency dynamics of financial connectedness and systemic risk. Journal of Financial Econometrics, 16(2), 271-296.

Gabauer, D. (2020). Volatility impulse response analysis for DCC-GARCH models: The role of volatility transmission mechanisms. Journal of Forecasting, 39(5), 788-796.

Antonakakis, N., Chatziantoniou, I., & Gabauer, D. (2020). Refined measures of dynamic connectedness based on time-varying parameter vector autoregressions. Journal of Risk and Financial Management, 13(4), 84.

Lastrapes, W. D., & Wiesen, T. F. (2021). The joint spillover index. Economic Modelling, 94, 681-691.

Balcilar, M., Gabauer, D., & Umar, Z. (2021). Crude Oil futures contracts and commodity markets: New evidence from a TVP-VAR extended joint connectedness approach. Resources Policy, 73, 102219.

Chatziantoniou, I., & Gabauer, D. (2021). EMU risk-synchronisation and financial fragility through the prism of dynamic connectedness. The Quarterly Review of Economics and Finance, 79, 1-14.

Chatziantoniou, I., Gabauer, D., & Stenfors, A. (2021). Interest rate swaps and the transmission mechanism of monetary policy: A quantile connectedness approach. Economics Letters, 204, 109891.

Gabauer, D. (2021). Dynamic measures of asymmetric & pairwise connectedness within an optimal currency area: Evidence from the ERM I system. Journal of Multinational Financial Management, 60, 100680.

Gabauer, D., Gupta, R., Marfatia, H., & Miller, S. (2020). Estimating US Housing Price Network Connectedness: Evidence from Dynamic Elastic Net, Lasso, and Ridge Vector Autoregressive Models (No. 202065). University of Pretoria, Department of Economics.

Chatziantoniou, I., Gabauer, D., & Gupta, R. (2021). Integration and Risk Transmission in the Market for Crude Oil: A Time-Varying Parameter Frequency Connectedness Approach (No. 202147).

Chatziantoniou, I., Aikins Abakah, E. J., Gabauer, D., & Tiwari, A. K. (2022). Quantile time-frequency price connectedness between green bond, green equity, sustainable investments and clean energy markets. Journal of Cleaner Production.

Cunado, J, Chatziantoniou, I., Gabauer, D., Hardik, M., & de Garcia, F.P. (2022). Dynamic spillovers across precious metals and energy realized volatilities: Evidence from quantile extended joint connectedness measures.

Examples

```
data("acg2020")
dca = ConnectednessApproach(acg2020,
                            nlag=1,
                            nfore=12,
                            model="VAR",
                            connectedness="Time",
                            VAR_config=list(TVPVAR=list(kappa1=0.99, kappa2=0.96,
                                          prior="MinnesotaPrior", gamma=0.1)))
dca$TABLE
```

ConnectednessTable *Connectedness table*

Description

This function provides standard connectedness table.

Usage

```
ConnectednessTable(FEVD, digit = 2)
```

Arguments

FEVD	Forecast error variance decomposition
digit	Number of decimal places

Value

Get connectedness table

Examples

```
data("dy2012")
fit = VAR(dy2012, configuration=list(nlag=1))
fevd = FEVD(Phi=fit$B, Sigma=fit$Q, nfore=10, type="time", generalized=TRUE)$FEVD
dca = ConnectednessTable(fevd)
```

DCCGARCHselection *DCC-GARCH selection specification*

Description

This function calculates the optimal DCC-GARCH specification

Usage

```
DCCGARCHselection(
  x,
  distributions = c("norm", "snorm", "std", "sstd", "ged", "sged"),
 models = c("sGARCH", "eGARCH", "gjrGARCH", "iGARCH", "TGARCH", "AVGARCH", "NGARCH",
    "NAGARCH", "APARCH", "ALLGARCH"),
  prob = 0.05,
  conf.level = 0.9,
  lag = 20,
  ar = 0,
  ma = 0
)
```

Arguments

x	zoo data matrix
distributions	Vector of distributions
models	Vector of GARCH models
prob	The quantile (coverage) used for the VaR.
conf.level	Confidence level of VaR test statistics
lag	Lag length of weighted Portmanteau statistics
ar	AR(p)
ma	MA(q)

Value

Get best DCC-GARCH

Author(s)

David Gabauer

References

Ghalanos, A. (2014). rugarch: Univariate GARCH models, R package version 1.3-3.

Antonakakis, N., Chatziantoniou, I., & Gabauer, D. (2021). The impact of Euro through time: Exchange rate dynamics under different regimes. International Journal of Finance & Economics, 26(1), 1375-1408.

---

dy2009 *Dataset of Diebold and Yilmaz (2009)*

Description

For detailed information see: Diebold, F. X., & Yilmaz, K. (2009). Measuring financial asset return and volatility spillovers, with application to global equity markets. The Economic Journal, 119(534), 158-171.

Usage

```
data(dy2009)
```

Format

A zoo data.frame containing 30x1141 observations.

Source

Yahoo Finance

dy2012 *Dataset of Diebold and Yilmaz (2012)*

Description

For detailed information see: Diebold, F. X., & Yilmaz, K. (2012). Better to give than to receive: Predictive directional measurement of volatility spillovers. International Journal of forecasting, 28(1), 57-66.

Usage

```
data(dy2012)
```

Format

A zoo data.frame containing 30x1141 observations.

Source

Yahoo Finance

ElasticNetVAR *Elastic Net vector autoregression*

Description

Estimation of a VAR using equation-by-equation LASSO, Ridge or Elastic Net regressions.

Usage

```
ElasticNetVAR(
  x,
 configuration = list(nlag = 1, nfolds = 10, loss = "mae", alpha = NULL, n_alpha = 10)
)
```

Arguments

x	zoo data matrix
configuration	Model configuration
nlag	Lag length
nfolds	N-fold cross validation
loss	Loss function
alpha	LASSO is alpha equal 1 and Ridge if alpha equal 0
n_alpha	Creates n-equidistant alpha values

Value

Estimate VAR model

Author(s)

David Gabauer

References

Tibshirani, R., Bien, J., Friedman, J., Hastie, T., Simon, N., Taylor, J., & Tibshirani, R. J. (2012). Strong rules for discarding predictors in lasso-type problems. Journal of the Royal Statistical Society: Series B (Statistical Methodology), 74(2), 245-266.

Hoerl, A. E., & Kennard, R. W. (1970). Ridge regression: Biased estimation for nonorthogonal problems. Technometrics, 12(1), 55-67.

Zou, H., & Hastie, T. (2005). Regularization and variable selection via the elastic net. Journal of the royal statistical society: series B (statistical methodology), 67(2), 301-320.

Demirer, M., Diebold, F. X., Liu, L., & Yilmaz, K. (2018). Estimating global bank network connectedness. Journal of Applied Econometrics, 33(1), 1-15.

Gabauer, D., Gupta, R., Marfatia, H., & Miller, S. M. (2020). Estimating US Housing Price Network Connectedness: Evidence from Dynamic Elastic Net, Lasso, and Ridge Vector Autoregressive Models. Lasso, and Ridge Vector Autoregressive Models (July 26, 2020).

Examples

```
data("dy2012")
fit = ElasticNetVAR(dy2012, configuration=list(nlag=1, alpha=1, nfolds=10, loss="mae"))
```

EquallyWeightedPortfolio

Equally weighted portfolio

Description

This function calculates the equality weighted portfolio

Usage

```
EquallyWeightedPortfolio(
  x,
  method = c("cumsum", "cumprod"),
 statistics = c("Fisher", "Bartlett", "Fligner-Killeen", "Levene", "Brown-Forsythe"),
  metric = "StdDev",
  digit = 2
)
```

Arguments

x	zoo return matrix (in percentage)
method	Cumulative sum or cumulative product
statistics	Hedging effectiveness statistic
metric	Risk measure of Sharpe Ratio (StdDev, VaR, or CVaR)
digit	Number of decimal places

Value

Get portfolio weights

Author(s)

David Gabauer

References

Ederington, L. H. (1979). The hedging performance of the new futures markets. The Journal of Finance, 34(1), 157-170.

Antonakakis, N., Cunado, J., Filis, G., Gabauer, D., & de Gracia, F. P. (2020). Oil and asset classes implied volatilities: Investment strategies and hedging effectiveness. Energy Economics, 91, 104762.

Examples

```
data("g2020")
mcp = EquallyWeightedPortfolio(g2020/100, statistics="Fisher")
mcp$TABLE
```

ExclusiveConnectedness

Exclusive Connectedness Measures

Description

This function results in exclusive connectedness measures

Usage

```
ExclusiveConnectedness(dca, group = c(1, 2), start = NULL, end = NULL)
```

Arguments

dca	Dynamic connectedness object
group	Vector of group indices
start	Start index
end	End index

Value

Get connectedness measures

Author(s)

David Gabauer

Examples

```
#Replication of Chatziantoniou, et al. (2022)
data("cegg2022")
dca = ConnectednessApproach(cegg2022,
                            nlag=1,
                            nfore=20,
                            model="VAR",
                            connectedness="Time",
                            corrected=TRUE)
exc = ExclusiveConnectedness(dca, group=c(1,2,3))
```

ExtendedJointConnectedness

Balcilar et al. (2021) extended joint connectedness approach

Description

This function provides extended joint connectedness measures.

Usage

```
ExtendedJointConnectedness(Phi, Sigma, nfore = 10)
```

Arguments

Phi	VAR coefficient matrix
Sigma	Residual variance-covariance matrix
nfore	H-step ahead forecast horizon

Value

Get connectedness measures

Author(s)

David Gabauer

References

Balcilar, M., Gabauer, D., & Umar, Z. (2021). Crude Oil futures contracts and commodity markets: New evidence from a TVP-VAR extended joint connectedness approach. Resources Policy, 73, 102219.

Examples

```
#Replication of Balcilar et al. (2021)
data("bgu2021")
fit = VAR(bgu2021, configuration=list(nlag=1))
dca = ExtendedJointConnectedness(Phi=fit$B, Sigma=fit$Q, nfore=20)
dca$TABLE
```

ExternalConnectedness *External Connectedness Measures*

Description

This function provides external connectedness measures

Usage

```
ExternalConnectedness(
  dca,
  groups = list(c(1), c(2:ncol(dca$NET))),
  start = NULL,
  end = NULL
)
```

Arguments

dca	Dynamic connectedness object
groups	List of at least two group vectors
start	Start index
end	End index

Value

Get connectedness measures

Author(s)

David Gabauer

References

Gabauer, D., & Gupta, R. (2018). On the transmission mechanism of country-specific and international economic uncertainty spillovers: Evidence from a TVP-VAR connectedness decomposition approach. Economics Letters, 171, 63-71.

Examples

```
data("gg2018")
dca = ConnectednessApproach(gg2018, model="VAR",
                            connectedness="Time",
                            nlag=1, nfore=10, window.size=200)
ext = ExternalConnectedness(dca, groups=list("US"=c(1,2,3,4), "JP"=c(5,6,7,8)))
```

FEVD *Forecast error variance decomposition*

Description

This function computes the orthogonalized/generalized forecast error variance decomposition

Usage

```
FEVD(
  Phi,
  Sigma,
  nfore = 100,
  type = c("time", "frequency"),
  generalized = TRUE,
  range = NULL
)
```

Arguments

Phi	VAR coefficient matrix
Sigma	Residual variance-covariance matrix
nfore	H-step ahead forecast horizon
type	Time or Frequency connectedness approach
generalized	Generalized or orthogonalized FEVD
range	Partition range for frequency approach only.

Value

Orthogonalized/generalized time/frequency forecast error variance decomposition

References

Stiassny, A. (1996). A spectral decomposition for structural VAR models. Empirical Economics, 21(4), 535-555.

Koop, G., Pesaran, M. H., & Potter, S. M. (1996). Impulse response analysis in nonlinear multivariate models. Journal of Econometrics, 74(1), 119-147.

Pesaran, H. H., & Shin, Y. (1998). Generalized impulse response analysis in linear multivariate models. Economics Letters, 58(1), 17-29.

Examples

```
data("dy2012")
fit = VAR(dy2012, configuration=list(nlag=1))
fevd = FEVD(Phi=fit$B, Sigma=fit$Q, nfore=10, type="time", generalized=TRUE)$FEVD
```

FrequencyConnectedness

Baruník and Křehlík (2018) frequency connectedness approach

Description

This function calculates the Baruník and Křehlík (2018) frequency connectedness measures.

Usage

```
FrequencyConnectedness(
  Phi,
  Sigma,
  nfore = 100,
  partition = c(pi, pi/2, 0),
  generalized = TRUE,
  orth = FALSE,
  scenario = "ABS",
  corrected = FALSE
)
```

Arguments

Phi	VAR coefficient matrix
Sigma	Residual variance-covariance matrix
nfore	H-step ahead forecast horizon
partition	Frequency spectrum

generalized	Orthorgonalized/generalized FEVD
orth	Orthorgonalized shocks
scenario	ABS or WTH
corrected	Boolean value whether corrected or standard TCI should be computed

Value

Get connectedness measures

Author(s)

David Gabauer

References

Baruník, J., & Křehlík, T. (2018). Measuring the frequency dynamics of financial connectedness and systemic risk. Journal of Financial Econometrics, 16(2), 271-296.

Examples

```
data("dy2012")
partition = c(pi+0.00001, pi/4, 0)
fit = VAR(dy2012, configuration=list(nlag=4))
dca = FrequencyConnectedness(Phi=fit$B, Sigma=fit$Q, nfore=100, partition=partition)
```

---

g2020 *Dataset of Gabauer (2020)*

Description

For detailed information see: Gabauer, D. (2020). Volatility impulse response analysis for DCC-GARCH models: The role of volatility transmission mechanisms. Journal of Forecasting, 39(5), 788-796.

Usage

```
data(g2020)
```

Format

zoo data.frame

GARCHselection *Univariate GARCH selection criterion*

Description

This function estimates and evaluates a combination of GARCH models with different distributions and suggests the best GARCH models among all alternatives given some test statistics

Usage

```
GARCHselection(
  x,
  distributions = c("norm", "snorm", "std", "sstd", "ged", "sged"),
 models = c("sGARCH", "eGARCH", "gjrGARCH", "iGARCH", "TGARCH", "AVGARCH", "NGARCH",
    "NAGARCH", "APARCH", "ALLGARCH"),
  prob = 0.05,
  conf.level = 0.9,
  lag = 20,
  ar = 0,
  ma = 0
)
```

Arguments

x	zoo data matrix
distributions	Vector of distributions
models	Vector of GARCH models
prob	The quantile (coverage) used for the VaR.
conf.level	Confidence level of VaR test statistics
lag	Lag length of weighted Portmanteau statistics
ar	AR(p)
ma	MA(q)

Value

Get optimal univariate GARCH model specification

Author(s)

David Gabauer

References

Ghalanos, A. (2014). rugarch: Univariate GARCH models, R package version 1.3-3.

Antonakakis, N., Chatziantoniou, I., & Gabauer, D. (2021). The impact of Euro through time: Exchange rate dynamics under different regimes. International Journal of Finance & Economics, 26(1), 1375-1408.

GARCHtests *Univariate GARCH test statistics*

Description

This function provides the results of multiple univariate GARCH test statistics

Usage

```
GARCHtests(fit, lag = 20, prob = 0.05, conf.level = 0.9)
```

Arguments

fit	Fitted univariate GARCH
lag	Lag length of weighted Portmanteau statistics
prob	The quantile (coverage) used for the VaR.
conf.level	Confidence level of VaR test statistics

Value

Get best univariate GARCH

Author(s)

David Gabauer

References

Ghalanos, A. (2014). rugarch: Univariate GARCH models, R package version 1.3-3.

Antonakakis, N., Chatziantoniou, I., & Gabauer, D. (2021). The impact of Euro through time: Exchange rate dynamics under different regimes. International Journal of Finance & Economics, 26(1), 1375-1408.

gcat2022 *Dataset of Chatziantoniou, Abakah, Gabauer & Tiwari (2022)*

Description

For detailed information see: Chatziantoniou, I., Abakah, E. J., Gabauer, D., & Tiwari, A. K. (2022). Quantile time-frequency price connectedness between green bond, green equity, sustainable investments and clean energy markets: Implications for eco-friendly investors. Available at SSRN 3970746.

Usage

```
data(gcat2022)
```

Format

zoo data.frame

---

gg2018 *Dataset of Gabauer and Gupta (2018)*

Description

For detailed information see, Gabauer, D., & Gupta, R. (2018). On the transmission mechanism of country-specific and international economic uncertainty spillovers: Evidence from a TVP-VAR connectedness decomposition approach. Economics Letters, 171, 63-71.

Usage

```
data(gg2018)
```

Format

zoo data.frame

---

gghm2022 *Dataset of Gabauer, Gupta, Haradik and Miller (2020)*

Description

For detailed information see: Gabauer, D., Gupta, R., Marfatia, H., and Miller, S. M. (2020). Estimating us housing price network connectedness: Evidence from dynamic elastic net, lasso, and ridge vector autoregressive models.

Usage

```
data(gghm2022)
```

Format

zoo data.frame

`HedgeRatio` *Kroner and Sultan (1993) hedge ratios*

Description

This function calculates the hedge ratios of Kroner and Sultan (1993)

Usage

```
HedgeRatio(
  x,
  H,
  method = c("cumsum", "cumprod"),
 statistics = c("Fisher", "Bartlett", "Fligner-Killeen", "Levene", "Brown-Forsythe"),
  metric = "StdDev",
  digit = 2
)
```

Arguments

`x`	zoo return matrix (in percentage)
`H`	Residual variance-covariance, correlation or pairwise connectedness matrix
`method`	Cumulative sum or cumulative product
`statistics`	Hedging effectiveness statistic
`metric`	Risk measure of Sharpe Ratio (StdDev, VaR, or CVaR)
`digit`	Number of decimal places

Value

Get hedge ratios

Author(s)

David Gabauer

References

Kroner, K. F., & Sultan, J. (1993). Time-varying distributions and dynamic hedging with foreign currency futures. Journal of Financial and Quantitative Analysis, 28(4), 535-551.

Ederington, L. H. (1979). The hedging performance of the new futures markets. The Journal of Finance, 34(1), 157-170.

Antonakakis, N., Cunado, J., Filis, G., Gabauer, D., & de Gracia, F. P. (2020). Oil and asset classes implied volatilities: Investment strategies and hedging effectiveness. Energy Economics, 91, 104762.

Examples

```
data("g2020")
fit = VAR(g2020, configuration=list(nlag=1))
hr = HedgeRatio(g2020/100, fit$Q)
hr$TABLE
```

`InclusiveConnectedness` *Inclusive Connectedness Measures*

Description

This function results in inclusive connectedness measures

Usage

```
InclusiveConnectedness(dca, group = c(1, 2), start = NULL, end = NULL)
```

Arguments

`dca`	Dynamic connectedness object
`group`	Vector of group indices
`start`	Start index
`end`	End index

Value

Get connectedness measures

Author(s)

David Gabauer

Examples

```
data("cegg2022")
dca = ConnectednessApproach(cegg2022,
                            model="VAR",
                            connectedness="Time",
                            nlag=1,
                            nfore=20,
                            corrected=TRUE)
inc = InclusiveConnectedness(dca, group=c(1,2,3))
```

`InternalConnectedness` *Internal Connectedness Measures*

Description

This function provides internal connectedness measures

Usage

```
InternalConnectedness(
  dca,
  groups = list(c(1), c(2:ncol(dca$NET))),
  start = NULL,
  end = NULL
)
```

Arguments

`dca`	Dynamic connectedness object
`groups`	List of at least two group vectors
`start`	Start index
`end`	End index

Value

Get connectedness measures

Author(s)

David Gabauer

References

Gabauer, D., & Gupta, R. (2018). On the transmission mechanism of country-specific and international economic uncertainty spillovers: Evidence from a TVP-VAR connectedness decomposition approach. Economics Letters, 171, 63-71.

Examples

```
data("gg2018")
dca = ConnectednessApproach(gg2018,
                            nlag=1,
                            nfore=10,
                            window.size=200,
                            model="VAR",
                            connectedness="Time")
int = InternalConnectedness(dca, groups=list("US"=c(1,2,3,4), "JP"=c(5,6,7,8)))
```

IRF *Impulse response functions*

Description

This function calculates orthorgonalized/generalized impulse response functions of time or frequency domain.

Usage

```
IRF(Phi, Sigma, nfore = 10, orth = TRUE)
```

Arguments

Phi	VAR coefficient matrix
Sigma	Residual Variance-Covariance Matrix
nfore	H-step ahead forecast horizon
orth	Boolean

Value

Orthorgonal/generalized time/frequency impulse response functions

Author(s)

David Gabauer

References

Stiassny, A. (1996). A spectral decomposition for structural VAR models. Empirical Economics, 21(4), 535-555.

Koop, G., Pesaran, M. H., & Potter, S. M. (1996). Impulse response analysis in nonlinear multivariate models. Journal of Econometrics, 74(1), 119-147.

Pesaran, H. H., & Shin, Y. (1998). Generalized impulse response analysis in linear multivariate models. Economics Letters, 58(1), 17-29.

Examples

```
data("dy2012")
fit = VAR(dy2012, configuration=list(nlag=1))
irf = IRF(Phi=fit$B, Sigma=fit$Q, nfore=10, orth=TRUE)
```

jcggh2022 *Dataset of Juncal, Chatziantoniou, Gabauer, Garcia & Hardik (2022)*

Description

For detailed information see: Juncal, C., Chatziantoniou, I., Gabauer, D., De Gracia, F. P., & Hardik, M. (2022). Dynamic spillovers across precious metals and energy realized volatilities: Evidence from quantile extended joint connectedness measures.

Usage

```
data(jcggh2022)
```

Format

zoo data.frame

JointConnectedness *Lastrapes and Wiesen (2021) joint connectedness approach*

Description

This function calculates the Lastrapes and Wiesen (2021) joint connectedness measures.

Usage

```
JointConnectedness(Phi, Sigma, nfore)
```

Arguments

Phi	VAR coefficient matrix
Sigma	Residual variance-covariance matrix
nfore	H-step ahead forecast horizon

Value

Get connectedness measures

Author(s)

David Gabauer

References

Lastrapes, W. D., & Wiesen, T. F. (2021). The joint spillover index. Economic Modelling, 94, 681-691.

Examples

```
data("lw2021")
fit = VAR(lw2021, configuration=list(nlag=2))
dca = JointConnectedness(Phi=fit$B, Sigma=fit$Q, nfore=30)
dca$TABLE
```

LADVAR *Least absolute deviation vector autoregression*

Description

Estimation of a LAD VAR using equation-by-equation LAD regressions.

Usage

```
LADVAR(x, configuration = list(nlag = 1))
```

Arguments

x	zoo data matrix
configuration	model configuration
nlag	Lag length

Value

Estimate LAD VAR model

Author(s)

David Gabauer

Examples

```
data("dy2012")
fit = LADVAR(dy2012, configuration=list(nlag=1))
```

lw2021 *Dataset of Lastrapes and Wiesen (2021)*

Description

For detailed information see: Lastrapes, W. D., & Wiesen, T. F. (2021). The joint spillover index. Economic Modelling, 94, 681-691.

Usage

```
data(lw2021)
```

Format

zoo data.frame

MinimumConnectednessPortfolio *Minimum connectedness portfolio*

Description

This function calculates the minimum connectedness portfolio

Usage

```
MinimumConnectednessPortfolio(
  x,
  H,
  method = c("cumsum", "cumprod"),
 statistics = c("Fisher", "Bartlett", "Fligner-Killeen", "Levene", "Brown-Forsythe"),
  long = TRUE,
  metric = "StdDev",
  digit = 2
)
```

Arguments

x	zoo return matrix (in percentage)
H	Pairwise connectedness matrix or alternatively variance-covariance or correlation matrix
method	Cumulative sum or cumulative product
statistics	Hedging effectiveness statistic
long	Allow only long portfolio position
metric	Risk measure of Sharpe Ratio (StdDev, VaR, or CVaR)
digit	Number of decimal places

Value

Get portfolio weights

Author(s)

David Gabauer

References

Broadstock, D. C., Chatziantoniou, I., & Gabauer, D. (2022). Minimum connectedness portfolios and the market for green bonds: Advocating socially responsible investment (SRI) activity. In Applications in Energy Finance (pp. 217-253). Palgrave Macmillan, Cham.

Ederington, L. H. (1979). The hedging performance of the new futures markets. The Journal of Finance, 34(1), 157-170.

Antonakakis, N., Cunado, J., Filis, G., Gabauer, D., & de Gracia, F. P. (2020). Oil and asset classes implied volatilities: Investment strategies and hedging effectiveness. Energy Economics, 91, 104762.

Examples

```
data("g2020")
fit = VAR(g2020, configuration=list(nlag=1))
dca = TimeConnectedness(Phi=fit$B, Sigma=fit$Q, nfore=10, generalized=TRUE)
mcp = MinimumConnectednessPortfolio(g2020/100, dca$PCI, statistics="Fisher")
mcp$TABLE
```

MinnesotaPrior *Minnesota Prior*

Description

Get Minnesota Prior

Usage

```
MinnesotaPrior(gamma = 0.1, k, nlag)
```

Arguments

gamma	Diagonal value of variance-covariance matrix
k	Number of series
nlag	Lag length

Value

Get Minnesota Prior

Author(s)

David Gabauer

References

Koop, G., & Korobilis, D. (2010). Bayesian multivariate time series methods for empirical macroeconomics. Now Publishers Inc.

Examples

```
prior = MinnesotaPrior(0.1, k=4, nlag=1)
```

MultivariateHedgingPortfolio

Multivariate Hedging Portfolio

Description

This function calculates the multivariate hedging portfolio of Cocca et al. (2024)

Usage

```
MultivariateHedgingPortfolio(
  x,
  H,
  method = c("cumsum", "cumprod"),
 statistics = c("Fisher", "Bartlett", "Fligner-Killeen", "Levene", "Brown-Forsythe"),
  metric = "StdDev",
  digit = 2
)
```

Arguments

x	zoo return matrix (in percentage)
H	Residual variance-covariance, correlation or pairwise connectedness matrix
method	Cumulative sum or cumulative product
statistics	Hedging effectiveness statistic
metric	Risk measure of Sharpe Ratio (StdDev, VaR, or CVaR)
digit	Number of decimal places

Value

Get hedge ratios

Author(s)

David Gabauer

References

Cocca, T., Gabauer, D., & Pomberger, S. (2024). Clean energy market connectedness and investment strategies: New evidence from DCC-GARCH R2 decomposed connectedness measures. Energy Economics.

Ederington, L. H. (1979). The hedging performance of the new futures markets. The Journal of Finance, 34(1), 157-170.

Antonakakis, N., Cunado, J., Filis, G., Gabauer, D., & de Gracia, F. P. (2020). Oil and asset classes implied volatilities: Investment strategies and hedging effectiveness. Energy Economics, 91, 104762.

Examples

```
data("g2020")
fit = VAR(g2020, configuration=list(nlag=1))
mhp = MultivariateHedgingPortfolio(g2020/100, fit$Q)
mhp$TABLE
```

PartialCorrelations *Partial Contemporaneous Correlations*

Description

Get partial contemporaneous correlations

Usage

```
PartialCorrelations(Q)
```

Arguments

Q	variance-covariance matrix

Value

Get partial contemporaneous correlations

Author(s)

David Gabauer

References

Dahlhaus, R., & Eichler, M. (2003). Causality and graphical models in time series analysis. Oxford Statistical Science Series, 115-137.

Examples

```
data(dy2012)
fit = VAR(dy2012, configuration=list(nlag=1))
pcc = PartialCorrelations(fit$Q)
```

`PlotFROM` *Dynamic from total directional connectedness plot*

Description

Visualize dynamic from total directional connectedness

Usage

```
PlotFROM(
  dca,
  ca = NULL,
  path = NULL,
  ylim = c(NULL, NULL),
  width = 10,
  height = 7,
  ...
)
```

Arguments

`dca`	Connectedness object
`ca`	Compare dca object with a single connectedness object or a list of of connectedness objects
`path`	Path where plots should be saved
`ylim`	A vector including the lower and upper limit of the y-axis
`width`	The width of the graphics region in inches
`height`	The height of the graphics region in inches
`...`	Arguments to be passed to methods, such as graphical parameters (see par).

Value

Return connectedness plot

PlotINF *Dynamic influence connectedness plot*

Description

Visualize dynamic influence connectedness

Usage

```
PlotINF(
  dca,
  ca = NULL,
  path = NULL,
  ylim = c(NULL, NULL),
  selection = NULL,
  width = 10,
  height = 7,
  ...
)
```

Arguments

dca	Connectedness object
ca	Compare dca object with a single connectedness object or a list of of connectedness objects
path	Path where plots should be saved
ylim	A vector including the lower and upper limit of the y-axis
selection	Indidcator of the illustrated series
width	The width of the graphics region in inches
height	The height of the graphics region in inches
...	Arguments to be passed to methods, such as graphidcal parameters (see par).

Value

Return connectedness plot

PlotNET *Dynamic net total directional connectedness plot*

Description

Visualize dynamic net total directional connectedness

Usage

```
PlotNET(
  dca,
  ca = NULL,
  path = NULL,
  ylim = c(NULL, NULL),
  width = 10,
  height = 7,
  ...
)
```

Arguments

dca	Connectedness object
ca	Compare dca object with a single connectedness object or a list of of connectedness objects
path	Path where plots should be saved
ylim	A vector including the lower and upper limit of the y-axis
width	The width of the graphics region in inches
height	The height of the graphics region in inches
...	Arguments to be passed to methods, such as graphical parameters (see par).

Value

Return connectedness plot

PlotNetwork *Network plot*

Description

Visualize net pairwise or pairwise connectedness measures

Usage

```
PlotNetwork(
  dca,
  method = "NPDC",
  path = NULL,
  name_length = NULL,
  threshold = 0.25,
  width = 10,
  height = 10,
  ...
)
```

Arguments

dca	Connectedness object
method	Either visualizing NPDC or PCI
path	Path where plots should be saved
name_length	Length of variable names in the network plot
threshold	Threshold for bivariate connections between 0 and 1
width	The width of the graphics region in inches
height	The height of the graphics region in inches
...	Arguments to be passed to methods, such as graphical parameters (see par).

Value

Return connectedness plot

PlotNPDC *Dynamic net pairwise connectedness plot*

Description

Visualize dynamic net pairwise connectedness

Usage

```
PlotNPDC(
  dca,
  ca = NULL,
  path = NULL,
  ylim = c(NULL, NULL),
  selection = NULL,
  width = 10,
  height = 7,
  ...
)
```

Arguments

dca	Connectedness object
ca	Compare dca object with a single connectedness object or a list of of connectedness objects
path	Path where plots should be saved
ylim	A vector including the lower and upper limit of the y-axis
selection	Indicator of the illustrated series
width	The width of the graphics region in inches
height	The height of the graphics region in inches
...	Arguments to be passed to methods, such as graphical parameters (see par).

Value

Return connectedness plot

PlotNPT *Dynamic net pairwise transmission plot*

Description

Visualize dynamic net total directional connectedness

Usage

```
PlotNPT(dca, ca = NULL, path = NULL, width = 10, height = 7, ...)
```

Arguments

dca	Connectedness object
ca	Compare dca object with a single connectedness object or a list of of connectedness objects
path	Path where plots should be saved
width	The width of the graphics region in inches
height	The height of the graphics region in inches
...	Arguments to be passed to methods, such as graphidcal parameters (see par).

Value

Return connectedness plot

PlotPCI *Dynamic pairwise connectedness plot*

Description

Visualize dynamic pairwise connectedness

Usage

```
PlotPCI(
  dca,
  ca = NULL,
  path = NULL,
  ylim = c(NULL, NULL),
  selection = NULL,
  width = 10,
  height = 7,
  ...
)
```

Arguments

dca	Connectedness object
ca	Compare dca object with a single connectedness object or a list of of connectedness objects
path	Path where plots should be saved
ylim	A vector including the lower and upper limit of the y-axis
selection	Indidcator of the illustrated series
width	The width of the graphics region in inches
height	The height of the graphics region in inches
...	Arguments to be passed to methods, such as graphidcal parameters (see par).

Value

Return connectedness plot

PlotTCI *Dynamic total connectedness plot*

Description

Visualize dynamic total connectedness

Usage

```
PlotTCI(
  dca,
  ca = NULL,
  path = NULL,
  ylim = c(NULL, NULL),
  width = 10,
  height = 5,
  ...
)
```

Arguments

dca	Connectedness object
ca	Compare dca object with a single connectedness object or a list of of connectedness objects
path	Path where plots should be saved
ylim	A vector including the lower and upper limit of the y-axis
width	The width of the graphics region in inches
height	The height of the graphics region in inches
...	Arguments to be passed to methods, such as graphical parameters (see par).

Value

Return connectedness plot

PlotTO *Dynamic to total directional connectedness plot*

Description

Visualize dynamic to total directional connectedness

Usage

```
PlotTO(
  dca,
  ca = NULL,
  path = NULL,
  ylim = c(NULL, NULL),
  width = 10,
  height = 7,
  ...
)
```

Arguments

dca	Connectedness object
ca	Compare dca object with a single connectedness object or a list of of connectedness objects
path	Path where plots should be saved
ylim	A vector including the lower and upper limit of the y-axis
width	The width of the graphics region in inches
height	The height of the graphics region in inches
...	Arguments to be passed to methods, such as graphical parameters (see par).

Value

Return connectedness plot

QVAR *Quantile vector autoregression*

Description

Estimation of a QVAR using equation-by-equation quantile regressions.

Usage

```
QVAR(x, configuration = list(nlag = 1, tau = 0.5, method = "fn"))
```

Arguments

x	zoo data matrix
configuration	model configuration
nlag	Lag length
tau	quantile between 0 and 1
method	See methods for rq in quantreg package. Default is "fn".

Value

Estimate QVAR model

Author(s)

David Gabauer

References

White, H., Kim, T. H., & Manganelli, S. (2015). VAR for VaR: Measuring tail dependence using multivariate regression quantiles. Journal of Econometrics, 187(1), 169-188.

Chatziantoniou, I., Gabauer, D., & Stenfors, A. (2021). Interest rate swaps and the transmission mechanism of monetary policy: A quantile connectedness approach. Economics Letters, 204, 109891.

Examples

```
data("dy2012")
fit = QVAR(dy2012, configuration=list(nlag=1, tau=0.5))
```

R2Connectedness *R2 connectedness approach*

Description

This function computes the R2 connectedness measures

Usage

```
R2Connectedness(
  x,
  window.size = NULL,
  nlag = 0,
  method = "pearson",
  relative = FALSE,
  corrected = FALSE
)
```

Arguments

x	zoo data matrix
window.size	Rolling-window size or Bayes Prior sample size
nlag	Lag length
method	"pearson", "spearman", or "kendall". "pearson" is default.
relative	Boolean whether relative or absolute R2 should be used
corrected	Boolean value whether corrected or standard TCI should be computed

Value

Get R2 connectedness measures

Author(s)

David Gabauer

References

Naeem, M. A., Chatziantoniou, I., Gabauer, D., & Karim, S. (2023). Measuring the G20 Stock Market Return Transmission Mechanism: Evidence From the R2 Connectedness Approach. International Review of Financial Analysis.

Balli, F., Balli, H. O., Dang, T. H. N., & Gabauer, D. (2023). Contemporaneous and lagged R2 decomposed connectedness approach: New evidence from the energy futures market. Finance Research Letters, 57, 104168.

Examples

```
data("dy2012")
dca = R2Connectedness(dy2012, window.size=NULL, nlag=0, method="pearson")
dca$TABLE
```

R2Correlations *R2 decomposed connectedness from correlations*

Description

This function computes the R2 decomposed connectedness measures from correlations

Usage

```
R2Correlations(R)
```

Arguments

R	zoo correlation data matrix

Value

Get R2 connectedness measures from correlation matrix

Author(s)

David Gabauer

References

Naeem, M. A., Chatziantoniou, I., Gabauer, D., & Karim, S. (2023). Measuring the G20 Stock Market Return Transmission Mechanism: Evidence From the R2 Connectedness Approach. International Review of Financial Analysis.

Balli, F., Balli, H. O., Dang, T. H. N., & Gabauer, D. (2023). Contemporaneous and lagged R2 decomposed connectedness approach: New evidence from the energy futures market. Finance Research Letters, 57, 104168.

`RiskParityPortfolio` *Minimum connectedness portfolio*

Description

This function calculates the minimum connectedness portfolio

Usage

```
RiskParityPortfolio(
  x,
  H,
  method = c("cumsum", "cumprod"),
 statistics = c("Fisher", "Bartlett", "Fligner-Killeen", "Levene", "Brown-Forsythe"),
  long = TRUE,
  metric = "StdDev",
  digit = 2
)
```

Arguments

`x`	zoo return matrix (in percentage)
`H`	Pairwise connectedness matrix or alternatively variance-covariance or correlation matrix
`method`	Cumulative sum or cumulative product
`statistics`	Hedging effectiveness statistic
`long`	Allow only long portfolio position
`metric`	Risk measure of Sharpe Ratio (StdDev, VaR, or CVaR)
`digit`	Number of decimal places

Value

Get portfolio weights

Author(s)

David Gabauer

References

Ederington, L. H. (1979). The hedging performance of the new futures markets. The Journal of Finance, 34(1), 157-170.

Antonakakis, N., Cunado, J., Filis, G., Gabauer, D., & de Gracia, F. P. (2020). Oil and asset classes implied volatilities: Investment strategies and hedging effectiveness. Energy Economics, 91, 104762.

Examples

```
data("g2020")
fit = VAR(g2020, configuration=list(nlag=1))
mcp = RiskParityPortfolio(g2020/100, fit$Q, statistics="Fisher")
mcp$TABLE
```

SummaryStatistics *Summary Statistics*

Description

Get comprehensive summary statistics

Usage

```
SummaryStatistics(
  x,
  portmanteau = c("Ljung-Box", "Box-Pierce", "Monti"),
  correlation = c("kendall", "spearman", "pearson"),
  nlag = 20,
  digit = 3
)
```

Arguments

x	zoo data matrix
portmanteau	portmanteau statistics: "Box-Pierce", "Ljung-Box", "Monti"
correlation	correlation coefficient: "pearson", "kendall", "spearman".
nlag	number of lags for Weighted Portmanteau statistics
digit	digit Number of decimal places

Value

Get summary statistics

Author(s)

David Gabauer

Examples

```
data(dy2012)
SummaryStatistics(dy2012)
```

`TimeConnectedness` *Diebold and Yilmaz (2009, 2012) connectedness approach*

Description

This function allows to calculate the Diebold and Yilmaz (2009, 2012) connectedness measures.

Usage

```
TimeConnectedness(
  Phi = NULL,
  Sigma = NULL,
  nfore = 10,
  generalized = TRUE,
  corrected = FALSE,
  FEVD = NULL
)
```

Arguments

`Phi`	VAR coefficient matrix
`Sigma`	Residual variance-covariance matrix
`nfore`	H-step ahead forecast horizon
`generalized`	Orthorgonalized/generalized FEVD
`corrected`	Boolean value whether corrected or standard TCI should be computed
`FEVD`	Alternatively, to provide Phi and Sigma it is also possible to use FEVD directly.

Value

Get connectedness measures

Author(s)

David Gabauer

References

Diebold, F. X., & Yilmaz, K. (2009). Measuring financial asset return and volatility spillovers, with application to global equity markets. The Economic Journal, 119(534), 158-171.

Diebold, F. X., & Yilmaz, K. (2012). Better to give than to receive: Predictive directional measurement of volatility spillovers. International Journal of Forecasting, 28(1), 57-66.

Examples

```
#Replication of DY2012
data("dy2012")
fit = VAR(dy2012, configuration=list(nlag=4))
dca = TimeConnectedness(Phi=fit$B, Sigma=fit$Q, nfore=10, generalized=TRUE)
dca$TABLE
```

TVPVAR *Time-varying parameter vector autoregression*

Description

Estimate TVP-VAR model

Usage

```
TVPVAR(x, configuration = list(l = c(0.99, 0.99), nlag = 1, prior = NULL))
```

Arguments

x	zoo data matrix
configuration	model configuration
nlag	Lag length
prior	List of prior VAR coefficients and variance-covariance matrix
l	forgetting factors (kappa1, kappa2)

Value

Estimate TVP-VAR model

Author(s)

David Gabauer

References

Koop, G., & Korobilis, D. (2014). A new index of financial conditions. European Economic Review, 71, 101-116.

Antonakakis, N., Chatziantoniou, I., & Gabauer, D. (2020). Refined measures of dynamic connectedness based on time-varying parameter vector autoregressions. Journal of Risk and Financial Management, 13(4), 84.

Examples

```
data("dy2012")
prior = BayesPrior(dy2012, nlag=1)
fit = TVPVAR(dy2012, configuration=list(nlag=1, prior=prior, l=c(0.99,0.99)))
```

UninformativePrior *Uninformative Prior*

Description

Get Uninformative Prior

Usage

```
UninformativePrior(k, nlag)
```

Arguments

k	Number of series
nlag	Lag length

Value

Get Uninformative Prior

Author(s)

David Gabauer

References

Koop, G., & Korobilis, D. (2010). Bayesian multivariate time series methods for empirical macroeconomics. Now Publishers Inc.

Examples

```
prior = UninformativePrior(k=4, nlag=1)
```

VAR *Vector autoregression*

Description

Estimation of a VAR using equation-by-equation OLS regressions.

Usage

```
VAR(x, configuration = list(nlag = 1))
```

Arguments

x	zoo data matrix
configuration	model configuration
nlag	Lag length

Value

Estimate VAR model

Author(s)

David Gabauer

References

Sims, C. A. (1980). Macroeconomics and reality. Econometrica, 1-48.

Examples

```
data("dy2012")
fit = VAR(dy2012, configuration=list(nlag=1))
```

VarianceTest *Variance Test*

Description

VarianceTest performs variance homogeneity tests including Ftest, Bartlett, Brown-Forsythe and Fligner-Killeen tests.

Usage

```
VarianceTest(
  formula,
  data,
  alpha = 0.05,
 method = c("Bartlett", "Brown-Forsythe", "Fligner-Killeen", "Fisher", "Levene"),
  na.rm = TRUE
)
```

Arguments

formula	a formula of the form lhs ~ rhs where lhs gives the sample values and rhs the corresponding groups.
data	a tibble or data frame containing the variables in the formula formula
alpha	the level of significance to assess variance homogeneity. Default is set to alpha = 0.05.

method	a character string to select one of the variance homogeneity tests: "Bartlett", "Brown-Forsythe", "Fisher" and "Fligner-Killeen".
na.rm	Ha logical value indicating whether NA values should be stripped before the computation proceeds.

Value

Get bivariate portfolio weights

Author(s)

David Gabauer

References

Antonakakis, N., Cunado, J., Filis, G., Gabauer, D., & de Gracia, F. P. (2020). Oil and asset classes implied volatilities: Investment strategies and hedging effectiveness. Energy Economics, 91, 104762.

VFEVD *Generalized volatility forecast error variance decomposition and volatility impulse response functions*

Description

This function provides the volatility impulse responses and the forecast error variance decomposition of DCC-GARCH models.

Usage

```
VFEVD(fit, nfore = 100, standardize = FALSE)
```

Arguments

fit	Fitted DCC-GARCH model
nfore	H-step ahead forecast horizon
standardize	Boolean value whether GIRF should be standardized

Value

Get volatility impulse response functions and forecast error variance decomposition

Author(s)

David Gabauer

References

Gabauer, D. (2020). Volatility impulse response analysis for DCC-GARCH models: The role of volatility transmission mechanisms. Journal of Forecasting, 39(5), 788-796.

`WeightedBoxTest` *WeightedBoxTest*

Description

Weighted portmanteau tests for testing the null hypothesis of adequate ARMA fit and/or for detecting nonlinear processes. Written in the style of Box.test() and is capable of performing the traditional Box Pierce (1970), Ljung Box (1978) or Monti (1994) tests.

Usage

```
WeightedBoxTest(
  x,
  lag = 1,
  type = c("Box-Pierce", "Ljung-Box", "Monti"),
  fitdf = 0,
  sqrd.res = FALSE,
  log.sqrd.res = FALSE,
  abs.res = FALSE,
  weighted = TRUE
)
```

Arguments

`x`	a numeric vector or univariate time series, or residuals of a fitted time series
`lag`	the statistic will be based on lag autocorrelation coefficients. lag=1 by default
`type`	test to be performed, partial matching is used. "Box-Pierce" by default
`fitdf`	number of degrees of freedom to be subtracted if x is a series of residuals, set at 0 by default
`sqrd.res`	A flag, should the series/residuals be squared to detect for nonlinear effects?, FALSE by default
`log.sqrd.res`	A flag, should a log of the squared series/residuals be used to detect for nonlinear effects? FALSE by default
`abs.res`	A flag, should the absolute series or residuals be used to detect for nonlinear effects? FALSE by default
`weighted`	A flag determining if the weighting scheme should be utilized. TRUE by default. If set to FALSE, the traditional test is performed with no weights

Value

Get Uninformative Prior

Author(s)

David Gabauer

References

Box, G. E. P. and Pierce, D. A. (1970), Distribution of residual correlations in autoregressive-integrated moving average time series models. Journal of the American Statistical Association, 65, 1509-1526.

Fisher, T. J. and Gallagher, C. M. (2012), New Weighted Portmanteau Statistics for Time Series Goodness-of-Fit Testing. Journal of the American Statistical Association, accepted.

Ljung, G. M. and Box, G. E. P. (1978), On a measure of lack of fit in time series models. Biometrika 65, 297-303.

Mahdi, E. and McLeod, A. I. (2012), Improved multivariate portmanteau test. Journal of Time Series Analysis 65(2), 297-303.

Monti, A. C. (1994), A proposal for a residual autocorrelation test in linear models. Biometrika 81(4), 776-780.

Pena, D. and Rodriguez, J. (2002) A powerful portmanteau test of lack of fit for time series. Journal of the American Statistical Association 97(458), 601-610.

`Wold` *Wold representation theorem*

Description

Transform VAR to VMA coefficients

Usage

```
Wold(x, nfore = 10)
```

Arguments

`x`	VAR coefficients
`nfore`	H-step ahead forecast horizon

Value

Get VMA coefficients

Author(s)

David Gabauer

Examples

```
data("dy2012")
fit = VAR(dy2012, configuration=list(nlag=1))
wold = Wold(fit$B, nfore=10)
```

Index