

Package ‘psymonitor’

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Type Package

Title Real Time Monitoring of Asset Markets: Bubbles and Crisis

Version 0.0.2

Description Apply the popular real-time monitoring strategy proposed by Phillips, Shi and Yu (2015a,b;PSY) <doi:10.1111/iere.12132>, <doi:10.1111/iere.12131>, along with a new bootstrap procedure designed to mitigate the potential impact of heteroskedasticity and to effect family-wise size control in recursive testing algorithms (Phillips and Shi, forthcoming).

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URL <https://github.com/itamarcaspi/psymonitor>

BugReports <https://github.com/itamarcaspi/psymonitor/issues>

Depends R (>= 3.2.0)

Imports doParallel, foreach, magrittr, parallel

Suggests ggplot2, knitr, lubridate, rmarkdown, spelling, testthat,

VignetteBuilder knitr

Encoding UTF-8

Language en-US

LazyData true

RoxygenNote 6.1.1

NeedsCompilation no

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R topics documented:

ADF	2
ADFres	3
cvPSYmc	3
cvPSYwmboot	4
disp	5
locate	7
PSY	7
snp	8
spread	9

Index	10
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ADF	<i>Estimate the ADF statistic</i>
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Description

ADF calculates the augmented Dickey-Fuller (ADF) test statistic with lag order set fixed or selected by AIC or BIC.

Usage

```
ADF(y, IC = 0, adflag = 0)
```

Arguments

y	A vector, The data.
IC	An integer. 0 for fixed lag (default) order 1 for AIC and 2 for BIC (default = 0).
adflag	An integer. Lag order when IC=0; maximum number of lags when IC>0 (default = 0).

Value

Numeric, ADF test statistic.

References

Said, S. E., & Dickey, D. A. (1984). Testing for Unit Roots in ARMA Models of Unknown Order. *Biometrika*, 71(1984), 599–607.

Examples

```
y <- rnorm(100)
tstat <- ADF(y, IC = 0, adflag = 1)
```

ADFRes *Estimate the ADF model under the null*

Description

ADFRes estimates the ADF model under the null with lag order selected by AIC or BIC

Usage

```
ADFRes(y, IC, adflag)
```

Arguments

y	A Vector. Data.
IC	An integer, 0 for fixed lag order (default), 1 for AIC and 2 for BIC.
adflag	An integer. Lag order when IC=0; maximum number of lags when IC>0 (default = 0).

Value

Numeric, ADF test statistic.

References

Phillips, P. C. B., Shi, S., & Yu, J. (2015a). Testing for multiple bubbles: Historical episodes of exuberance and collapse in the S&P 500. *International Economic Review*, 56(4), 1034–1078.

Phillips, P. C. B., Shi, S., & Yu, J. (2015b). Testing for multiple bubbles: Limit Theory for Real-Time Detectors. *International Economic Review*, 56(4), 1079–1134.

cvPSYmc *Simulate the finite sample critical values for the PSY test.*

Description

cvPSYmc implements the real time bubble detection procedure of Phillips, Shi and Yu (2015a,b)

Usage

```
cvPSYmc(obs, swindow0, IC = 0, adflag = 0, nrep = 199,
multiplicity = TRUE, Tb, useParallel = TRUE, nCores)
```

Arguments

obs	A positive integer. The number of observations.
swindow0	A positive integer. Minimum window size (default = $T(0.01 + 1.8/\sqrt{T})$, where T denotes the sample size)
IC	An integer. 0 for fixed lag order (default), 1 for AIC and 2 for BIC (default = 0).
adflag	An integer, lag order when IC=0; maximum number of lags when IC>0 (default = 0).
nrep	A positive integer. Number of replications (default = 199).
multiplicity	Logical. If multiplicity=TRUE, use family-wise size control in the recursive testing algorithms.
Tb	A positive integer. The simulated sample size (swindow0+ controlling). Ignored if multiplicity=FALSE.
useParallel	Logical. If useParallel=TRUE, use multi core computation.
nCores	A positive integer. Optional. If useParallel=TRUE, the number of cores defaults to all but one.

Value

A matrix. BSADF bootstrap critical value sequence at the 90, 95 and 99 percent level.

References

- Phillips, P. C. B., Shi, S., & Yu, J. (2015a). Testing for multiple bubbles: Historical episodes of exuberance and collapse in the S&P 500. *International Economic Review*, 56(4), 1034–1078.
- Phillips, P. C. B., Shi, S., & Yu, J. (2015b). Testing for multiple bubbles: Limit Theory for Real-Time Detectors. *International Economic Review*, 56(4), 1079–1134.

Examples

```
cv <- cvPSYmc(80, IC = 0, adflag = 1, Tb = 30, nrep = 99, nCores = 1)
```

cvPSYwmboot

Conduct the new composite bootstrapping for the PSY test.

Description

cvPSYwmboot implements the new bootstrap procedure designed to detect bubbles and crisis periods while mitigating the potential impact of heteroskedasticity and to effect family-wise size control in recursive testing algorithms (Phillips and Shi, forthcoming).

Usage

```
cvPSYwmboot(y, swindow0, IC = 0, adflag = 0, Tb, nboot = 199,
  useParallel = TRUE, nCores)
```

Arguments

y	A vector. The data.
swindow0	A positive integer. Minimum window size (default = $T(0.01 + 1.8/\sqrt{T})$, where T denotes the sample size),
IC	An integer. 0 for fixed lag order (default), 1 for AIC and 2 for BIC (default = 0).
adflag	An integer, lag order when IC=0; maximum number of lags when IC>0 (default = 0).
Tb	A positive integer. The simulated sample size (swindow0+ controlling).
nboot	A positive integer. Number of bootstrap replications (default = 199).
useParallel	Logical. If useParallel=TRUE, use multi core computation.
nCores	A positive integer. Optional. If useParallel=TRUE, the number of cores defaults to all but one.

Value

A matrix. BSADF bootstrap critical value sequence at the 90, 95 and 99 percent level.

References

Phillips, P. C. B., Shi, S., & Yu, J. (2015a). Testing for multiple bubbles: Historical episodes of exuberance and collapse in the S&P 500. *International Economic Review*, 56(4), 1034–1078.

Phillips, P. C. B., Shi, S., & Yu, J. (2015b). Testing for multiple bubbles: Limit Theory for Real-Time Detectors. *International Economic Review*, 56(4), 1079–1134.

Phillips, P. C. B., & Shi, S.(forthcoming). Real time monitoring of asset markets: Bubbles and crisis. In Hrishikesh D. Vinod and C.R. Rao (Eds.), *Handbook of Statistics Volume 41 - Econometrics Using R*.

Examples

```
y <- rnorm(80)
cv <- cvPSYwmboot(y, IC = 0, adflag = 1, Tb = 30, nboot = 99, nCores = 1)
```

 disp

Generate a table with identified bubble/crisis periods

Description

disp generates a data frame with bubble/crisis periods identified by the PSY procedure

Usage

```
disp(OT, obs)
```

Arguments

OT	A date vector. Bubbles/crisis periods identified by the <code>spymonitor::locate</code> function.
obs	A positive integer. The number of observations.

Value

A vector of strings with bubble/crisis periods.

References

Phillips, P. C. B., Shi, S., & Yu, J. (2015a). Testing for multiple bubbles: Historical episodes of exuberance and collapse in the S&P 500. *International Economic Review*, 56(4), 1034–1078.

Phillips, P. C. B., Shi, S., & Yu, J. (2015b). Testing for multiple bubbles: Limit Theory for Real-Time Detectors. *International Economic Review*, 56(4), 1079–1134.

* Phillips, P. C. B., & Shi, S. (forthcoming). Real time monitoring of asset markets: Bubbles and crisis. In Hrishikesh D. Vinod and C.R. Rao (Eds.), *Handbook of Statistics Volume 41 - Econometrics Using R*.

Examples

```
data(spread)

y      <- spread$value[150:200]
obs    <- length(y)
swindow0 <- floor(obs*(0.01 + 1.8/sqrt(obs)))
dim    <- obs - swindow0 + 1
Tb     <- 24 + swindow0 - 1

# Estimate PSY statistics and CVs
bsadf  <- PSY(y, swindow0)
quantilesBsadf <- cvPSYwmboot(y, swindow0, Tb=Tb, nboot = 49, nCores = 2)
quantile95 <- quantilesBsadf %*% matrix(1, nrow = 1, ncol = dim)

# locate bubble/crisis dates
ind95   <- (bsadf > t(quantile95[2, ])) * 1
monitorDates <- spread$date[swindow0:obs]
OT      <- locate(ind95, monitorDates)

# Show bubble/crisis periods
disp(OT, obs)
```

locate *Locate bubble/crisis periods*

Description

locate locate bubble/crisis periods with non-zero bubble indicator

Usage

locate(index, dates)

Arguments

index	A vector. A dummy variable that equals 1 for a bubble/crisis period and 0 otherwise.
dates	A vector. Dates of the time series.

Value

A vector. Dates identified as bubbles or crisis.

References

Phillips, P. C. B., Shi, S., & Yu, J. (2015a). Testing for multiple bubbles: Historical episodes of exuberance and collapse in the S&P 500. *International Economic Review*, 56(4), 1034–1078.

Phillips, P. C. B., Shi, S., & Yu, J. (2015b). Testing for multiple bubbles: Limit Theory for Real-Time Detectors. *International Economic Review*, 56(4), 1079–1134.

* Phillips, P. C. B., & Shi, S. (forthcoming). Real time monitoring of asset markets: Bubbles and crisis. In Hrishikesh D. Vinod and C.R. Rao (Eds.), *Handbook of Statistics Volume 41 - Econometrics Using R*.

PSY *Estimate PSY's BSADF sequence of test statistics*

Description

PSY implements the real time bubble detection procedure of Phillips, Shi and Yu (2015a,b)

Usage

PSY(y, swindow θ , IC = θ , adflag = θ)

Arguments

<code>y</code>	A vector. The data.
<code>swindow0</code>	A positive integer. Minimum window size (default = $T(0.01 + 1.8/\sqrt{T})$, where T denotes the sample size)
<code>IC</code>	An integer. 0 for fixed lag order (default), 1 for AIC and 2 for BIC (default = 0).
<code>adflag</code>	An integer, lag order when IC=0; maximum number of lags when IC>0 (default = 0).

Value

Vector, BSADF test statistic.

References

Phillips, P. C. B., Shi, S., & Yu, J. (2015a). Testing for multiple bubbles: Historical episodes of exuberance and collapse in the S&P 500. *International Economic Review*, 56(4), 1034–1078.

Phillips, P. C. B., Shi, S., & Yu, J. (2015b). Testing for multiple bubbles: Limit Theory for Real-Time Detectors. *International Economic Review*, 56(4), 1079–1134.

Examples

```
y <- rnorm(80)
bsadf <- PSY(y, IC = 0, adflag = 1)
```

snp	<i>S&P 500 price to dividend ratio</i>
-----	--

Description

S&P 500 price to dividend ratio: January 1973– July 2017

Usage

```
snp
```

Format

A tibble

Source

Datastream International.

Examples

```
head(snp)
```

spread

Credit risk in the European sovereign sector

Description

Credit risk in the European sovereign sector: June 1997–June 2016. Proxied by an index constructed as a GDP weighted 10-year government bond yield of the GIIPS (Greece, Ireland, Italy, Portugal, and Spain) countries.

Usage

spread

Format

A tibble

Source

Datastream International.

Examples

```
head(spread)
```

Index

*Topic **datasets**

snp, [8](#)

spread, [9](#)

ADF, [2](#)

ADFres, [3](#)

cvPSYmc, [3](#)

cvPSYwmbot, [4](#)

disp, [5](#)

locate, [7](#)

PSY, [7](#)

snp, [8](#)

spread, [9](#)