Package 'MultipleBubbles'

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Title Test and Detection of Explosive Behaviors for Time Series

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Description
Provides the Augmented Dickey-Fuller test and its variations to check the existence of bubbles (explosive behavior) for time series, based on the article by Peter C. B. Phillips, Shuping Shi and Jun Yu (2015a) <doi:10.1111/iere.12131>. Some functions may take a while depending on the size of the data used, or the number of Monte Carlo replications applied.

License GPL (>= 2)

Imports MASS (>= 7.3), foreach (>= 1.4.4), stats

LazyData TRUE

RoxygenNote 6.1.0

NeedsCompilation no

Repository CRAN

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Contents

`ADF_FL` *Augmented Dickey-Fuller Statistic*

Description

Calculate the Augmented Dickey-Fuller Statistic with a fixed lag order .

Usage

```
ADF_FL(y, adflag = 0, mflag = 1)
```

Arguments

`y`	the time series to be used.
`adflag`	is the lag order.
`mflag`	1 for ADF with constant and whithout trend, 2 for ADF with constant and trend and 3 for ADF without constant and trend.

References

Phillips, P.C. & Shi, S. & Yu, J. (2015a). "Testing for Multiple Bubbles: Historical Episodes of Exuberance and Collapse in the S&P 500". *SSRN Electronic Journal*.

Examples

```
y <- rnorm(10)
ADF_FL(y, adflag = 1, mflag = 2)
```

`ADF_IC` *Augmented Dickey-Fuller Statistic by AIC or BIC*

Description

Calculate the Augmented Dickey-Fuller Statistic with lag order selected by AIC or BIC.

Usage

```
ADF_IC(y, adflag, mflag, IC)
```

Arguments

`y`	the time series to be used.
`adflag`	the maximum lag order.
`mflag`	1 for ADF with constant and whithout trend, 2 for ADF with constant and trend and 3 for ADF without constant and trend.
`IC`	1 for AIC and 2 for BIC.

References

Phillips, P.C. & Shi, S. & Yu, J. (2013). "Testing for Multiple Bubbles: Historical Episodes of Exuberance and Collapse in the S&P 500". *SSRN Electronic Journal*.

Examples

```
y <- rnorm(10)
ADF_IC(y, adflag = 1, mflag = 2, IC = 1)
ADF_IC(y, adflag = 1, mflag = 2, IC = 2)
```

---

badf *Backward Augmented Dickey-Fuller Sequence.*

Description

In this program, we calculate critical value sequences for the backward ADF statistic sequence for a matrix generated from a standard Normal distribution.

Usage

```
badf(m, t, adflag = 0, mflag = 1)
```

Arguments

m	Number of Monte Carlo replications. Must be bigger than 2.
t	Sample size. Must be bigger than 2.
adflag	Number of lags to be included in the ADF Test. Default equals 0.
mflag	1 for ADF with constant and whithout trend, 2 for ADF with constant and trend and 3 for ADF without constant and trend.

References

Phillips, P.C. & Shi, S. & Yu, J. (2015a). "Testing for Multiple Bubbles: Historical Episodes of Exuberance and Collapse in the S&P 500". *SSRN Electronic Journal*.

Examples

```
foo <- badf(m = 100, t = 50, adflag = 1, mflag = 1)
plot(foo$quantiles[2,], type = 'l')
```

bsadf *Critical values for backward SADF statistic sequence.*

Description

Calculate critical value sequences for the backward sup ADF statistic sequence using Monte Carlo simulations for a sample generated from a Normal distribution.

Usage

```
bsadf(m, t, adflag = 0, mflag = 1)
```

Arguments

m	Number of Monte Carlo Simulations
t	Sample size.
adflag	is the lag order.
mflag	1 for ADF with constant and whithout trend, 2 for ADF with constant and trend and 3 for ADF without constant and trend.#' @keywords AugmentedDickey-FullerTest backwardSADF MonteCarlo.

References

Phillips, P.C. & Shi, S. & Yu, J. (2015a). "Testing for Multiple Bubbles: Historical Episodes of Exuberance and Collapse in the S&P 500". *SSRN Electronic Journal*.

Examples

```
foo <- bsadf(m = 20, t = 50, adflag = 1, mflag = 2)
plot(foo$quantiles[2,], type = 'l')
```

DGP *Random walk.*

Description

Generate a random walk with drift 1/n.

Usage

```
DGP(n, niter)
```

Arguments

n	sample size. Number of rows in the generated matrix.
niter	number of columns in the generated matrix.

Examples

```
DGP(n = 100, niter = 10)
```

---

gsadf *Critical values for generalized sup ADF statistic sequence.*

Description

Calculate critical value sequences for the generalized sup ADF statistic sequence using Monte Carlo simulations for a sample generated from a Normal distribution.

Usage

```
gsadf(m, t, adflag = 0, mflag = 1, swindow0 = floor(r0 * t))
```

Arguments

m	Number of Monte Carlo Simulations. Default equals 2000. Must be bigger than 2.
t	Sample size. Default equals 100. Must be bigger than 2.
adflag	Number of lags to be included in the ADF Test. Default equals 0.
mflag	1 for ADF with constant and whithout trend, 2 for ADF with constant and trend and 3 for ADF without constant and trend.
swindow0	Minimum window size.

References

Phillips, P.C. & Shi, S. & Yu, J. (2015a). "Testing for Multiple Bubbles: Historical Episodes of Exuberance and Collapse in the S&P 500". *SSRN Electronic Journal*.

Examples

```
foo <- gsadf(m = 20, t = 50)
quant <- rep(foo$quantiles[2], 100)
plot(quant, type = 'l')
```

sadf *Critical values for sup ADF statistic sequence.*

Description

Calculate critical value sequences for the sup ADF statistic sequence using Monte Carlo simulations for a sample generated from a Normal distribution.

Usage

```
sadf(m, t)
```

Arguments

m	Number of Monte Carlo Simulations. Default equals 2000. Must be bigger than 2.
t	Sample size. Default equals 100. Must be bigger than 2.

References

Phillips, P.C. & Shi, S. & Yu, J. (2015a). "Testing for Multiple Bubbles: Historical Episodes of Exuberance and Collapse in the S&P 500". *SSRN Electronic Journal*.

Examples

```
foo <- sadf(m = 20, t = 50)
quant <- rep(foo$quantiles[2], 100)
plot(quant, type = 'l')
```

sadf_gsadf *Sup ADF and generalized sup ADF statistics for a time series.*

Description

Calculate the sup ADF and the generalized sup ADF statistics using the backward ADF statistic sequence and the backward SADF statistic sequence, respectively.

Usage

```
sadf_gsadf(y, adflag, mflag, IC, parallel = FALSE)
```

Arguments

y	the time series.
adflag	the lag order for the ADF test.
mflag	1 for ADF with constant and whithout trend, 2 for ADF with constant and trend and 3 for ADF without constant and trend.
IC	1 for AIC and 2 for BIC.
parallel	If TRUE, uses parallel computing for the loop. If the data is large it could be faster, but usually it is slower for small data.

References

Phillips, P.C. & Shi, S. & Yu, J. (2015a). "Testing for Multiple Bubbles: Historical Episodes of Exuberance and Collapse in the S&P 500". *SSRN Electronic Journal*.

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sp_data *S&P 500 data.*

Description

the S&P 500 price dividend ratio from January 1871 to December 2010.

Format

A vector with the S&P 500 price dividend ratio.

References

Phillips, P.C. & Shi, S. & Yu, J. (2015a). "Testing for Multiple Bubbles: Historical Episodes of Exuberance and Collapse in the S&P 500". *SSRN Electronic Journal*.

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