Package 'DriftBurstHypothesis'

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Type Package

Title Calculates the Test-Statistic for the Drift Burst Hypothesis

Version 0.1.1

Date 2019-01-24

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Description Calculates the T-Statistic for the drift burst hypothesis from the working paper Christensen, Oomen and Reno (2018) <DOI:10.2139/ssrn.2842535>. The authors' MATLAB code is available upon request, see: <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2842535>.

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BugReports https://github.com/emilsjoerup/DriftBurstHypothesis/issues

URL https://github.com/emilsjoerup/DriftBurstHypothesis

Imports Rcpp (>= 0.12.18)

LinkingTo Rcpp, RcppArmadillo

NeedsCompilation yes

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Details

The DESCRIPTION file:

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Index of help topics:

Author(s)

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References

Christensen, Oomen and Reno (2018) <DOI:10.2139/ssrn.2842535>.

drift_bursts *Drift Bursts*

Description

Calculates the Test-Statistic for the Drift Burst Hypothesis.

Usage

```
drift_bursts(time, logprices, testtimes = seq(34200, 57600, 60),
             PreAverage = 5, AcLag = -1L, Mean_bandwidth = 300L,
             Variance_bandwidth = 900L, bParallelize = FALSE, iCores = NA)
```

Arguments

time	A numeric of timestamps for the trades. The timestamps used for testing were of the format second after midnight of the given day, but the precision was in nano-seconds.
logprices	A numeric containing the logarithm of the prices of the asset.
testtimes	A numeric containing the times at which to calculate the tests. The standard of seq(floor(min(time)), ceiling(max(time)), 60) denotes calculating the test-statistic once per minute, i.e. 391 times for a typical 6.5 hour trading day.
PreAverage	An integer denoting the period for pre-averaging estimates of the log-prices.
AcLag	An integer denoting which lag is to be used for the HAC estimator of the variance - the standard of -1 denotes using an automatic lag selection algorithm.
Mean_bandwidth	An integer denoting the bandwidth for the left-sided exponential kernel for the mean.
Variance_bandwidth	An integer denoting the bandwidth for the left-sided exponential kernel for the variance.
bParallelize	A Boolean to determine whether to parallelize the underlying C++ code. (Using OpenMP)
iCores	An integer denoting the number of cores to use for calculating the code when paralellized. If this argument is not provided, sequential evaluation will be used even though bParallelize is TRUE

Details

The DBH test statistic cannot be calculated before 1 period of testtimes has passed.

The test statistic is unstable before max(Mean_bandwidth , Variance_bandwidth) seconds has passed.

Value

A list containing the series of the drift burst hypothesis test-statistic as well as the estimated local mean and variance series.

Author(s)

Emil Sjoerup

References

Christensen, Oomen and Reno (2018) <DOI:10.2139/ssrn.2842535>.

Examples

```
#Simulate from a stochastic volatility model.
#Both a flash crash and flash rally are coded into the function.
StochasticVolatilitySim = function(iT, dSigma, dPhi, dMu){
  vSim = numeric(iT)
  vEps = rnorm(iT , sd =dSigma)
  vEpsy = rnorm(iT)
  vEps[30001:32000] = rnorm(2000 ,sd =seq(from = dSigma ,
                                          to = 2*dSigma , length.out = 2000))
  vEps[32001:34000] = rnorm(2000 ,sd =seq(from = 2*dSigma ,
                                          to = dSigma , length.out = 2000))
  vEpsy[30001:32000] = -rnorm(2000 ,mean =seq(from = 0,
                                              to = 0.3 , length.out = 2000))
  vEpsy[32001:34000] = -rnorm(2000 ,mean =seq(from = 0.3,
                                              to = 0 , length.out = 2000))


  vEps[60001:63000] = rnorm(3000,sd = seq(from = dSigma ,
                                          to = 2*dSigma , length.out = 3000))
  vEps[63001:66000] = rnorm(3000,  sd = seq(from = 2*dSigma ,
                                              to =  dSigma, length.out = 3000))

  vEpsy[60001:63000] = rnorm(3000 ,mean =seq(from = 0,
                                             to = 0.2 , length.out = 3000))
  vEpsy[63001:66000] = rnorm(3000 ,mean =seq(from = 0.2,
                                             to = 0 , length.out = 3000))
  vSim[1] = dMu + dPhi *rnorm(1 , mean = dMu , sd = dSigma /sqrt(1-dPhi^2))
  for (i in 2:iT) {
    vSim[i] = dMu + dPhi * (vSim[(i-1)] - dMu) + vEps[i]
  }
  vY = exp(vSim/2) * vEpsy
  return(vY)
}

iT = 66500; dSigma = 0.3; dPhi = 0.98; dMu = -10;

set.seed(123)
vY = 500+cumsum(StochasticVolatilitySim(iT, dSigma, dPhi, dMu))

#insert an outlier to illustrate robustness.
vY[50000] = 500

#Here, the observations are equidistant, but the code can handle unevenly spaced observations.
timestamps = seq(34200 , 57600 , length.out = iT)
```

```
testtimes = seq(34200, 57600, 60)
logprices = log(vY)

DBHtStat = drift_bursts(timestamps,  logprices,
                        testtimes, PreAverage = 5, AcLag = -1L,
                        Mean_bandwidth = 300L, Variance_bandwidth = 900L,
                        bParallelize = FALSE)

#plot series
plot(vY , x = timestamps/86400 , type = 'l')
#plot test statistic
plot(DBHtStat$DriftBursts, x = testtimes/86400, type = 'l')
```

Index