Package ‘mleur’

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mleur-package

Maximum likelihood unit root test

Description
Support for mle unit root tests

Details

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Author(s)
A. I. McLeod, Hao Yu and Ying Zhang
Maintainer: Ian McLeod <aimcleod@uwo.ca>

Examples

```r
# Example 1. Analysis of money velocity
library(lattice)
xyplot(vel, lwd=1.5, type="b", cex=0.7, pch=16, aspect=0.8,
      xlab="year", ylab="money velocity")
mleurDiag(vel)
mleur(vel)
dftest(vel)
arlest(vel)
arlest(vel, method="LSE")
```

```r
# Example 2.
# Difference in BAA and AAA corporate bonds
library(lattice)
xyplot(DiffBA, lwd=1.5, type="b", cex=0.7, pch=16, aspect=0.8,
      xlab="year", ylab="money velocity")
mleurDiag(DiffBA)
mleur(DiffBA)
dftest(DiffBA)
arlest(DiffBA)
arlest(DiffBA, method="LSE")
```
ar1est

MLE or LSE for AR(1) parameter. Sample mean correction used in MLE case. Intercept term estimated in LSE case.

Description

Fast exact computation of the MLE for AR(1) by solving the likelihood equation. The sample mean correction is used, so the method is not strictly speaking exact but the name derives from the fact that if the mean is known and was used instead of the sample mean the estimate would be an exact MLE estimate of the parameter in the AR(1) model. It has been shown that effect of estimating the sample mean is negligible.

Usage

```r
ar1est(z, method = c("MLE", "LSE"))
```

Arguments

- `z`: time series or vector
- `method`: must be "MLE" or "LSE"

Details

The exact MLE for mean-zero an AR(1) time series satisfies a cubic equation. The solution of this equation for the MLE given by Zhang (2002) is used. This approach is more reliable as well as faster than the usual approach to the exact MLE using a numerical optimization technique which can occasionally have convergence problems.

Value

MLE for the parameter

Author(s)

A.I. McLeod and Ying Zhang

References


Examples

```r
# Example 1
# compare MLE and LSE for vel series
ar1est(vel)
ar1est(vel, method = "MLE")
ar1est(vel, method = "LSE")
#```
# dfstat

**Description**

Computes the Dickey-Fuller test using the pivotal test statistic and returns critical points for tests at levels 0.1, 0.05, 0.01.

**Usage**

```r
dfstat(y)
```

**Arguments**

- `y`: time series or vector

**Details**

The function `ur.df()` in the package `ur.ca` is used.

**Value**

The output is a list with components:

- `dfStat`: value of Dickey-Fuller pivotal statistic
- `criticalValues`: critical values corresponding to 1

**Author(s)**

A.I. McLeod and Hao Yu

**See Also**

`ur.df`, `mleur`

**Examples**

```r
dfstat(vel)
mleur(vel)
```
**DiffBA**

*Bond yield differences, annual*

**Description**

The difference in Moody’s BAA and AAA corporate bond yields annually

**Usage**

```r
data(DiffBA)
```

**Format**

The format is: Time-Series [1:35] from 1976 to 2010: 1.32 0.95 0.76 1.06 1.73 ...

**Details**

The data set includes the annual Moody’s Baa and Aaa corporate bond yields from 1976 to 2010, and the difference between Baa and Aaa.

**Source**

The annual data of BAA and AAA are downloaded from the Board of Governors of the Federal Reserve System (http://www.federalreserve.gov/releases/h15/data.htm)

**Examples**

```r
mleurDiag(DiffBA)
mleur(DiffBA)
dftest(DiffBA)
```

**GetPower**

*Simulation function to compute power for AR(1) alternative*

**Description**

Compares the empirical power of unit-root tests using simulation. Various non-normal distributions may be selected.

**Usage**

```r
GetPower(phi, n, NSIM = 1000, tests = c("DF", "MLEp", "MLEn", "MCT"),
noiseDist = c("normal", "t", "stable", "GARCH11"), df = 5,
ALPHA = 1.5, BETA = 0, alpha = 0.2, beta = 0.7)
```
Arguments

phi  AR(1) parameter or phi=1 if null is true
n   length of series
NSIM Number of simulations
tests available tests include: DF for Dickey-Fuller, MLEp for exact MLE using pivotal, MLEn - exact MLEn using normalized, MCT using Monte-Carlo test
noiseDist distribution of innovations: "normal" for Gaussian; "t" for t-distribution; "stable" for stable distribution; "GARCH11" for GARCH
df   df for t-distribution
ALPHA shape parameter of stable distribution in (0,2]
BETA skewness parameter of stable in [-1,1]
alpha GARCH(1,1) first parameter
beta  GARCH(1,1) second parameter

Value

List with the following components:
power vector with estimated power for selected tests
phi   AR(1) parameter value
NSIM Number of simulations used
MOE  margin of error for level 0.95 c.i.

Author(s)

A.I. McLeod

See Also

mleur, dfertest

Examples

GetPower(phi=0.8, n=50, NSIM=100, tests=c("DF", "MLEp"))
mctest

Monte-Carlo unit root test

Description

The Monte-Carlo unit root test using the exact MLE. This provides a check for the function mleur() as well as a more robust approach using bootstrap residuals.

Usage

mctest(y, type = c("p", "n"), NumRep = 1000, bootQ = FALSE)

Arguments

- **y**: the time series to be tested
- **type**: default "p" for pivotal statistic, otherwise the normalized statistic is used
- **NumRep**: Number of iterations for Monte-Carlo
- **bootQ**: if FALSE, use NID innovations, otherwise if TRUE a bootstrap sample of the residuals

Value

p-value

Author(s)

A.I. McLeod and Hao Yu

See Also

mleur

Examples

mctest(DiffBA, NumRep=100, type="n")
**mleur**  
*Fast exact MLE unit root test*

**Description**
Implement fast unit root test using response surface

**Usage**
```r
mleur(y, type = c("p", "n"))
```

**Arguments**
- `y`  
  time series
- `type`  
  default "p" for pivotal statistic, otherwise the normalized statistic is used

**Details**
In paper.

**Value**
a vector of length 4 with named elements: c("test statistic", "1

**Author(s)**
A.I. McLeod and Hao Yu

**Examples**
```r
mleur(vel)
```

---

**mleurDiag**  
*Diagnostic checks for mleur test*

**Description**
Test for autocorrelation for mleur test

**Usage**
```r
mleurDiag(y, lag.max = "default")
```

**Arguments**
- `y`  
  time series
- `lag.max`  
  maximum lag for test. Default setting is "default".
Details

Box-and-Whisker plot of residuals from fitted AR(1) plotted along with the p-value for the Wilk-Shapiro test. The test in the package fBasics is used. The p-values of the Box-Ljung portmanteau test are plotted as well as the residual autocorrelations.

Value

The residuals are returned invisibly.

Author(s)

A. I. McLeod

See Also

mleur

Examples

z <- rnorm(100)
mleurDiag(z)

```
simar1
  Simulate AR(1)
```

Description

Exact simulation for AR(1) with normal and non-normal innovations

Usage

```r
simar1(phi = 0.5, n = 100, InnovationVariance = 1, noiseDist = c("normal", "t", "stable", "GARCH11"), df = 5, ALPHA = 1.5, BETA = 0, GAMMA = 1, DELTA = 0, alpha = 0.2, beta = 0.7)
```

Arguments

- `phi`: AR(1) parameter
- `n`: length of series
- `InnovationVariance`: innovation variance, if applicable
- `noiseDist`: distribution of innovations: "normal" for Gaussian; "t" for t-distribution; "stable" for stable distribution; "GARCH11" for GARCH
- `df`: df for t-distribution
- `ALPHA`: shape parameter of stable distribution in (0,2]
- `BETA`: skewness parameter of stable in [-1,1]
testStatUM

  GAMMA      scale parameter of stable
  DELTA      shift parameter of stable
  alpha      GARCH(1,1) first parameter
  beta       GARCH(1,1) second parameter

Details

  More details later.

Value

  a vector of length n containing the simulated series

Author(s)

  A.I. McLeod

Examples

  simar1()

---

testStatUM    unit root MLE test statistic

Description

  Computes the MLE unit root test statistic.

Usage

  testStatUM(y, type = c("p", "n"))

Arguments

  y        time series
  type     default "p" for pivotal statistic, otherwise the normalized statistic is used

Details

  See paper.

Value

  the test statistic

Author(s)

  A.I. McLeod
vel

See Also

mleur

Examples

testStatUM(vel)

vel  Velocity of money, 1869-1970, Nelson

Description


Usage

data(vel)

Format

The format is: Time-Series [1:102] from 1869 to 1970: 5.61 5.16 4.63 5.05 4.95 4.71 4.46 4.65 ...

Source

See example 1 below.

Examples

#Example 1: Data source:
data(nporg, package="urca")
testdata <- na.omit(nporg[, c("year", "vel")])
vel <- ts(testdata[, "vel"], start=testdata[1,1], freq=1)
#
mleurDiag(vel)
dftest(vel)
mleur(vel)
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