Package 'ORDER2PARENT'

February 19, 2015

Type Package

Title Estimate parent distributions with data of several order
statistics

Version 1.0

Date 2010-09-15

Author Cheng Chou

Maintainer Cheng Chou <chengzho@usc.edu>

Depends splines, Matrix

Description This package uses B-spline based nonparametric smooth
estimators to estimate parent distributions given observations
on multiple order statistics.

License GPL-2

Repository CRAN

Date/Publication 2012-10-29 08:57:22

NeedsCompilation no

R topics documented:

1

ORDER2PARENT-package   *Parent Distribution Estimation with Multiple Order Statistics*

Description

This package can estimate parent distribution nonparametrically when there are observations about multiple order statistics available. The estimator is based on B-spline.

Details

Package:	ORDER2PARENT
Type:	Package
Version:	1.0
Date:	2010-09-15
License:	GPL-2
LazyLoad:	yes

bgmm, blr, parentest

Author(s)

Cheng Chou

Maintainer: Cheng Chou <chengzho@usc.edu>

---

bgmm   *Parent Distribution Estimation with B-Spline GMM Estimator*

Description

Given observations on several order statistics, this function use the B-Spline GMM Estimator (Chou and Tao, 2010) to estimate the corresponding parent distribution of these order statistics nonparametrically.

Usage

```
bgmm(dat, orderinfo, degree = 3, support = NULL, weight.type = 1)
```

Arguments

dat	a list consisting of the vectors of observations on various order statistics.
orderinfo	a matrix about the ranks and the sizes of various order statistics.
degree	the degree of B-spline used for estimation. The default is 3, i.e. cubic B-spline.

support	a vector specifying the support of the parent distribution. If unknown, it can be omitted, and the interval of data will be used as the support.
weight.type	the type of weight matrix used in implementing the GMM estimator. The default is 1, i.e. the weight matrix based on sample size.

Details

The dat must be a list consisting of vectors of observations on order statistics. For example, there are three order statistics, and the observations on them are contained in three vectors, dat.order1, dat.order2, and date.order3. Then a typical dat is list(dat.order1, dat.order2, dat.order 3). \orderinfo must be a matrix with two columns and J rows where J is the number of observed order statistics. For j-th row of orderinfo, the first column is the rank, and the second column is the size of the j-th order statistic. \support is vector whose first element is the lower bound of the support, and the second element is the upper bound. If you want to use the second type of weight matrix, which is based on mean square error of the first stage estimates, set weight.type=2.

Value

bgmm gives a list consisting of two element: betahat and n.knots. These two elements will be used in parentest for estimation of parent cdf.

See Also

[blr](blr), parentest

Examples

```
n.order<-c(20, 20, 60) # number of observations for each order statistic below.
m<-5 # the size of random samples is 5.
# The three order statistics are 1:5 (the minimum), 3:5 (the sample median),
# and 5:5 (the maximum)
rank.x<-c(1, 3, 5)
data.example<-list()
for(i in 1:3){
sorted.sample<-t(apply(matrix(rnorm(m*n.order[i]),nr=n.order[i],nc=m), 1, sort))
data.example[[i]]<-sorted.sample[,rank.x[i]]
}
order.example<-rbind(c(1, 5), c(3, 5), c(5, 5), deparse.level=0)
gmm.example<-bgmm(data.example, order.example)
```

---

blr	*Parent Distribution Estimation with B-Spline Linear Regression Estimator*

Description

Given observations on several order statistics, this function use the B-Spline linear regression estimator (Chou and Tao, 2010) to estimate the corresponding parent distribution of these order statistics nonparametrically.

Usage

```
blr(dat, orderinfo, degree = 3, support = NULL, constraint = FALSE)
```

Arguments

dat	a list consisting of the vectors of observations on various order statistics.
orderinfo	a matrix about the ranks and the sizes of various order statistics.
degree	the degree of B-spline used for estimation. The default is 3, i.e. cubic B-spline.
support	a vector specifying the support of the parent distribution. If unknown, it can be omitted, and the interval of data will be used as the support.
constraint	whether add monotone constraints in estimation. The default is no (FALSE).

Details

The details about specifying the above arguments can be found in bgmm.

Value

blr gives a list consisting of two element: betahat and n.knots. These two elements will be used in parentest for estimation of parent cdf.

See Also

bgmm, parentest

Examples

```
n.order<-c(20, 20, 60) # number of observations for each order statistic below.
m<-5 # the size of random samples is 5.
# The three order statistics are 1:5 (the minimum), 3:5 (the sample median),
# and 5:5 (the maximum)
rank.x<-c(1, 3, 5)
data.example<-list()
for(i in 1:3){
sorted.sample<-t(apply(matrix(rnorm(m*n.order[i]),nr=n.order[i],nc=m), 1, sort))
data.example[[i]]<-sorted.sample[,rank.x[i]]
}
order.example<-rbind(c(1, 5), c(3, 5), c(5, 5), deparse.level=0)
blr.example<-blr(data.example, order.example)
```

---

parentcdf   *Transform CDF of Order Statistics to Its Parent CDF*

Description

Using the well relationship between the cdf of order statistic and the cdf of parent distribution, this function can transform the the cdf of order statistic to the corresponding parent cdf.

Usage

```
parentcdf(F.order, k, m)
```

Arguments

F.order   CDF of order statistic, either a scalar or a vector.

k   the rank of the order statistic

m   the size of the order statistic

Details

Use the well known relationship (David and Nagaraja, 2003) between the cdf of order statistic and the parent distribution, `parentcdf` will return the corresponding parent distribution.

Value

The corresponding parent distribution.

References

David, H.A., and Nagaraja, H.N. (2003): Order Statistics, Third Edition. New York: Wiley.

---

parentest   *Generate Smooth Estimator of Parent Distribution*

Description

Using the output from `blr` or `bgmm`, this function gives rise to estimates of parent cdf for any given value.

Usage

```
parentest(x0, beta.hat, n.knots, degree = 3, support = NULL)
```

Arguments

x0	the value whose parent cdf's are wanted. It can either be a scalar or a vector.
beta.hat	the estimate of control variables.
n.knots	the number of inner knots.
degree	the degree of B-spline. The default is 3, i.e. a cubic B-spline.
support	a vector specifying the support of the parent distribution. If unknown, it can be omitted, and the interval of data will be used as the support.

Details

Together with blr and/or bgmm, this function can be estimate the parent cdf of any given value.

Value

The estimates of parent cdf's of x0. NOTE that the degree used in parentest should be consistent with the degree used in estimation of control variables.

See Also

blr, bgmm

Examples

```
n.order<-c(20, 20, 60) # number of observations for each order statistic below.
m<-5 # the size of random samples is 5.
# The three order statistics are 1:5 (the minimum), 3:5 (the sample median),
# and 5:5 (the maximum)
rank.x<-c(1, 3, 5)
data.example<-list()
for(i in 1:3){
sorted.sample<-t(apply(matrix(rnorm(m*n.order[i]),nr=n.order[i],nc=m), 1, sort))
data.example[[i]]<-sorted.sample[,rank.x[i]]
}
order.example<-rbind(c(1, 5), c(3, 5), c(5, 5), deparse.level=0)
blr.example<-blr(data.example, order.example)
# Based on 'blr.example', we can estimate the parent cdf of given values, like data.example[[3]]
parenthat<-parentest(data.example[[3]], blr.example$betahat, blr.example$n.knots)
```

Index