

Package ‘dynia’

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Type Package

Title Fit Dynamic Intervention Model

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Description Fit dynamic intervention model using the arima() function.

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LazyData yes

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R topics documented:

casualties	2
fitdi	2
GetIntMod	3
GetLikeDI	4
GetPV	5
Nile	6
print.dynia	7
Index	8

casualties

*Casualties time series with covariate***Description**

Monthly casualties, January 2007 to December 2010, with covariate time series.

Usage

```
data(casualties)
```

Format

The format is: mts [1:108, 1:2] 159 143 150 159 130 150 211 155 175 151 ... - attr(*, "dim-names")=List of 2 ..\$: NULL ..\$: chr [1:2] "num" "covariate" - attr(*, "tsp")= num [1:3] 2002 2011 12 - attr(*, "class")= chr [1:3] "mts" "ts" "matrix"

Examples

```
data(casualties)
plot(casualties)
abline(v=c(2007,10), col="red")

###Intervention based on Casualties Data###
fitdi(z=casualties[,1],T=70,xint=scale(casualties[,2]),order=c(1,0,0),
      seasonal=list(order=c(0,0,1),period=12))
```

fitdi

*Fit Dynamic Intervention Model***Description**

The function FitDI will fit the dynamic Intervention Model based on the optimized likelihood value and corresponding delta in the function.

Usage

```
fitdi(z, T, xint, itype = c("step", "pulse"), delta = NA, delta0=NA,...)
```

Arguments

z	The series which we intend to fit the intervention model.
T	T denotes the start of the intervention in the model.
xint	xint denotes for the possible covariates included in the model.By default,xint=NA
itype	itype includes the type of the intervention:"step" and "pulse" intervention

delta	The optimization process will be incorporated if the specific delta is not provided.
delta0	Optional with default=NA.P-value for null hypothesis:delta=delta0 will be provided when delta0 get value.
...	the supported arguments for arima function could be put here

Value

Fixed delta or specific delta provided. Intervention output for the model

Author(s)

Jinkun Xiao and A. I. McLeod

Examples

```
####Casualties Intervention####
fitdi(z=casualties[,1],T=70,xint=scale(casualties[,2]),itype="s",order=c(1,0,0),
      seasonal=list(order=c(0,0,1),period=12),delta0=0)

####Nile River Intervention####
fitdi(z=Nile,T=34,itype="p",order=c(0,0,1),delta=1)
```

GetIntMod

Find the intervention model with necessary covariates

Description

Fit the intervention model with some covariates

Usage

```
GetIntMod(delta, z, T, xint = NA, itype = c("step", "pulse"), ...)
```

Arguments

delta	The optimization process will be incorporated if the specific delta is not provided.
z	The series which we intend to fit the intervention model
T	T denotes the start of the intervention in the model
xint	xint denotes for the possible covariates included in the model
itype	itype includes the type of the intervention:"step" and "pulse" intervention
...	Any supported arguments for arima function could be put here.

Value

Intervention Model is provided

Author(s)

Jinkun Xiao and A. I. McLeod

Examples

```
GetIntMod(delta=1.033,z=casualties[,1],T=70,xint=scale(casualties[,2]),itype="s",
order=c(1,0,0),seasonal=list(order=c(0,0,1),period=12))
```

GetLikeDI

Calculate the Likelihood function value provide a certain intervention model

Description

Likelihood function value is calculated for the intervention

Usage

```
GetLikeDI(delta, z, T, xint = NA, itype = c("step", "pulse"), ...)
```

Arguments

delta	The specific number for Intervention Level estimated
z	The time series we fit into the model
T	The start of the Intervention in the series
xint	The covariate considered in the model
itype	The type of intervention fitting in the model:"Step"(Default),"Step"
...	Supported argument for arima function

Value

Likelihood value is provided

Author(s)

Jinkun Xiao and A. I. McLeod

Examples

```
###Likelihood Test for Casualties with null:delta=1###
###Constrained Model Likelihood####
(LLRestricted<-GetLikeDI(delta=0,z=casualties[,1],T=70,xint=scale(casualties[,2]),
  itype="s",order=c(1,0,0),seasonal=list(order=c(0,0,1),period=12)))
###Full Model Likelihood###
(LLFull <- optimize(f = GetLikeDI, interval = c(0.1, 2), maximum = TRUE,
  z = casualties[,1], T = 70, xint = scale(casualties[,2]), itype = "s",
  order=c(1,0,0),seasonal=list(order=c(0,0,1),period=12)))
X <- 2 * (LLFull$objective - LLRestricted)
###P-VLUE For Likelihood Test###
(pval <- 1 - pchisq(X, 1))
GetPV(delta=1,z=casualties[,1],T=70,xint=scale(casualties[,2]),itype="s",order=c(1,0,0),
  seasonal=list(order=c(0,0,1),period=12))

#####
###Likelihood Test for Nile Flow with null:delta=1###
LLRestricted <- GetLikeDI(delta=1,z=Nile,T=34,itype="p",order=c(1,0,0))
ans <- optimize(f = GetLikeDI, interval = c(0.1, 2), maximum = TRUE,z=Nile,T=33
  ,itype="p",order=c(1,0,0))
LLFull <- ans$objective
X <- 2 * (LLFull - LLRestricted)
(pval <- 1 - pchisq(X, 1))
GetPV(delta=0,z=Nile,T=34,itype="p",order=c(1,0,0))
```

GetPV

P-Value for a certain hypothesis for delta

Description

The chi-square test p-value is provided for the null hypothesis:delta=delta0.Delta

Usage

```
GetPV(delta0, z, T, xint, itype = c("step", "pulse"), ...)
```

Arguments

delta0	Tested value for the delta
z	The time series we fit into the model
T	The start of Intervention Time in the series
xint	The covariate considered in the model
itype	Type of intervention fitting in the model:"Step"(Default),"Step"
...	Supported argument for arima function

Value

p-value for the test is provided

Author(s)

Jinkun Xiao and A. I. McLeod

Examples

```
GetPV(delta0=1,z=Nile,T=69,itype="s",order=c(1,0,0),seasonal=list(order=c(0,0,1),period=12))
```

Nile

Annual FLOW of Nile River at Aswan, 1871-1945

Description

This is average annual flow of the Nile River below the Aswan Dam. The units are CMS (cubicmeters per second).

Usage

```
data(Nile)
```

Format

The format is: Time-Series [1:75] from 1870 to 1944: 3958 3370 3485 3438 3702 ...

References

Keith W. Hipel and A. Ian McLeod(2005) Time Series Modelling of Water Resources and Environmental Systems. <http://www.stats.uwo.ca/faculty/aim/1994Book/default.htm>

Examples

```
data(Nile)
plot(Nile, type="b",xlab="year", ylab="Nile Flow River")
lines(window(Nile,start=c(1870),end=c(1902)), lwd=2, col="black")
segments(1903,0,1902,5000,col="red",lty=1, lwd=3)
```

print.dynia	<i>Print the class of dynia</i>
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Description

Print the output with class of dynia

Usage

```
## S3 method for class 'dynia'  
print(x, ...)
```

Arguments

x	x is the value with class of dynia
...	Optional Argument

Value

A output includes optimal delta,intervention model and p-value for the null hypothesis:delta=delta0

Author(s)

Ken Jinkun Xiao and A.Ian McLeod

Examples

```
data(casualties)  
fitdi(z=casualties[,1],T=70,xint=casualties[,2],itype="s",delta0=1,  
order=c(1,0,0),seasonal=list(order=c(0,0,1),period=12))
```

Index

*Topic **datasets**

casualties, [2](#)

Nile, [6](#)

*Topic **ts**

fitdi, [2](#)

GetIntMod, [3](#)

GetLikeDI, [4](#)

GetPV, [5](#)

print.dynia, [7](#)

casualties, [2](#)

fitdi, [2](#)

GetIntMod, [3](#)

GetLikeDI, [4](#)

GetPV, [5](#)

Nile, [6](#)

print.dynia, [7](#)