

# Package ‘jcp’

November 6, 2021

**Type** Package

**Title** Joint Change Point Detection

**Version** 1.2

**Date** 2021-11-06

**Maintainer** Michael Messer <michael.messer@tuwien.ac.at>

**Description** Procedures for joint detection of changes in both expectation and variance in univariate sequences. Performs a statistical test of the null hypothesis of the absence of change points. In case of rejection performs an algorithm for change point detection. Reference - Bivariate change point detection - joint detection of changes in expectation and variance, Scandinavian Journal of Statistics, DOI 10.1111/sjos.12547.

**License** GPL-3

**RoxygenNote** 7.1.2

**NeedsCompilation** no

**Author** Michael Messer [aut, cre]

**Repository** CRAN

**Date/Publication** 2021-11-06 15:00:10 UTC

## R topics documented:

jcp . . . . .	2
plot.jcp . . . . .	3
summary.jcp . . . . .	5

<b>Index</b>	<b>7</b>
--------------	----------

jcp

*jcp***Description**

Joint change point detection - expectation and variance - via bivariate moving sum statistics

**Usage**

```
jcp(x, H = NA, q = NA, alpha = 0.05, sim = 1000, region = "square")
```

**Arguments**

x	numeric vector. Input sequence of random variables.
H	NA or numeric vector. Window set. If NA (default), then H is automatically set. If not NA, then H must an increasing vector of positive integers with maximum $\leq \text{length}(x)/2$ .
q	NA or numeric value. Rejection threshold. If NA (default), then the rejection boundary is derived in simulations (from Gaussian process limit) according to sim and alpha. If not NA, then q is considered predefined and must be set a positive real number.
alpha	numeric value. Significance level. Must be in (0,1), default = 0.05. In case of predefined q, alpha is set to NA.
sim	numeric value. Number of simulations of limit process for approximation of q. Must be positive integer, default = 1000. In case of predefined q, sim is set to NA.
region	character string. Defines rejection region, default = "square". Must be chosen either "square", "circle" or "ellipse".

**Value**

invisible list	
changepoints	detected change points (increasingly ordered)
mean_sd	matrix of estimated means and standard deviations
M	test statistic
q	rejection threshold
H	window set
sim	number of simulations of the limit process (approximation of q)
alpha	significance level
region	rejection region
method	derivation of threshold q, either asymptotic or predefined
x	input sequence

EVrho	list containing the auxiliary processes E, V and correlation rho, for each element of H one list entry
CP_meta	matrix containing meta information of estimation. Estimated change points (increasingly ordered), responsible window h, components E, V and rho of joint statistic at estimated change points (regarding responsible window)
SFA	detected change points of single filter algorithms

**Author(s)**

Michael Messer

**References**

Michael Messer (2021) Bivariate change point detection - joint detection of changes in expectation and variance, Scandinavian Journal of Statistics, DOI 10.1111/sjos.12547.

**See Also**

[plot.jcp](#), [summary.jcp](#)

**Examples**

```
# Normal distributed sequence with 3 change points at
# c1=250 (change in expectation),
# c2=500 (change in variance) and
# c3=750 (change in expectation and variance)
set.seed(0)
m <- c(8,10,10,3); s <- c(4,4,10,5)
x <- rnorm(1000, mean=rep(m,each=250), sd=rep(s,each=250))
result <- jcp(x)
summary(result)
plot(result)

# Set additional parameters (window set)
result2 <- jcp(x,H=c(80,160,240))
summary(result2)
plot(result2)
```

---

plot.jcp

*plot.jcp*

---

**Description**

Plot method for class 'jcp'

**Usage**

```
## S3 method for class 'jcp'  
plot(x, cex = 1, cex.main = 1, ...)
```

**Arguments**

x	object of class jcp
cex	numeric, global sizes in plot
cex.main	numeric, size of titles
...	additional arguments

**Value**

No return value, called for side effects

**Author(s)**

Michael Messer

**References**

Michael Messer (2021) Bivariate change point detection - joint detection of changes in expectation and variance, *Scandinavian Journal of Statistics*, DOI 10.1111/sjos.12547.

**See Also**

[jcp](#), [summary.jcp](#)

**Examples**

```
# Normal distributed sequence with 3 change points at  
# c1=250 (change in expectation),  
# c2=500 (change in variance) and  
# c3=750 (change in expectation and variance)  
set.seed(0)  
m <- c(8,10,10,3); s <- c(4,4,10,5)  
x <- rnorm(1000, mean=rep(m,each=250), sd=rep(s,each=250))  
result <- jcp(x)  
summary(result)  
plot(result)  
  
# Set additional parameters (window set)  
result2 <- jcp(x,H=c(80,160,240))  
summary(result2)  
plot(result2)
```

---

`summary.jcp``summary.jcp`

---

**Description**

Summary method for class 'jcp'

**Usage**

```
## S3 method for class 'jcp'  
summary(object, ...)
```

**Arguments**

<code>object</code>	object of class jcp
<code>...</code>	additional arguments

**Value**

No return value, called for side effects

**Author(s)**

Michael Messer

**References**

Michael Messer (2021) Bivariate change point detection - joint detection of changes in expectation and variance, Scandinavian Journal of Statistics, DOI 10.1111/sjos.12547.

**See Also**

[jcp](#), [plot.jcp](#)

**Examples**

```
## Normal distributed sequence with 3 change points at  
## c1=250 (change in expectation),  
## c2=500 (change in variance) and  
## c3=750 (change in expectation and variance)  
set.seed(0)  
m <- c(8,10,10,3); s <- c(4,4,10,5)  
x <- rnorm(1000, mean=rep(m,each=250), sd=rep(s,each=250))  
result <- jcp(x)  
plot(result)  
summary(result)  
  
# Set additional parameters (window set)  
result2 <- jcp(x,H=c(80,160,240))
```

```
plot(result2)  
summary(result2)
```

# Index

jcp, [2](#), [4](#), [5](#)

plot.jcp, [3](#), [3](#), [5](#)

summary.jcp, [3](#), [4](#), [5](#)