Package 'IMW'

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Type Package

Title Incremental Moment Windows

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Description

Computes rolling statistics, including the mean, variance, skewness, and kurtosis, over moving windows. The package uses incremental algorithms to efficiently update statistics as new observations arrive, supporting both online computation and batch processing for time-series analysis and streaming data applications. Implemented in C++, the package provides a high-performance, header-only implementation that facilitates direct integration into other packages.

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Encoding UTF-8

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`as.matrix.imw` *Matrix Conversion*

Description

Converts an object of imw-object to a matrix.

Usage

```
## S3 method for class 'imw'
as.matrix(x, ...)
```

Arguments

`x`	An imw-object.
`...`	Additional arguments; not used in this instance.

Value

A numeric matrix of rolling statistics.

Examples

```
N <- 100
x <- cumsum(rnorm(N))

k <- 10
mw <- imw(x, k)

as.matrix(mw)
```

imw *Incremental Moment Windows*

Description

Rolling estimates of moments given a fixed window size.

Usage

```
imw(x, k)
```

Arguments

x	Vector, or column matrix: The data used to estimate the moments.
k	Numeric: The window size.

Value

An imw-object.

Examples

```
N <- 100
x <- cumsum(rnorm(N))

k <- 10
imw(x, k)
```

imw-object *An imw-object*

Description

An imw-object is a list of class `imw` containing the following:

`stats` Matrix: The rolling mean, variance, skewness, and kurtosis of data.

`lagged` Vector: A vector of the incremental moments, as well as the number of observations used to calculate these moments, at the beginning of the last window.

`total` Vector: A vector of the incremental moments, as well as the number of observations used to calculate these moments, at the end of the last window.

`x` Matrix: The data used to estimate the moments.

`k` Numeric: The size of the window used to calculate the four moments.

`kurtosis` *Rolling Kurtosis*

Description

Returns the rolling kurtosis of an imw-object.

Usage

```
kurtosis(x, ...)
```

Arguments

`x`	An imw-object.
`...`	Additional arguments, see details.

Details

The only additional argument is `type` which takes the values `1, 2, 3`, corresponding to the three methods discussed by Joanes and Gill (1998).

Value

The estimated rolling kurtosis.

References

D. N. Joanes and C. A. Gill (1998), Comparing measures of sample skewness and kurtosis. The Statistician, 47, 183–189.

Examples

```
N <- 100
x <- cumsum(rnorm(N))

k <- 10
mw <- imw(x, k)

kurtosis(mw)
```

`kurtosis.imw` *Rolling Kurtosis*

Description

Returns the rolling kurtosis of an imw-object.

Usage

```
## S3 method for class 'imw'
kurtosis(x, ...)
```

Arguments

`x`	An imw-object.
`...`	Additional arguments, see details.

Details

The only additional argument is `type` which takes the values `1, 2, 3`, corresponding to the three methods discussed by Joanes and Gill (1998).

Value

The estimated rolling kurtosis.

References

D. N. Joanes and C. A. Gill (1998), Comparing measures of sample skewness and kurtosis. The Statistician, 47, 183–189.

Examples

```
N <- 100
x <- cumsum(rnorm(N))

k <- 10
mw <- imw(x, k)

kurtosis(mw)
```

mean.imw *Rolling Mean*

Description

Returns the rolling mean of an imw-object.

Usage

```
## S3 method for class 'imw'
mean(x, ...)
```

Arguments

x	An imw-object.
...	Additional arguments; not used in this instance.

Value

The estimated rolling mean.

Examples

```
N <- 100
x <- cumsum(rnorm(N))

k <- 10
mw <- imw(x, k)

mean(mw)
```

plot.imw *Plot of rolling statistics*

Description

Shows the four rolling statistics of an imw-object.

Usage

```
## S3 method for class 'imw'
plot(x, ...)
```

Arguments

x	An imw-object.
...	Additional arguments passed to the internal plot functions.

Value

An invisible NULL.

Examples

```
N <- 100
x <- cumsum(rnorm(N))

k <- 10
mw <- imw(x, k)

plot(mw)
```

---

skewness *Rolling Skewness*

Description

Returns the rolling skewness of an imw-object.

Usage

```
skewness(x, ...)
```

Arguments

x	An imw-object.
...	Additional arguments, see details.

Details

The only additional argument is type which takes the values 1, 2, 3, corresponding to the three methods discussed by Joanes and Gill (1998).

Value

The estimated rolling skewness.

References

D. N. Joanes and C. A. Gill (1998), Comparing measures of sample skewness and kurtosis. The Statistician, 47, 183–189.

Examples

```
N <- 100
x <- cumsum(rnorm(N))

k <- 10
mw <- imw(x, k)

skewness(mw)
```

`skewness.imw` *Rolling Skewness*

Description

Returns the rolling skewness of an imw-object.

Usage

```
## S3 method for class 'imw'
skewness(x, ...)
```

Arguments

`x`	An imw-object.
`...`	Additional arguments, see details.

Details

The only additional argument is `type` which takes the values `1`, `2`, `3`, corresponding to the three methods discussed by Joanes and Gill (1998).

Value

The estimated rolling skewness.

References

D. N. Joanes and C. A. Gill (1998), Comparing measures of sample skewness and kurtosis. The Statistician, 47, 183–189.

Examples

```
N <- 100
x <- cumsum(rnorm(N))

k <- 10
mw <- imw(x, k)

skewness(mw)
```

---

uimw *Update Incremental Moment Windows*

Description

Update an imw-object with new data.

Usage

```
uimw(object, xnew)
```

Arguments

object	An imw-object.
xnew	Vector, or column matrix: The new data used to update the estimated moments.

Value

An imw-object.

Examples

```
# Initial data
N <- 100
x <- cumsum(rnorm(N))

k <- 10
mw <- imw(x, k)

# Additional data
M <- 20
y <- cumsum(c(tail(x, 1), rnorm(M)))[-1]

uimw(mw, y)
```

variance *Rolling Variance*

Description

Returns the rolling variance of an imw-object.

Usage

```
variance(x, ...)
```

Arguments

x	An imw-object.
...	Additional arguments, see details.

Details

The only additional argument is type which takes the values 1 and 2 corresponding to the population and sample variance, respectively.

Value

The estimated rolling variance.

Examples

```
N <- 100
x <- cumsum(rnorm(N))

k <- 10
mw <- imw(x, k)

variance(mw)
```

variance.imw *Rolling Variance*

Description

Returns the rolling variance of an imw-object.

Usage

```
## S3 method for class 'imw'
variance(x, ...)
```

Arguments

x	An imw-object.
...	Additional arguments, see details.

Details

The only additional argument is type which takes the values 1 and 2 corresponding to the population and sample variance, respectively.

Value

The estimated rolling variance.

Examples

```
N <- 100
x <- cumsum(rnorm(N))

k <- 10
mw <- imw(x, k)

variance(mw)
```

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