

# Package ‘bidask’

December 17, 2023

**Type** Package

**Title** Efficient Estimation of Bid-Ask Spreads from Open, High, Low, and Close Prices

**Version** 2.0.2

## Description

Implements an efficient estimator of bid-ask spreads from open, high, low, and close prices as described in Ardia, Guidotti, & Kroencke (2021) <<https://www.ssrn.com/abstract=3892335>>.

It also provides an implementation of the estimators described in Roll (1984) <[doi:10.1111/j.1540-6261.1984.tb03897.x](https://doi.org/10.1111/j.1540-6261.1984.tb03897.x)>, Corwin & Schultz (2012) <[doi:10.1111/j.1540-6261.2012.01729.x](https://doi.org/10.1111/j.1540-6261.2012.01729.x)>, and Abdi & Rinaldo (2017) <[doi:10.1093/rfs/hhx084](https://doi.org/10.1093/rfs/hhx084)>.

**License** GPL-3

**URL** <https://github.com/eguidotti/bidask>

**BugReports** <https://github.com/eguidotti/bidask/issues>

**Encoding** UTF-8

**Imports** xts, zoo

**RoxygenNote** 7.2.3

**Suggests** dplyr, crypto2, quantmod, knitr, rmarkdown, testthat (>= 3.0.0)

**Config/testthat/edition** 3

**VignetteBuilder** knitr

**NeedsCompilation** no

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edge	<i>Efficient Estimation of Bid-Ask Spreads from Open, High, Low, and Close Prices</i>
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### Description

Implements an efficient estimator of bid-ask spreads from open, high, low, and close prices as described in [Ardia, Guidotti, & Kroencke \(2021\)](#).

### Usage

```
edge(open, high, low, close, sign = FALSE)
```

### Arguments

open	numeric vector of open prices.
high	numeric vector of high prices.
low	numeric vector of low prices.
close	numeric vector of close prices.
sign	whether signed estimates should be returned.

### Details

Prices must be sorted in ascending order of the timestamp.

### Value

The spread estimate. A value of 0.01 corresponds to a spread of 1%.

### Note

Please cite [Ardia, Guidotti, & Kroencke \(2021\)](#) when using this package in publication.

### References

Ardia, D., Guidotti E., & Kroencke T. A. (2021). Efficient Estimation of Bid-Ask Spreads from Open, High, Low, and Close Prices. Available at SSRN: <https://www.ssrn.com/abstract=3892335>

**Examples**

```
# simulate open, high, low, and close prices with spread 1%
x <- sim(spread = 0.01)

# estimate the spread
edge(x$Open, x$High, x$Low, x$Close)
```

sim

*Simulation of Open, High, Low, and Close Prices***Description**

This function performs simulations consisting of  $n$  periods (e.g., days) and where each period consists of a given number of trades. For each trade, the actual price  $P_t$  is simulated as  $P_t = P_{t-1}e^{\sigma x}$ , where  $\sigma$  is the standard deviation per trade and  $x$  is a random draw from a unit normal distribution. The standard deviation per trade equals the volatility divided by the square root of the number of trades. Trades are assumed to be observed with a given probability. The bid (ask) for each trade is defined as  $P_t$  multiplied by one minus (plus) half the spread and we assume a 50% chance that a bid (ask) is observed. High and low prices equal the highest and lowest prices observed during the period. Open and Close prices equal the first and the last price observed in the period. If no trade is observed for a period, then the previous Close is used as the Open, High, Low, and Close prices for that period.

**Usage**

```
sim(
  n = 10000,
  trades = 390,
  prob = 1,
  spread = 0.01,
  volatility = 0.03,
  overnight = 0,
  drift = 0,
  units = "day",
  sign = FALSE
)
```

**Arguments**

n	the number of periods to simulate.
trades	the number of trades per period.
prob	the probability to observe a trade.
spread	the bid-ask spread.
volatility	the open-to-close volatility.
overnight	the close-to-open volatility.

drift	the expected return per period.
units	the units of the time period. One of: sec, min, hour, day, week, month, year.
sign	whether to return positive prices for buys and negative prices for sells.

**Value**

Simulated open, high, low, and close prices.

**Note**

Please cite [Ardia, Guidotti, & Kroencke \(2021\)](#) when using this package in publication.

**References**

Ardia, D., Guidotti E., & Kroencke T. A. (2021). Efficient Estimation of Bid-Ask Spreads from Open, High, Low, and Close Prices. Available at SSRN: <https://www.ssrn.com/abstract=3892335>

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spread	<i>Estimation of Bid-Ask Spreads from Open, High, Low, and Close Prices</i>
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**Description**

This function implements several methods to estimate bid-ask spreads from open, high, low, and close prices.

**Usage**

```
spread(x, width = nrow(x), method = "EDGE", sign = FALSE, na.rm = FALSE)
```

**Arguments**

x	<a href="#">xts</a> object with columns named Open, High, Low, Close.
width	integer width of the rolling window to use, or vector of endpoints defining the intervals to use. By default, the whole time series is used to compute a single spread estimate.
method	the estimator(s) to use. See details.
sign	whether signed estimates should be returned.
na.rm	whether missing values should be ignored.

## Details

The method EDGE implements the Efficient Discrete Generalized Estimator described in Ardia, Guidotti, & Kroencke (2021).

The methods OHL, OHLC, CHL, CHLO implement the generalized estimators described in Ardia, Guidotti, & Kroencke (2021). They can be combined by concatenating their identifiers, e.g., OHLC.CHLO uses an average of the OHLC and CHLO estimators.

The method AR implements the estimator described in Abdi & Rinaldo (2017). AR2 implements their 2-period version.

The method CS implements the estimator described in Corwin & Schultz (2012). CS2 implements their 2-period version. Both versions are adjusted for overnight (close-to-open) returns as described in the paper.

The method ROLL implements the estimator described in Roll (1984).

## Value

Time series of spread estimates. A value of 0.01 corresponds to a spread of 1%.

## Note

Please cite [Ardia, Guidotti, & Kroencke \(2021\)](#) when using this package in publication.

## References

Ardia, D., Guidotti E., & Kroencke T. A. (2021). Efficient Estimation of Bid-Ask Spreads from Open, High, Low, and Close Prices. Available at SSRN: <https://www.ssrn.com/abstract=3892335>

Abdi, F., & Rinaldo, A. (2017). A simple estimation of bid-ask spreads from daily close, high, and low prices. *Review of Financial Studies*, 30 (12), 4437-4480. doi:10.1093/rfs/hhx084

Corwin, S. A., & Schultz, P. (2012). A simple way to estimate bid-ask spreads from daily high and low prices. *Journal of Finance*, 67 (2), 719-760. doi:10.1111/j.15406261.2012.01729.x

Roll, R. (1984). A simple implicit measure of the effective bid-ask spread in an efficient market. *Journal of Finance*, 39 (4), 1127-1139. doi:10.1111/j.15406261.1984.tb03897.x

## Examples

```
# simulate open, high, low, and close prices with spread 1%
x <- sim(spread = 0.01)

# estimate the spread
spread(x)

# by default this is equivalent to
edge(x$Open, x$High, x$Low, x$Close)

# estimate the spread using a rolling window of 21 periods
spread(x, width = 21)

# estimate the spread for each month
```

```
ep <- xts::endpoints(x, on = "months")
spread(x, width = ep)

# use multiple estimators
spread(x, method = c("EDGE", "AR", "CS", "ROLL", "OHLC", "OHL.CHL"))
```

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