Package ‘bidask’

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Type Package

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

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Depends xts

Imports zoo

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NeedsCompilation no

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Simulate a OHLC Price Process

Description

This function performs simulations consisting of \( n \) periods (e.g., days) and where each period consists of a given number of trades (e.g., each minute). For each trade, the true value of the stock price, \( P_m \), is simulated as \( P_m = P_{m-1} e^{\sigma x} \), where \( \sigma \) is the standard deviation per trade and \( x \) is a random draw from a unit normal distribution. The standard deviation per period is equal to the volatility and the standard deviation per trade equals the volatility divided by the square root of the number of trades. In each simulation, the trades are assumed to be observed with a given probability. The bid (ask) for each trade is defined as \( P_m \) multiplied by one minus (plus) half the assumed bid-ask 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 at time \( t \), then the previous Close at time \( t - 1 \) is used as the Open, High, Low, and Close prices at time \( t \). The simulations may include close-to-open returns (e.g., overnight jumps).

Usage

```r
sim(
  n = 10000,
  trades = 390,
  prob = 1,
  spread = 0.01,
  volatility = 0.03,
  jump = 0,
  drift = 0,
  askhigh = FALSE,
  bidlow = FALSE,
  units = "day"
)
```

Arguments

- **n**: the number of periods to simulate.
- **trades**: the number of trades per period.
- **prob**: the probability to observe a trade.
- **spread**: the percentage spread.
- **volatility**: the close-to-close volatility.
- **jump**: the close-to-open volatility.
- **drift**: the expected return per period.
- **askhigh**: if TRUE, returns the column AskHigh containing 1 if the High price is buyer initiated and 0 otherwise.
spread

bidlow if TRUE, returns the column BidLow containing 1 if the Low price is seller initiated and 0 otherwise.

units the units of the time period. One of: sec, min, hour, day, week, month, year.

Value

Simulated OHLC prices.

References


spread

Estimate Bid-Ask Spreads from OHLC Prices

Description

This function estimates bid-ask spreads from open, high, low, and close prices with several methods.

Usage

spread(
x,  
width = nrow(x),  
method = "EDGE",  
probs = c(0.025, 0.975),  
na.rm = FALSE,  
trim = 0
)

Arguments

x xts object with columns named Open, High, Low, Close, representing OHLC prices.

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. Choose one or more of: EDGE, AR, AR2, CS, CS2, ROLL, O, OC, OHL, OHLC, C, CO, CHL, CHLO, or GMM. See details.
<table>
<thead>
<tr>
<th>probs</th>
<th>vector of probabilities to compute the critical values when the method EDGE is selected. By default, the critical values at 2.5% and 97.5% are computed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>na.rm</td>
<td>a logical value indicating whether NA values should be stripped before the computation proceeds.</td>
</tr>
<tr>
<td>trim</td>
<td>the fraction (0 to 0.5) of observations to be trimmed from each end before the spread is computed. Values of trim outside that range are taken as the nearest endpoint.</td>
</tr>
</tbody>
</table>

**Details**


The methods O, OC, OHL, OHL, C, CO, CHL, CHLO implement the generalized estimators described in Ardia-Guidotti-Kroencke (2021). They can be combined by concatenating their identifiers, e.g., OHL.CHL0 uses an average of the OHL and CHLO estimators. The method GMM combines the 8 OHLC estimators with the Generalized Method of Moments.

The method AR implements the estimator proposed in Abdi & Ranaldo (2017). AR2 implements the 2-period adjusted version.

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

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

**Value**

Time series of spread estimates.

**References**


**Examples**

```r
# simulate a price process with spread 1%
x <- sim(spread = 0.01)

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

# compute the spread for each month
ep <- endpoints(x, on = "months")
spread(x, width = ep)

# compute the critical values at 5% and 95%
spread(x, probs = c(0.05, 0.95))

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