Package 'bidask'

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Type Package

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

Version 0.1.0

Description
Implements a novel estimation procedure of bid-ask spreads from open, high, low, and close prices as described in Ardia-Guidotti-Kroencke <https://www.ssrn.com/abstract=3892335>. Moreover, it provides an implementation of the estimators proposed in Roll (1984) <doi:10.1111/j.1540-6261.1984.tb03897.x>, Corwin-Schultz (2012) <doi:10.1111/j.1540-6261.2012.01729.x>, and Abdi-Ranaldo (2017) <doi:10.1093/rfs/hhx084>.

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Imports zoo

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`sim` *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 σ 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

```
sim(
  n = 10000,
  trades = 390,
  prob = 1,
  spread = 0.01,
  volatility = 0.03,
  jump = 0,
  drift = 0,
  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.
`units`	the units of the time period. One of: `sec`, `min`, `hour`, `day`, `week`, `month`, `year`.

Value

Simulated OHLC prices.

References

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

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

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

`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 `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 any combination of the OHLC methods, e.g. `OHLC.CHLO`. See details.
`probs`	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.
`na.rm`	a `logical` value indicating whether `NA` values should be stripped before the computation proceeds.
`trim`	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.

Details

The method `EDGE` implements the Efficient Discrete Generalized Estimator proposed in Ardia-Guidotti-Kroencke (2021). This is an optimal combination of the OHLC methods when full OHLC price data are available. The OHLC methods implement the generalized estimators proposed in Ardia-Guidotti-Kroencke (2021). These estimators 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 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 original paper.

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

Value

Time series of spread estimates.

References

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

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

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

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Examples

```
# 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"))
```

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