NDK_HURST_EXPONENT

Last Modified on 04/15/2016 11:13 am CDT

- C/C++
- .Net

```
int __stdcall NDK_HURST_EXPONENT(double * X,
                                 size_t   N,
                                 double   alpha,
                                 WORD     retType,
                                 double * retVal
                                )
```

Calculates the Hurst exponent (a measure of persistence or long memory) for time series.

Returns

status code of the operation

Return values

NDK_SUCCESS	Operation successful
NDK_FAILED	Operation unsuccessful. See **SFMacros.h** for more details.

Parameters

[in]	**X**	is the input data sample (a one dimensional array).
[in]	**N**	is the number of observations in X.
[in]	**alpha**	is the statistical significance level (1%, 5%, 10%). If missing, a default of 5% is assumed.
[in]	**retType**	is a number that determines the type of return value: 1 = Empirical Hurst exponent (R/S method) 2 = Anis-Lloyd/Peters corrected Hurst exponent 3 = Theoretical Hurst exponent 4 = Upper limit of the confidence interval 5 = Lower limit of the confidence interval
[out]	**retVal**	is the calculated value of this function.

Note

NDK_FAILED.

2. The input data series may include missing values (NaN), but they will not be included in the calculations.

3. The Hurst exponent, \(h\), is defined in terms of the rescaled range as follows: \[E \left [\frac{R(n)}{S(n)} \right]=C_n^H \] \[n \to \infty \]

4. Where:

- \(\left [\frac{R(n)}{S(n)} \right]\) is the Rescaled Range.
- \(E \left [x \right]\) is the expected value.
- \(n\) is the time of the last observation (e.g. it corresponds to \(X_n\) in the input time series

data.)

- h is a constant. of

5. The Hurst exponent is a measure autocorrelation (persistence and long memory): -A value of \(0

6. The Hurst exponent's namesake, Harold Edwin Hurst (1880-1978), was a British hydrologist who researched reservoir capacity along the Nile river.

7. The rescaled range is calculated for a time series, $X=X_1,X_2,\dots, X_n$, as follows:

1. Calculate the mean:
   $m=\dfrac{1}{n} \sum_{i=1}^{n} X_i$
2. Create a mean adjusted series:
   $Y_t=X_{t}-m$ for $t=1,2, \dots ,n$
3. Calculate the cumulative deviate series Z:
   $Z_t= \sum_{i=1}^{t} Y_{i}$ for $t=1,2, \dots ,n$
4. Create a range series R:
   $R_t = max\left (Z_1, Z_2, \dots, Z_t \right)- min\left (Z_1, Z_2, \dots, Z_t \right)$ for $t=1,2, \dots, n$
5. Create a standard deviation series R:
   $S_{t}= \sqrt{\dfrac{1}{t} \sum_{i=1}^{t}\left (X_{i} - u \right)^{2}}$ for $t=1,2, \dots ,n$ Where: h is the mean for the time series values $X_1,X_2, \dots, X_t$

8. Calculate the rescaled range series (R/S):
$\left (R/S \right)_{t} = \frac{R_{t}}{S_{t}}$ for $t=1,2, \dots, n$

Requirements

Header	SFSDK.H
Library	SFSDK.LIB
DLL	SFSDK.DLL

Examples

int NDK_HURST_EXPONENT(double[] pData,
UIntPtr nSize,
double alpha,

Namespace: NumXLAPI
Class: SFSDK
Scope: Public

short retType,
ref double retVal
)

Lifetime: Static

Calculates the Hurst exponent (a measure of persistence or long memory) for time series.

Returns

status code of the operation

Return values

NDK_SUCCESS	Operation successful
NDK_FAILED	Operation unsuccessful. See **SFMacros.h** for more details.

Parameters

[in]	**pData**	is the input data sample (a one dimensional array).
[in]	**nSize**	is the number of observations in pData.
[in]	**alpha**	is the statistical significance level (1%, 5%, 10%). If missing, a default of 5% is assumed.
[in]	**retType**	is a number that determines the type of return value: 1 = Empirical Hurst exponent (R/S method) 2 = Anis-Lloyd/Peters corrected Hurst exponent 3 = Theoretical Hurst exponent 4 = Upper limit of the confidence interval 5 = Lower limit of the confidence interval
[out]	**retVal**	is the calculated value of this function.

Remarks

1. The input data series may include missing values (NaN), but they will not be included in the calculations.

2. The Hurst exponent, \(h\), is defined in terms of the rescaled range as follows: \[E \left [\frac{R(n)}{S(n)} \right]=C_n^H \] \[n \to \infty \]

3. Where:

- \(\left [\frac{R(n)}{S(n)} \right]\) is the Rescaled Range.
- \(E \left [x \right]\) is the expected value.
- \(n\) is the time of the last observation (e.g. it corresponds to \(X_n\) in the input time series data.)
- \(h\) is a constant. of

4. The Hurst exponent is a measure autocorrelation (persistence and long memory): -A value of \(0

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1. Calculate the mean:
   \(m=\dfrac{1}{n} \sum_{i=1}^{n} X_i\)
2. Create a mean adjusted series:

$Y_t=X_{t}-m$ for $t=1,2, \dots ,n$

3. Calculate the cumulative deviate series Z:
   $Z_t= \sum_{i=1}^{t} Y_{i}$ for $t=1,2, \dots ,n$
4. Create a range series R:
   $R_t = max\left (Z_1, Z_2, \dots, Z_t \right)- min\left (Z_1, Z_2, \dots, Z_t \right)$ for $t=1,2, \dots, n$
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   $S_{t}= \sqrt{\dfrac{1}{t} \sum_{i=1}^{t}\left (X_{i} - u \right)^{2}}$ for $t=1,2, \dots ,n$ Where: h is the mean for the time series values $X_1,X_2, \dots, X_t$

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$\left (R/S \right)_{t} = \frac{R_{t}}{S_{t}}$ for $t=1,2, \dots, n$

Exceptions

Exception Type	Condition
None	N/A

Requirements

Namespace	NumXLAPI
Class	SFSDK
Scope	Public
Lifetime	Static
Package	NumXLAPI.DLL

Examples

References

[1] A.A.Anis, E.H.Lloyd (1976) The expected value of the adjusted rescaled Hurst range of independent normal summands, Biometrica 63, 283-298.
[2] H.E.Hurst (1951) Long-term storage capacity of reservoirs, Transactions of the American Society of Civil Engineers 116, 770-808.
[3] E.E.Peters (1994) Fractal Market Analysis, Wiley.

[4] R.Weron (2002) Estimating long range dependence: finite sample properties and confidence intervals, Physica A 312, 285-299.

See Also

[template("related")]